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## JUSTIFICATION FOR USING THE ALIGNMENT METHOD IN OBSERVING DUMP SUBSIDENCE

**Abstract** *This article examines issues related to observing the deformation and subsidence of dumps generated in the mining industry. The significance of mine surveying observations in determining the processes of dump subsidence and displacement is analyzed. Alongside traditional geodetic methods, particularly observation through geometric leveling, the potential for using the alignment method is scientifically substantiated. The advantages of organizing observation work, the degree of accuracy, and the application conditions based on the alignment section scheme and the sequential alignment scheme are analyzed. The research results indicate that the alignment method yields high-precision results in determining dump deformation and is one of the key methods for the effective organization of mine surveying observations.*

**Keywords:** *dump, deformation, subsidence, displacement, mine surveying observations, geodetic measurements, alignment method, leveling, mining, geodesy.*

**Introduction.** Mining is one of the most important and strategic sectors of human activity. This field plays a crucial role in the development of industry and in ensuring the stable operation of the energy and production sectors. Mining operations encompass processes such as the exploration of mineral deposits, their extraction, the primary processing of extracted raw materials, and the construction of mining enterprises.

During the mining process, large volumes of rock are excavated, and a certain portion is deposited in dumps as production waste. Over time, such dumps can undergo deformation due to various natural and anthropogenic factors. Therefore, monitoring their stability and identifying settlement and displacement processes is one of the key tasks of the mine surveying service at mining enterprises.

Currently, among the primary responsibilities of the mine surveying service, monitoring dump deformation is of particular importance, as it plays a significant role in ensuring mine safety and environmental sustainability.



## Literature Review and Research Methods

The deformation of dumps primarily occurs under the influence of their own weight, natural conditions, and anthropogenic factors. These processes depend on the mechanical properties, moisture content, temperature, and geological structure of the rocks.

The main types of deformation observed in dumps are as follows:

*Settlement Deformation* - This deformation occurs as a result of rock compaction under its own weight. In this case, the internal structure of the rock does not change significantly.

*Compaction Deformation* - Rocks compact due to external influences, and during this process, a change occurs in their structure. Examples include: the moistening of rocks, the thawing of frozen rocks, changes in hydrogeological conditions, etc.

*Swelling Deformation* - The volume of rock can increase as a result of chemical reactions or changes in moisture and temperature.

*Subsidence Deformation* - This occurs as a result of an imbalance in rock masses during the extraction of underground mineral resources.

The mathematical characteristic of dump settlement is expressed by the vertical distance between the initial and settled positions of the dump.

Settlement is divided into the following types:

- *Uniform settlement* - the settlement value is the same at all points;
- *Uneven settlement* - settlement values are different at various points.

In practice, uneven settlement is often observed. This situation can lead to the tilting, bending, and displacement of the dump layers.

## Results and Discussion

Deformation monitoring on dumps begins with the formation of the dump and continues until its operation ceases. Monitoring work is carried out based on a special technical assignment.

The technical assignment specifies the following:

- dump sections to be monitored;
- location of initial benchmarks;
- observation frequency;
- required accuracy level;
- reporting documents.

*Geodetic leveling methods* are typically used to determine the settlement of dumps. Leveling work is divided into three classes based on accuracy:

| Leveling Class | Permissible Error |
|----------------|-------------------|
| Class I        | 1 mm              |
| Class II       | 2 mm              |
| Class III      | 3 mm              |

Leveling is performed using high-precision levels such as the H-05 and Ni-002.

However, in modern mining conditions, traditional leveling methods sometimes do not provide sufficient accuracy. Therefore, in this article, we will

consider the feasibility of using alternative methods, including the alignment method.

**Analysis of Results and Discussion.** The results of observing dump deformation make it possible to determine the strength of the rock mass and prevent the occurrence of settlement. To address these issues, high-precision results are obtained by carrying out the following mine surveying and geodetic observation work using these two methods:

1) *Geodetic measurement work* - is divided into three classes of leveling based on accuracy. The results of leveling performed twice should not exceed 1 mm for Class I leveling, 2 mm for Class II leveling, and 5 mm for Class III leveling.

Deep benchmarks can be metallic, bimetallic, and double-rod. Deep benchmarks are constructed with lengths ranging from 2 m to 100 m, and even longer. The benchmarks must be installed 0.5-2 km away from the zone of influence of the construction pressure.

Deep benchmarks are installed only when the settlement of a dump must be measured with first-order leveling accuracy. If the settlement of the structure is measured with second- or third-order leveling accuracy, then ground benchmarks are installed. There must be no fewer than four ground benchmarks.

Benchmarks are built for long-term preservation. Their degree of stability

$$\leq \pm m_{n.b.k.x} \sqrt{2nM}$$

is found from the expression. Where  $n$  is the number of stations;

$m_{n.b.k.x}$  – is the root-mean-square error of the relative height determined from a single station. For first-order leveling, this value is required to be  $\pm 0.15$  mm, for second-order leveling,  $\pm 0.5$  mm, and for third-order leveling,  $\pm 1.0$  mm.

2) *Geometric Leveling Method*. The accuracy of observing the settlement of many dumps with a homogeneous composition is ensured by using Class I or II leveling methods.

Only in certain cases are special high-precision leveling methods used to determine settlement.

In the Class I leveling method, the determination of dump settlement is performed at two instrument horizons, in forward and reverse directions, using high-precision levels such as the H-05 and Ni-002. An Invar staff is used in leveling.

Leveling is performed when the external environment is favorable and the staff markings are clearly visible.

Although the methods discussed above are widely used, modern standards demand high-precision results. Therefore, we will consider implementing unconventional methods that differ slightly from those we use in practice.

One method that is unconventional for us is the alignment method, which includes the following types:

- *The complete alignment scheme;*
- *The partial alignment scheme;*
- *The sequential alignment scheme;*
- *The closing alignment method.*

Since the partial alignment scheme and the sequential alignment scheme are the most effective of these methods, we will apply them in practice.

*The Partial Alignment Scheme.* In this scheme, the distance between observation points I-II, which are established on the dump, is divided into approximately four equal parts: 1.2, 2.4, 4.6, 6.11 (Figure 1). First, the position of the middle point 4 is determined relative to the overall alignment I-II.

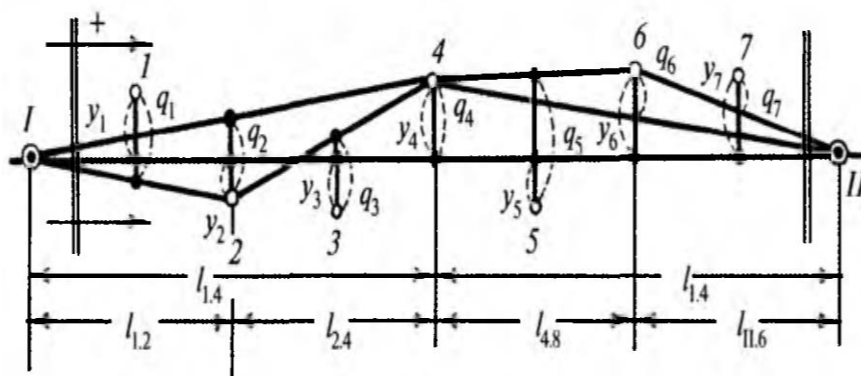


**Figure 1. The established partial alignment scheme.**

Then, the displacement of points 2 and 6 is measured relative to the half-alignments 1-4 and 4-6. After that, the displacement of all other observed points in each quarter-alignment (1-2, 2-4, 4-6, 6-1) is determined. Thus, the total alignment is only used to determine the displacement of the point located in the middle. Measurements are carried out in forward and reverse directions. These tasks are repeated at the times specified in the instructions, and by comparing them with the previous ones, displacement, settlement, and slides are predicted.

In this scheme, since the measurements are performed on different alignments, the issue of reducing the determined displacements to a common alignment arises.

The measurements are carried out as follows:

For point 4, located in the middle, the value of the measured displacement ( $y$ ) and the reduced displacement ( $q$ ) are equal, i.e.:

In this case, the distance between points and the vertical angles are determined using a theodolite on benchmarks located at points between points I-II.

$$y_4 q_4 = 8 \text{ m}$$

For the second point:

$$y_2 q_2 \delta_2 y_2 = + \text{ or}$$

$\delta_2$  Here it is calculated using the following ratio:

$$\frac{\delta_2}{y_4} = \frac{l_{1.2}}{l_{1.4}}$$

For point 6:

$$y_6 = q_6 q_4 \frac{l_{11.6}}{l_{11.4}} +$$

For point 1:

$$y_1 q_1 \delta_1 + \delta_2 = +$$

where

$$\delta_1 = q_2 \frac{l_{1.1}}{l_{1.2}} \quad \delta_2 = q_4 \frac{l_{1.1}}{l_{1.4}}$$

from this:

$$y_1 q_1 q_2 \frac{l_{1.1}}{l_{1.2}} + q_4 \frac{l_{1.1}}{l_{1.4}} = +$$

In the reverse direction (from point II relative to point I), measurements at the points are performed in the following order: 4, 6, 2, 7, 5, 3, 1.

If, as before, we assume the error of the midpoint, point 4, to be equal to 1, then the permissible error for other points will be as follows:

Points 1 and 7 ----- 0.43

Points 2 and 6 ----- 0.71

Points 3 and 5 ----- 0.83

Point 4 ----- 1.0

As can be seen, the error values between these points have approached those of the full alignment scheme. However, the error of the points located in the middle is 2 times greater than that of the points at the edge of the alignment. This is the main drawback of this scheme.

This method, unlike others, makes it possible to obtain accurate results and determine each observation based on distances. Its disadvantages are that problems arise when measuring inaccessible points and that the errors in each measurement differ from one another.

*Sequential Alignments Scheme.* This scheme utilizes a well-known principle in geodesy: orientation accuracy increases when sighting distant points, while distance measurement accuracy is highest at short distances. The essence of the sequential alignments scheme is as follows.

A theodolite is set up at the starting point of the alignment, which is divided into approximately equal parts, and a sighting mark is placed at the end point (Figure 2). Relative to the overall I-II alignment, only the displacement of point 1 is measured. Then, the measurements are continued in the reverse direction. The theodolite is set up at point II, and the sighting mark is placed at point I.

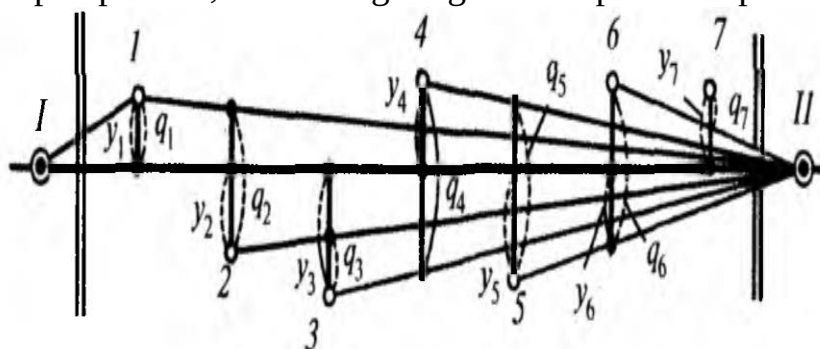


**Figure 2. Sequential Alignments Scheme.**

The expression for referencing to the overall I-II alignment is written as follows:

$$y_1 = q_1$$

$$y_2 = q_1 \frac{l_{2.11}}{l_{1.11}} q_2 +$$

$$y_3 = q_1 \frac{l_{3.11}}{l_{1.1}} q_2 \frac{l_{3.11}}{l_{2.11}} + q_3 +$$

If we assume the error of observation point 4, located in the middle of the alignment, is equal to 1, then the errors of the remaining points will be as follows:

Points 1 and 7..... 0.70

Points 2 and 6..... 0.87

Points 3 and 5 ..... 0.97

Point 4 ..... 1.0

In this scheme, the displacement measurement was performed with a similar level of accuracy for all points compared to the other schemes considered.

$\sqrt{2}$  The error at the weakest point in the middle increases by a factor of [missing value] compared to the points at the edges.

In this scheme, an accumulation of errors is observed during the measurement process, which is a major drawback.

### Conclusion

Monitoring the settlement of waste dumps is one of the key factors in ensuring safety at mining enterprises. The research results showed that using the alignment method alongside traditional geodetic methods increases the accuracy of monitoring work.

Alignment section and sequential alignment schemes provide highly accurate results in determining dump deformation. Since these methods combine the capabilities of trigonometric leveling and distance measurement, they are often more effective than geometric leveling methods.

In the future, the combined use of modern geodetic instruments, such as laser scanners, GNSS technologies, and digital monitoring systems, can further increase the effectiveness of monitoring waste dump deformation.

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## THE ROLE OF LEGAL INFORMATION AND AWARENESS IN ENSURING PUBLIC PARTICIPATION IN LEGISLATIVE ACTIVITY

**Abstract:** *This article investigates the strategic importance of legal information and awareness in ensuring the transparency of the legislative activity. The author analyzes legal mechanisms for increasing public participation in the discussion of draft laws, examining the experiences of developed nations such as the USA, the European Union, and Estonia regarding "Plain Legal Language" and digital communication platforms. The article concludes by proposing practical recommendations for aligning Uzbekistan's legislative activity with international standards, specifically by attaching brief summaries for citizens to draft projects and implementing a multi-channel information system.*

**Keywords:** *legislative activity, public discussion, legal awareness, plain legal language, transparency, digital democracy, regulation.gov.uz.*

Legal awareness serves as a vital institutional tool in facilitating public participation in the legislative activity and elevating it to a qualitatively new level. The effective organization of legal awareness aids in conveying the essence and objectives of draft normative-legal acts to the public, increasing citizens' legal awareness, and ensuring their participation through informed and grounded proposals.

According to the 2024 United Nations E-Government Survey, Uzbekistan has shown consistent progress, ranking 63rd in EGD I and 53rd in the E-Participation Index (EPI). While the rise to 53rd place in EPI reflects a robust digital infrastructure (e.g., regulation.gov.uz), there remains a "participation gap". High rankings in technical infrastructure must be matched by high-quality legal awareness to ensure that digital platforms are not just available, but actively and meaningfully used by the citizenry.

Nevertheless, in current practice, legal awareness is often limited to explanatory work conducted only after a document has been adopted. However, legal awareness should commence at the stage of legislative initiative; the objectives, underlying problems, and expected legal consequences of a draft project must be communicated to the public in advance.

The OECD's concept of the "Ladder of Citizen Participation" (also known as the "Levels of Stakeholder Participation") provides a structured approach to understanding how citizens and stakeholders can be involved in government decision-making processes. It outlines three key levels of participation: Information, Consultation, and Engagement (OECD, 2023).

### 1. Information

This is the most basic level of participation, where the government simply provides information to the public. Communication is one-way — from authorities to citizens — and aims to increase transparency and awareness but does not require feedback. Examples include websites, newsletters, or public announcements (OECD, 2024).

## 2. Consultation

At this stage, the government asks for the public's opinions or feedback on draft laws or policies. This involves two-way communication: authorities share information and collect public comments. Crucially, authorities are expected to provide feedback — explaining how citizens' views were taken into account in the final decision (OECD, 2024).

## 3. Engagement

This is the most advanced form of participation, where citizens and stakeholders take part in co-creation and co-decision processes. Engagement involves collaboration throughout the policy cycle — from problem identification to implementation and monitoring. It requires accessible data, institutional trust, and resources for meaningful participation (OECD, 2023).

According to the OECD Recommendation on Open Government (2017), public authorities have an obligation of “active dissemination,” meaning that they must actively promote information across various platforms to inform broad segments of the population.

The experience of developed foreign countries demonstrates that extensive coverage of draft normative acts is more effective than publicity generated after their adoption. In the United States, pursuant to Section 5 U.S.C. § 553(b) of the Administrative Procedure Act (APA), it is mandatory to publish any federal proposed rule in the Federal Register.

The Federal Register is the official daily journal of the government, serving as the primary source for all significant regulatory announcements, which are subsequently redistributed through radio, newspapers, and television.

In the United Kingdom, according to the "Consultation Principles" (Cabinet Office, 2018), draft documents are published on the GOV.UK – Consultations portal. In practice, for particularly significant draft laws, notification via BBC News, Parliament TV, and official press releases is employed as a standard procedure, even where not strictly mandatory.

In France, according to Articles 131-132 of the Code des relations entre le public et l'administration (CRPA), which regulates public discussion, documents submitted for consultation are published in the Journal officiel de la République française. For major projects, notifications in media outlets such as France Info, France 24, Le Monde, and Le Figaro are carried out within the framework of state-funded information policy.

In South Korea, Article 42 of the Administrative Procedures Act (1996, amended 2016) states: "If a regulation affects the public, the draft shall be announced through the Official Gazette, major newspapers, or broadcasting media."

Additionally, online discussions are conducted through the "People's Opinion Portal"

As observed in the experience of developed foreign nations, these countries have clearly defined the mandatory sources where announcements regarding the public discussion of draft normative-legal acts must be published.

Based on this experience, it would be advisable for Uzbekistan to adopt a similar mechanism: information about the submission of draft regulatory legal acts for public discussion should be mandatorily published on official government websites, in mass media (television, radio, newspapers), and through social media platforms to ensure maximum public awareness and engagement.

In particular, information on draft regulatory legal acts submitted for public discussion should be mandatorily published on the [regulation.gov.uz](http://regulation.gov.uz) portal, as well as on the official websites of relevant ministries and agencies. Additionally, such announcements should be disseminated through national mass media, including television and radio channels such as "O'zbekiston 24", "Yoshlar", "Mahalla", "Oilaviy", and "O'zbekiston radiosi", and through printed newspapers like *Xalq so'zi*, *Narodnoye slovo*, and *Jamiyat*.

Furthermore, to ensure broader accessibility and active public engagement, announcements may also be shared via popular online media platforms, such as [gazeta.uz](http://gazeta.uz), [kun.uz](http://kun.uz), and [daryo.uz](http://daryo.uz), as well as through the official social media channels of public authorities. Establishing such a multi-channel information system would enable timely and widespread dissemination of consultation materials to citizens.

Implementing this approach would significantly enhance transparency and accountability in the legislative process, ensuring that citizens are properly informed and able to participate effectively in lawmaking. Adopting these practices would harmonize Uzbekistan's consultation mechanisms with international standards, promote genuine participation of public representatives, and strengthen the principles of transparency and democratic governance.

Currently, in Uzbekistan, the process of explaining the content of draft laws to citizens is not sufficiently systematized.

The [regulation.gov.uz](http://regulation.gov.uz) portal posts the full text of draft laws, but it is written in legal language, which is often difficult for the general public to understand.

Some ministries provide brief explanations on their websites or social media accounts, but this is not conducted in a systematic or standardized manner, meaning that some ministries and agencies do not post explanations at all, and the information that is published does not provide a clear understanding of the draft law.

Press conferences and briefings are held in parliamentary committees, but this practice is mainly applied to major draft laws.

In legal awareness raising, implementing the principle of "plain legal language"—stating draft regulatory acts in a simple and understandable manner—is of paramount importance. Complex legal terminology and technical-legal structures serve as significant barriers that limit public participation. In this regard, preparing explanatory materials for every draft regulatory act—outlining its

summary, key provisions, and social significance—enhances the conscious engagement of the public.

In the European Union, within the framework of the "Have Your Say" platform for regulatory initiatives, documents are published in both "legal text" and "summary for citizens" formats. These summaries explain the core content of the document, whom it affects, and what changes are expected in simple language. This approach ensures that public participation is not restricted to experts alone but allows broader segments of the population to be involved in the legislative activity.

In the experience of Estonia and Finland, visual and interactive tools are widely utilized in the process of raising legal awareness. Materials such as infographics, diagrams, and Q&A formats regarding draft regulatory acts are presented to the public. This creates an opportunity to quickly and easily grasp the essence of complex legal norms.

In the United States, the Plain Writing Act (2010) was enacted, which mandates federal executive agencies to write legal and administrative documents in clear, concise, and understandable language. This law is aimed at ensuring transparency in legislative activity and legal information for the public, serving to help citizens comprehend regulatory initiatives and participate actively in discussions.

In the legislative activity process, the most critical stage of raising legal awareness occurs during the drafting of regulatory acts and their presentation for public discussion. Foreign experience demonstrates that utilizing information technology and Artificial Intelligence (AI) during the drafting stage is decisive in expanding and improving the quality of public participation.

In the United States, several AI-based tools and research initiatives exist to analyze legal and political texts, simplify them, and support public discourse:

PolicyPulse – an interactive system based on generative Large Language Models (LLMs) that automatically analyzes online public opinion regarding specific political issues, extracting key thematic categories and critical points. This tool helps policy researchers obtain general civic sentiment in a rapid and systematic format, effectively engaging citizen contributions in the project discussion process.

FiscalNote - a widely used platform in the West that analyzes the text of draft bills. Using AI, it performs functions such as identifying key aspects, comparing them with similar legislation, and tracking changes over time. This makes it easier for the public and stakeholders to quickly understand and comment on complex regulatory texts.

These types of systems present the complex text of draft regulatory documents in a structured format, providing citizens with brief summaries, key provisions, and an understanding of their social impact. It is advisable to create such system in Uzbekistan as well.

Currently, more than 80% of the drafts posted on the regulation.gov.uz portal are written in complex legal language, which prevents ordinary citizens from understanding the content and leads to passive participation in discussions.



Implementing the experience of the US Plain Writing Act and the EU Summary for citizens. It should be mandatory to attach a "Plain Language Annotation" and visual materials to every draft.

In result, public participation in legislative activity will increase 2-3 times, the effectiveness of identifying hidden corruption-prone norms in laws will improve, and the level of legal awareness among the population will be formed right at the drafting stage.

Furthermore, creating the "Explanatory Note for Citizens" system may help to enhance the role of public.

Every developing agency, when posting a draft on the regulation.gov.uz portal, must attach a "Summary for Citizens" text not exceeding 200 words. This summary should include:

Purpose: Why is this document being adopted?

Change: How does it differ from the current regulations?

Result: How will it affect the lives of ordinary citizens or entrepreneurs?

For drafts of socio-economic significance (especially in tax, customs, education, and healthcare), at least one infographic or comparative table must be attached.

A "Visual Project" button should be introduced on the portal, displaying complex legal norms in the form of flowcharts.

Implementation of the "Legal-AI" Analytical Module is also will be helpful to explain the core meaning of projects to citizens.

To integrate a virtual assistant based on Artificial Intelligence (LLM) into the regulation.gov.uz portal. When a complex legal clause is selected, the AI translates it into "plain human language."

The implementation of these proposals will yield the following results:

Firstly, a transition from "formal participation" (pro forma commenting) to "meaningful participation" in legislative activity.

Secondly, the level of legal awareness will be established during the drafting stage, rather than only after a law is enacted.

Thirdly, corruption loopholes arising from complex legal terminology will be brought under public scrutiny.

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## **CALCULATION OF THE LOAD ACTING ON THE PISTON IN INTERNAL COMBUSTION ENGINES AND ANALYSIS OF COMPRESSION AND EXPANSION PROCESSES**

**Abstract.** *This paper analyzes the parameters of compression and expansion processes in internal combustion engines. It is shown that, in addition to conventional parameters, determining the load acting on the piston is important for studying engine working processes. Expressing the force acting on the piston in kilograms and tons provides a clearer understanding of the mechanical loads occurring in the engine cylinder. The proposed approach contributes to a deeper understanding of engine operation and helps evaluate the operating conditions of internal combustion engine components under high mechanical loads.*

**Keywords:** *internal combustion engine, compression process, expansion process, piston load, cylinder pressure, mechanical work, indicator diagram.*

**Introduction.** In modern transport vehicles (automobiles, tractors, and road construction machinery), internal combustion engines are mainly used as power units. In such engines, the thermal energy generated as a result of the combustion of the working mixture is converted into mechanical work. Both liquid and gaseous fuels can be used in internal combustion engines.

In motor vehicles, internal combustion engines operate under various power modes. In addition, when studying the operating processes of the engine, the analysis of the parameters of the compression and expansion processes is of great importance.

**Main part.** During the compression process, in four-stroke engines with and without supercharging, the piston begins to move toward the top dead center after the intake valves are closed, while in two-stroke engines the compression process begins after the completion of the gas exchange process. As a result, the fresh charge that has entered the cylinder is compressed, and its temperature and pressure increase.

The compression ratio in carburetor engines is limited by the occurrence of detonation combustion, whereas in diesel engines it is limited by the self-ignition temperature of diesel fuel. Therefore, at the end of the compression process the temperature and pressure of the charge remain within certain limits. The characteristics of the compression process in a real cycle are shown in Figure 1. At the initial stage of the compression process, the temperature of the charge is lower than the temperature of the cylinder walls, the cylinder head, and

the piston crown; therefore, the charge begins to heat up. In a real cycle, since the combustion products expand at high temperatures, part of the heat is transferred to the external environment through the cylinder head, cylinder walls, and the piston crown. As a result, the temperature of the combustion products decreases.

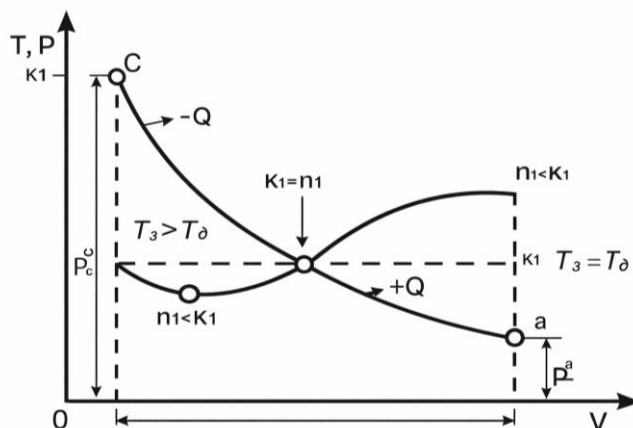


**Figure 1. Diagram of the compression process.**

After the expansion process, the exhaust process takes place. When the exhaust valve opens, the exhaust gases leave the engine cylinder at high velocity, resulting in a high level of noise. To reduce this noise, a muffler (silencer) is installed in the exhaust pipe.

**Materials and methods.** During the research process, the operating processes of internal combustion engines were studied based on the results of bench tests and mathematical calculation methods.

The maximum pressure values occurring in the engine cylinder, the piston surface area, and the load acting on the piston were determined based on the pressure. In the calculations, the following value was adopted as the maximum pressure for diesel engines:

$$P = 8 \text{ MPa} = 8 \times 10^6 \text{ Pa}$$

Here:

**S** – piston surface area,

**P** – pressure acting on the piston.

The calculation results were analyzed based on the following parameters for different types of engines: compression ratio, maximum temperature, pressure, and the amount of work performed.

**Research work.** The power of each engine is characterized by the maximum pressure generated inside the cylinder. Therefore, it is important to determine the load acting on the piston as a result of fuel combustion in the cylinder of an engine operating under nominal conditions.

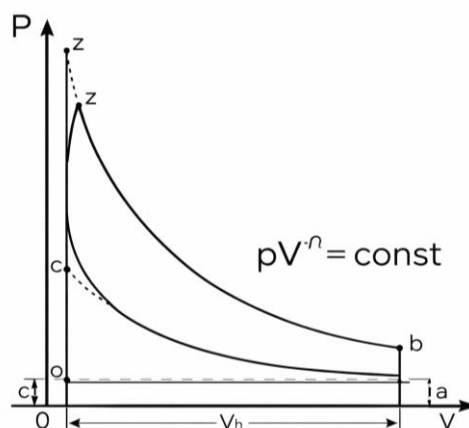


**Figure 2. Diagram of the expansion process.**

Based on the calculations, the values of the load acting on the piston of the diesel engine were determined. In diesel engines, the maximum pressure is equal to 8 MPa, and under the influence of this pressure a significant mechanical force acts on the piston. The calculation results show that the force acting on the piston is an important indicator in analyzing the operating processes of the engine.

**Discussion.** The analysis of the parameters of compression and expansion processes shows that the operating process in engine cylinders proceeds differently under various operating conditions. Most transport vehicles often do not operate at full power.

For example, in urban conditions during cargo transportation, due to speed restrictions, the engine usually operates at a load of up to 50%. Transport machines operating in open-pit mines or in construction work also function for long periods while utilizing only a part of their nominal power. Therefore, the fuel efficiency, emission of harmful substances, and the degree of wear of such machines depend on the engine's partial load operating modes.

**Results.** As a result of the conducted calculations, the following results were obtained:

- ❖ the maximum pressure in diesel engines is approximately **8 MPa**;
- ❖ the mechanical force acting on the piston is approximately **76 kN**;
- ❖ this value corresponds to a weight force of approximately **7.6 tons**.

Expressing the load acting on the piston in kilograms or tons makes it possible to more accurately evaluate the mechanical forces generated inside the engine cylinder.

**Conclusion.** The results of the study show that the compression and expansion processes in internal combustion engines are important stages that determine the main operating processes of the engine. During these processes, high pressure and temperature are generated inside the cylinder, resulting in significant mechanical loads acting on the piston.

The combined analysis of parameters such as the load acting on the piston, the work performed, and the pressure inside the cylinder plays an important role



in evaluating the operational efficiency of internal combustion engines. This approach helps to better understand engine operating processes during laboratory studies of internal combustion engines as well as in engineering calculations.

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## **OPTIMIZATION OF TRAFFIC FLOW AT URBAN INTERSECTIONS AND IMPROVEMENT OF ENERGY EFFICIENCY BASED ON INTELLIGENT TRAFFIC LIGHT SYSTEMS**

**Abstract.** *This paper examines the management of traffic flows at urban intersections and their optimization through intelligent traffic light systems. Based on mathematical modeling of traffic flow parameters, an adaptive control algorithm was developed that enables real-time traffic monitoring and dynamic adjustment of traffic signal phases. The analysis conducted using intersections in Namangan city as a case study shows that the implementation of intelligent systems can increase intersection capacity, reduce vehicle waiting time, decrease fuel consumption, and lower harmful emissions into the atmosphere.*

**Keywords:** *intelligent traffic light system, traffic flow, intersection, adaptive control, capacity, energy efficiency, traffic congestion, ecology.*

**Introduction.** Modern urbanization and the rapid growth of automobile transport have significantly increased the load on urban transport infrastructure. As the number of vehicles rises, traffic congestion at intersections becomes more frequent, causing economic losses, environmental pollution, and social challenges. Therefore, improving traffic flow management has become one of the key tasks of modern transport systems.

Numerous studies have focused on adaptive traffic flow control. Papageorgiou et al. emphasized that adaptive traffic signal systems play a crucial role in reducing congestion and improving traffic efficiency [1]. One of the most widely used systems is the SCOOT (Split Cycle Offset Optimization Technique) developed by Robertson, which adjusts signal phases in real time according to traffic intensity [2]. Research by Stevanovic shows that adaptive traffic signal systems can reduce vehicle waiting times by 20–40% [3]. In addition, Garber and Hoel demonstrated that the relationship between key traffic flow parameters—speed, density, and flow rate—determines the overall efficiency of transport systems [4–5]. These findings confirm that intelligent traffic signal systems have become an essential element of modern traffic management. Unlike conventional signal systems with fixed timing plans, intelligent systems analyze traffic conditions in real time and dynamically adjust signal phases. As a result, they help optimize traffic flow, reduce congestion, and improve the energy efficiency and sustainability of urban transport systems.

**Theoretical Foundations of Traffic Flow.** In traffic flow theory, the movement of vehicles is characterized by three main parameters:

1. **Traffic flow rate** –  $N$  (veh/h)
2. **Traffic density** –  $q$  (veh/km)

### 3. Average speed of vehicles – V (km/h)

The fundamental relationship between them is expressed by the following equation:

$$N = q \cdot V$$

This equation forms the **fundamental diagram of traffic flow**. As traffic density increases, vehicle speed decreases, and at a certain critical point the maximum traffic flow occurs.

**The fundamental diagram of traffic flow** illustrates the relationships between key traffic parameters such as speed, density, and flow rate. Using this diagram, important characteristics of a transport system can be identified, including maximum traffic flow, critical density, system capacity, and the onset of congestion.

When traffic density exceeds the critical level, vehicle speed decreases sharply and traffic flow becomes unstable, which often leads to congestion. According to traffic flow management theory, efficient intersection operation largely depends on the optimal allocation of traffic signal phases. If signal timings do not correspond to actual traffic intensity, vehicles experience excessive delays and intersection performance decreases.

**Operating Principle of Intelligent Traffic Light Systems.** An intelligent traffic light system is an adaptive system based on real-time monitoring and control of traffic flow. Such a system consists of the following main components:

1. **Data collection** using sensors to detect traffic flow
2. **Data processing** through a microcontroller
3. **Determination of optimal green signal time** for each direction
4. **Automatic control of traffic light phases**

To detect traffic flow, **inductive loop sensors, video cameras, or ultrasonic sensors** are used. These sensors allow the determination of the number of vehicles, their speed, and traffic density.

Using this mathematical model, it is possible to optimize the traffic flow at the intersection and effectively manage the phases of traffic signal lights.

**Research Results.** The results of calculations carried out at intersections in Namangan city showed the following:

| Indicator                 | Conventional System | Smart System |
|---------------------------|---------------------|--------------|
| Average waiting time      | 78–95 s             | 42–55 s      |
| Congestion length         | 100 %               | 65–72 %      |
| Fuel consumption          | 100 %               | 82–88 %      |
| CO <sub>2</sub> emissions | 100 %               | 86–90 %      |

The results show that the implementation of a smart traffic light system significantly increases the efficiency of traffic flow.

**Energy Efficiency Analysis.** Excessive waiting of vehicles at intersections leads to engine idling. This increases fuel consumption and raises the amount of harmful gases emitted into the atmosphere.

By implementing smart traffic light systems:

1. vehicle idling time decreases by **30–40 %**
2. fuel consumption is reduced by **12–18 %**

### 3. CO<sub>2</sub> emissions decrease by 10–14%

According to calculations, it is possible to save **8–12 thousand liters of fuel per year** at a single large urban intersection.

#### **Fundamental Diagram of Traffic Flow:**

**Discussion.** The research results show that smart traffic light systems play an important role in optimizing traffic flow. Adaptive control algorithms allow traffic flow to be analyzed in real time, which ensures the stable operation of the transport system.

Smart traffic light systems also contribute to improving the environmental sustainability of the transport system. The reduction in vehicle idling time leads to a decrease in atmospheric pollution.

**Conclusion.** The results of the conducted research show that the implementation of smart traffic light systems plays an important role in improving the efficiency of urban transport systems. Traffic light systems based on adaptive control algorithms make it possible to optimize traffic flow in real time.

The analysis indicates that smart traffic light systems:

1. increase the capacity of intersections;
2. reduce vehicle waiting time;
3. decrease fuel consumption;
4. reduce the amount of harmful emissions released into the atmosphere;
5. improve the energy efficiency of transport infrastructure.

In the future, the transport system can be further improved by integrating smart traffic light systems with artificial intelligence algorithms, traffic flow forecasting models, and a unified citywide transport management platform. Such systems are an important component of the future **Smart City** concept.

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## **THE ROLE OF ONLINE LEARNING IN THE HIGHER EDUCATION SYSTEM: ITS ADVANTAGES AND DISADVANTAGES**

**Abstract:** *This article examines the role of online learning in the higher education system, providing a comprehensive analysis of its advantages and disadvantages. The study investigates the effectiveness of online education platforms, the attitudes of students and faculty members toward digital learning environments, and the key trends in distance education that emerged during and after the COVID-19 pandemic. Using a mixed-methods research design involving a survey of 350 students from three higher education institutions in Tashkent, the paper evaluates the perceived benefits and drawbacks of online instruction compared with traditional classroom-based learning. The findings suggest that while online learning offers significant advantages in terms of flexibility, accessibility, and cost-effectiveness, it also presents notable challenges related to student engagement, technical infrastructure, and the quality of practical instruction. The study concludes by proposing a blended learning model as the most effective approach and provides evidence-based recommendations for improving online education quality in Uzbekistan's higher education system.*

**Keywords:** *online learning, higher education, distance education, digital technologies, education quality, e-learning platforms, student engagement, blended learning, COVID-19 pandemic.*

### **Introduction**

The rapid advancement of information and communication technologies (ICT) in the 21st century has fundamentally transformed the landscape of higher education worldwide. Online learning, once regarded as a supplementary mode of instruction, has emerged as an integral component of modern university education, providing millions of students with unprecedented access to quality academic programs regardless of geographical or temporal constraints [1]. The urgency and relevance of this topic became especially apparent during the COVID-19 pandemic of 2020–2021, when educational institutions across the globe were compelled to transition to remote instruction, accelerating the adoption of digital learning technologies at an extraordinary pace [2].

In the context of Uzbekistan, the government has undertaken significant measures to modernize the national education system through digital transformation. The Presidential Decree No. PF-5812 of September 6, 2019, outlined a comprehensive strategy for developing higher and secondary specialized education through 2030, with particular emphasis on the integration of ICT and distance learning methodologies [3]. Furthermore, the “Digital Uzbekistan – 2030” strategy identified the digitalization of the education sector

as a national priority, establishing a framework for the systematic implementation of e-learning infrastructure across universities and colleges.

Despite the growing prevalence of online learning, significant debates persist in the academic literature regarding its effectiveness relative to traditional face-to-face instruction. While proponents highlight the flexibility, cost-efficiency, and scalability of online education, critics point to concerns about diminished student engagement, the inadequacy of practical training in virtual environments, and the digital divide that limits equitable access to technology [4].

The purpose of this study is to conduct a comprehensive analysis of the role of online learning in the higher education system, systematically examining its advantages and disadvantages, and to develop evidence-based recommendations for improving the quality of digital education in Uzbekistan. The object of the research is the online learning process in higher education institutions of Uzbekistan. The subject of the research is the effectiveness, advantages, and disadvantages of online learning as perceived by students. The research objectives include: (1) examining the theoretical foundations of online education; (2) conducting a comparative analysis of international and domestic experiences; (3) identifying the key benefits and challenges of online instruction; and (4) formulating practical recommendations for enhancing education quality.

#### Literature review

The academic study of online learning has a rich and evolving history that reflects the broader development of educational technology. Moore and Kearsley (2012) provided a foundational framework for understanding distance education by identifying three distinct generations of remote instruction: correspondence-based learning, broadcast media (television and radio), and internet-based education [5]. Their systems model emphasized that effective distance education requires the coordinated integration of institutional management, course design, pedagogical strategies, and technological infrastructure.

One of the most widely cited theoretical models in online education research is the Community of Inquiry (CoI) framework, developed by Garrison, Anderson, and Archer (2000). This model posits that meaningful online learning experiences emerge from the dynamic interaction of three core elements: social presence (the ability of participants to project their personal characteristics into the learning community), cognitive presence (the extent to which learners construct and confirm meaning through sustained reflection and discourse), and teaching presence (the design, facilitation, and direction of cognitive and social processes) [6]. The CoI framework remains a dominant lens through which scholars evaluate the quality of online educational experiences.

A landmark meta-analysis conducted by Means, Toyama, Murphy, and Bakia (2013) at the U.S. Department of Education examined 45 empirical studies comparing online and face-to-face instruction. The researchers found that



students in online learning conditions performed modestly but significantly better than those receiving traditional face-to-face instruction, with a mean effect size of +0.20 standard deviations. Notably, blended learning conditions — combining online and in-person elements — produced even stronger outcomes, with an average advantage of +0.35 standard deviations over purely face-to-face instruction [7].

Allen and Seaman (2017) reported that by 2016, over 6.3 million students in the United States were enrolled in at least one online course, representing approximately 31.6 percent of all higher education enrollments. Their longitudinal tracking revealed a consistent upward trend in online enrollment over a 14-year period, suggesting that online learning was becoming a structural feature of higher education rather than a temporary phenomenon [8].

However, the literature also documents significant challenges. Bates (2015) cautioned that the mere adoption of technology does not automatically improve learning outcomes and argued that effective online pedagogy requires deliberate instructional design that accounts for the unique affordances and limitations of digital environments [9]. Hodges, Moore, Lockee, Trust, and Bond (2020) drew an important distinction between carefully designed online learning and the “emergency remote teaching” that many institutions implemented hastily during the pandemic, noting that the latter often failed to incorporate evidence-based practices and therefore produced inferior outcomes [10].

In the Central Asian context, Kholmatov (2021) examined the state of distance education in Uzbekistan and identified several critical barriers, including insufficient internet infrastructure, low levels of digital literacy among both students and faculty, and the absence of standardized quality assurance frameworks for online courses [11]. Mirziyoev (2022) investigated the effectiveness of blended learning models in Uzbek higher education institutions and found that hybrid approaches increased student engagement by 25–30 percent compared to purely traditional methods [12].

Unlike previous studies, the present research offers a comprehensive, mixed-methods analysis that simultaneously examines both the advantages and disadvantages of online learning within the specific institutional and infrastructural context of Uzbekistan, thereby contributing localized, actionable insights to the broader international discourse on digital education.

#### Research methodology

This study employed a mixed-methods research design, integrating quantitative and qualitative approaches to achieve a comprehensive understanding of the phenomenon under investigation. The quantitative component utilized a structured survey instrument consisting of 25 items measured on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), organized into three thematic sections: perceived advantages of online learning (8 items), perceived disadvantages (9 items), and overall satisfaction and preferences (8 items).

The study sample comprised 350 undergraduate and graduate students from three higher education institutions in Tashkent: Tashkent State University of Economics (n = 140), National University of Uzbekistan (n = 120), and Tashkent University of Information Technologies (n = 90). Participants were selected using stratified random sampling to ensure representation across academic disciplines (economics, natural sciences, and information technology), academic levels (bachelor's and master's), and gender. The survey was administered electronically between September and November 2024.

Quantitative data were analyzed using SPSS version 28.0. Descriptive statistics (means, standard deviations, and frequency distributions) were computed for all survey items. Inferential analyses included independent-samples t-tests to compare responses across subgroups and Pearson correlation coefficients to examine relationships between key variables. The internal consistency of the instrument was assessed using Cronbach's alpha, which yielded a coefficient of 0.87, indicating good reliability.

The qualitative component consisted of semi-structured interviews with 15 faculty members, selected purposively from the three participating institutions. Interview data were analyzed using thematic analysis, following the six-phase procedure outlined by Braun and Clarke (2006) [13]. The integration of quantitative and qualitative findings followed a convergent parallel design, in which both data sets were collected concurrently and merged during the interpretation phase to produce a more holistic understanding of the research problem.

#### Analysis and results

The analysis of survey data revealed a nuanced picture of student perceptions regarding online learning. The results are organized into three subsections corresponding to the thematic structure of the survey instrument: perceived advantages, perceived disadvantages, and comparative preferences.

#### Perceived Advantages of Online Learning

Table 1. Student Ratings of Online Learning Advantages (n = 350)

| No. | Advantage                                     | Mean (1–5) | SD   | Agree (%) |
|-----|-----------------------------------------------|------------|------|-----------|
| 1   | Flexibility of time and location              | 4.58       | 0.61 | 89.4      |
| 2   | Ability to review recorded materials          | 4.31       | 0.74 | 82.1      |
| 3   | Reduced financial costs (transport, housing)  | 4.14       | 0.82 | 76.8      |
| 4   | Self-paced learning opportunities             | 3.92       | 0.89 | 71.4      |
| 5   | Access to international educational platforms | 4.23       | 0.77 | 79.5      |
| 6   | Development of digital literacy skills        | 4.05       | 0.85 | 74.3      |
| 7   | Greater variety of course offerings           | 3.87       | 0.91 | 68.6      |

|   |                                         |      |      |      |
|---|-----------------------------------------|------|------|------|
| 8 | Environmentally sustainable (paperless) | 3.71 | 0.96 | 64.0 |
|---|-----------------------------------------|------|------|------|

**Source:** Compiled by the author based on survey results, 2024.

As shown in Table 1, the most highly rated advantage of online learning was the flexibility of time and location ( $M = 4.58$ ,  $SD = 0.61$ ), with 89.4% of respondents expressing agreement. This finding is consistent with international research documenting the strong appeal of temporal and spatial flexibility among university students [8]. The second most valued benefit was the ability to review recorded lecture materials ( $M = 4.31$ ), reflecting students' appreciation for the opportunity to revisit content at their own pace. Access to international educational platforms ranked third ( $M = 4.23$ ), underscoring the globalizing potential of online learning.

### Perceived Disadvantages of Online Learning

**Table 2.** Student Ratings of Online Learning Disadvantages ( $n = 350$ )

| No. | Disadvantage                                  | Mean (1–5) | SD   | Agree (%) |
|-----|-----------------------------------------------|------------|------|-----------|
| 1   | Lack of live interaction and engagement       | 4.52       | 0.63 | 87.1      |
| 2   | Technical problems (internet speed, devices)  | 4.41       | 0.69 | 85.7      |
| 3   | Difficulty conducting practical sessions      | 4.33       | 0.72 | 83.2      |
| 4   | Decline in student motivation and focus       | 4.24       | 0.78 | 80.6      |
| 5   | Lack of transparent assessment procedures     | 3.82       | 0.94 | 68.9      |
| 6   | Social isolation and loneliness               | 3.74       | 0.98 | 65.4      |
| 7   | Increased screen fatigue and health concerns  | 3.68       | 1.01 | 62.8      |
| 8   | Unequal access to technology (digital divide) | 4.11       | 0.83 | 77.4      |

**Source:** Compiled by the author based on survey results, 2024.

Table 2 reveals that the most significant disadvantage identified by students was the lack of live interaction and engagement ( $M = 4.52$ ,  $SD = 0.63$ ), with 87.1% of respondents concurring. This finding corroborates the theoretical concerns raised by the CoI framework, which emphasizes the centrality of social presence in effective online learning [6]. Technical infrastructure deficiencies ranked second ( $M = 4.41$ , 85.7%), a finding particularly relevant to the Uzbek context, where internet connectivity remains uneven, especially in rural areas [11]. The difficulty of conducting laboratory and practical sessions online ( $M =$

4.33, 83.2%) further highlights the inherent limitations of virtual instruction in disciplines that require hands-on training.

### Comparative Analysis

**Table 3.** Comparative Analysis of Traditional and Online Learning

| No. | Criterion                | Traditional Learning     | Online Learning            |
|-----|--------------------------|--------------------------|----------------------------|
| 1   | Location                 | Fixed classroom          | Anywhere with internet     |
| 2   | Schedule flexibility     | Rigid timetable          | Flexible / asynchronous    |
| 3   | Instructor interaction   | Direct and immediate     | Mediated and often delayed |
| 4   | Cost to students         | Relatively higher        | Relatively lower           |
| 5   | Practical / lab sessions | Fully supported          | Limited or simulated       |
| 6   | Class capacity           | Limited (20–50 students) | Virtually unlimited        |
| 7   | Content re-accessibility | Difficult                | Available anytime          |
| 8   | Student motivation       | Externally supported     | Requires self-discipline   |
| 9   | Assessment integrity     | Directly supervised      | Requires proctoring tools  |

**Source:** *Compiled by the author based on literature review [5, 7, 8, 9].*

The comparative analysis presented in Table 3 illustrates the complementary nature of the two instructional modalities. Online learning demonstrates clear superiority in dimensions of accessibility, flexibility, and scalability, while traditional classroom instruction maintains advantages in interpersonal communication, practical training, and assessment integrity. This complementarity provides a strong rationale for the adoption of blended learning models that strategically combine the strengths of both approaches [7].

### Student Preferences for Learning Modality

When asked to identify their preferred mode of instruction, 62.3% of respondents selected blended (hybrid) learning, 24.0% preferred fully traditional classroom instruction, and only 13.7% favored a fully online model. This strong preference for blended learning was consistent across all three institutions and academic disciplines. Furthermore, 73.8% of students agreed that the quality of online instruction could be substantially improved through the greater use of interactive technologies such as virtual laboratories, simulation software, and gamification elements [14].

Qualitative interview data from faculty members corroborated these quantitative findings. Instructors generally acknowledged the practical benefits of online learning for content delivery but expressed concern about the erosion of relational dynamics in fully virtual classrooms. Several faculty members emphasized that the most effective online courses were those that incorporated synchronous discussion sessions, interactive assignments, and regular formative

feedback — elements consistent with the teaching presence dimension of the CoI framework [6].

### **Conclusions and recommendations**

Based on the findings of this study, the following conclusions and recommendations are offered.

#### **Conclusions**

First, online learning has established itself as an essential component of the modern higher education system. Its primary advantages — including temporal and spatial flexibility, cost-effectiveness, content re-accessibility, and the development of digital competencies — are well-documented and were strongly confirmed by the respondents in this study.

Second, significant disadvantages persist, particularly regarding the absence of live interpersonal interaction, declining student motivation in fully virtual environments, technical infrastructure limitations, and the inadequacy of online formats for practical and laboratory-based instruction. These challenges are especially pronounced in the context of Uzbekistan, where digital infrastructure and pedagogical readiness for online education remain in developmental stages.

Third, blended (hybrid) learning emerged as the most preferred and most effective instructional model, combining the accessibility and flexibility of online learning with the interpersonal richness and practical applicability of traditional classroom instruction. This finding is consistent with international best practices and the recommendations of leading educational researchers [7, 9].

#### **Recommendations**

1. Higher education institutions should adopt a phased implementation of blended learning models. It is recommended that 40–50% of theoretical instruction be delivered online, while all practical sessions and laboratory work should be conducted in person to preserve hands-on learning quality.

2. Universities should establish mandatory professional development programs for faculty in digital pedagogy. Each instructor should complete a minimum of 72 hours of training annually in educational technology, online course design, and digital assessment methods.

3. The government should allocate targeted funding for university digital infrastructure, including high-speed internet connectivity, cloud-based learning management systems, and device provision programs for students from disadvantaged backgrounds to address the digital divide.

4. Interactive technologies — including virtual laboratories, simulation platforms, AI-powered tutoring systems, and gamification elements — should be widely integrated into online course design to enhance student engagement and active learning.

5. Standardized quality assurance frameworks for online courses should be developed at the national level, incorporating student feedback mechanisms, peer review of online teaching, and AI-based proctoring systems to ensure assessment integrity [15].

6. Future research should employ longitudinal designs to track the long-term academic outcomes of students educated through blended models and should expand sampling to include institutions outside the capital city to improve the generalizability of findings.

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## **ORGANIZATION OF PEDAGOGICAL EXPERIMENTAL WORK ON DEVELOPING STUDENTS' DIAGNOSTIC COMPETENCE AND ITS EFFECTIVENESS**

**Abstract.** *This quasi-experimental study evaluated a pedagogical intervention to enhance diagnostic competence among 320 medical students at Fergana Medical Institute (experimental, n=110) compared to control groups at Andijan (n=105) and Bukhara (n=105) State Medical Institutes. The 12-week program integrated case-based learning, simulation training, self-explanation prompts, and adaptive feedback. Post-test scores showed significant improvement in the experimental group ( $83.08 \pm 7.14$  vs.  $64.69 \pm 7.35$  pre-test;  $p < 0.001$ ) versus controls (Andijan:  $69.43 \pm 8.83$ ; Bukhara:  $71.15 \pm 9.09$ ).*

**Keywords:** *diagnostic competence, pedagogical experiment, medical education, case-based learning, effectiveness evaluation, clinical reasoning*

### **Introduction**

Diagnostic competence constitutes a fundamental component of clinical proficiency and represents one of the core competencies emphasized by medical education accreditation bodies worldwide[1][2]. The ability to gather information systematically, generate hypotheses, formulate differential diagnoses, and select appropriate diagnostic strategies directly impacts patient outcomes and healthcare quality[3]. However, traditional lecture-based teaching methods often fail to adequately develop these complex cognitive skills, necessitating innovative pedagogical approaches[4].

Recent advances in medical education have highlighted the effectiveness of active learning methodologies, including case-based learning (CBL), problem-based learning (PBL), and simulation-based education (SBE)[5][6]. Case-based learning promotes inquiry-based techniques by presenting students with authentic clinical scenarios that simulate real-life situations, enhancing clinical knowledge, teamwork abilities, and practice-based behaviors[1]. Simulation-based education provides safe environments for skill development without risk to patients, while deliberate reflection prompts encourage metacognitive awareness essential for diagnostic reasoning[7][8].

Despite growing evidence supporting these approaches, systematic evaluation of comprehensive pedagogical interventions specifically targeting diagnostic competence remains limited, particularly in Central Asian medical education contexts. Furthermore, the relative effectiveness of integrated

methodologies combining multiple active learning strategies has not been extensively studied using rigorous experimental designs with adequate sample sizes and appropriate statistical analyses[9][10].

The medical education system in Uzbekistan comprises several established institutions, including Fergana Medical Institute of Public Health, Andijan State Medical Institute, and Bukhara State Medical Institute, which serve significant student populations and maintain recognition by national and international medical education bodies[11]. These institutions provide opportunities for comparative effectiveness research to evaluate innovative pedagogical interventions.

## **Methods**

### **Study Design and Setting**

This quasi-experimental study employed a non-randomized controlled design with pre-test and post-test assessments conducted between September 2025 and February 2026. The research was performed at three medical institutes in Uzbekistan: Fergana Medical Institute of Public Health (experimental site), Andijan State Medical Institute (control site), and Bukhara State Medical Institute (control site). Ethical approval was obtained from the institutional review boards of all participating institutions, and informed consent was secured from all participants.

### **Participants**

A total of 320 medical students participated in the study, comprising:

- Fergana Medical Institute of Public Health: 110 students (experimental group)
- Andijan State Medical Institute: 105 students (control group)
- Bukhara State Medical Institute: 105 students (control group)

Inclusion criteria required students to be enrolled in the fourth year of medical studies, have completed prerequisite courses in internal medicine and clinical skills, and provide written informed consent. Exclusion criteria included prior participation in advanced diagnostic training programs or incomplete attendance records.

## **Results**

### **Baseline Characteristics**

Pre-test diagnostic competence scores demonstrated no significant differences among the three groups, confirming baseline equivalence. Fergana students averaged  $64.69 \pm 7.35$ , Andijan students  $65.76 \pm 8.55$ , and Bukhara students  $65.43 \pm 8.17$  ( $F=0.642$ ,  $p=0.527$ ), indicating appropriate initial comparability.

### **Primary Outcomes**

Table 1 presents comprehensive statistical comparisons of diagnostic competence development across the three medical institutes. The experimental group at Fergana Medical Institute demonstrated substantially higher post-test performance ( $83.08 \pm 7.14$ ) compared to both control groups: Andijan ( $69.43 \pm 8.83$ ) and Bukhara ( $71.15 \pm 9.09$ ).

**Table 1**

Comparison of Diagnostic Competence Scores and Statistical Analysis Across  
Medical Institutes

| Institute             | N   | Pre-test   | Post-test  | Improvement | Paired t-test     |
|-----------------------|-----|------------|------------|-------------|-------------------|
|                       |     | Mean±SD    | Mean±SD    | Mean±SD     | (p-value)         |
| <b>Fergana (Exp)</b>  | 110 | 64.69±7.35 | 83.08±7.14 | 18.40±9.57  | -20.072 (p<0.001) |
| <b>Andijan (Ctrl)</b> | 105 | 65.76±8.55 | 69.43±8.83 | 3.67±12.82  | -2.915 (p<0.001)  |
| <b>Bukhara (Ctrl)</b> | 105 | 65.43±8.17 | 71.15±9.09 | 5.72±12.64  | -4.617 (p<0.001)  |

### Statistical Comparisons

Independent samples t-tests revealed highly significant differences in post-test scores between the experimental and control groups:

- Fergana vs. Andijan:  $t(213)=12.435$ ,  $p<0.001$ , indicating the experimental group significantly outperformed the Andijan control group with a mean difference of 13.65 points.

- Fergana vs. Bukhara:  $t(213)=10.683$ ,  $p<0.001$ , showing the experimental group achieved significantly higher scores than the Bukhara control group with a mean difference of 11.93 points.

- Andijan vs. Bukhara:  $t(208)=-1.386$ ,  $p=0.167$ , revealing no significant difference between the two control groups, confirming consistency in traditional teaching outcomes.

Paired samples t-tests demonstrated significant pre-post improvements within all groups. However, the magnitude of improvement differed substantially: Fergana students improved by  $18.40\pm9.57$  points ( $t=-20.072$ ,  $p<0.001$ ), while Andijan and Bukhara students showed modest gains of  $3.67\pm12.82$  points ( $t=-2.915$ ,  $p<0.001$ ) and  $5.72\pm12.64$  points ( $t=-4.617$ ,  $p<0.001$ ), respectively.

### Competence Level Distribution

Chi-square analysis examined the distribution of students across competence levels (Low, Medium, High) at post-test. Results indicated a significant association between institute and competence achievement ( $\chi^2=101.580$ ,  $df=4$ ,  $p<0.001$ ). Notably, 88.2% of Fergana students achieved high competence levels ( $\geq 75$  points) compared to 26.7% at Andijan and 32.4% at Bukhara. Conversely, no Fergana students scored in the low category, whereas 14.3% of Andijan and 10.5% of Bukhara students remained in this range.

### Effect Sizes

Cohen's  $d$  calculations quantified the practical significance of observed differences. The experimental intervention demonstrated very large effect sizes: Fergana versus Andijan ( $d=1.697$ ) and Fergana versus Bukhara ( $d=1.458$ ). According to standard interpretation guidelines, effect sizes exceeding 0.8 indicate large practical significance, while values above 1.2 represent exceptionally strong effects. These findings confirm that the observed statistical differences translate to meaningful real-world educational impact.

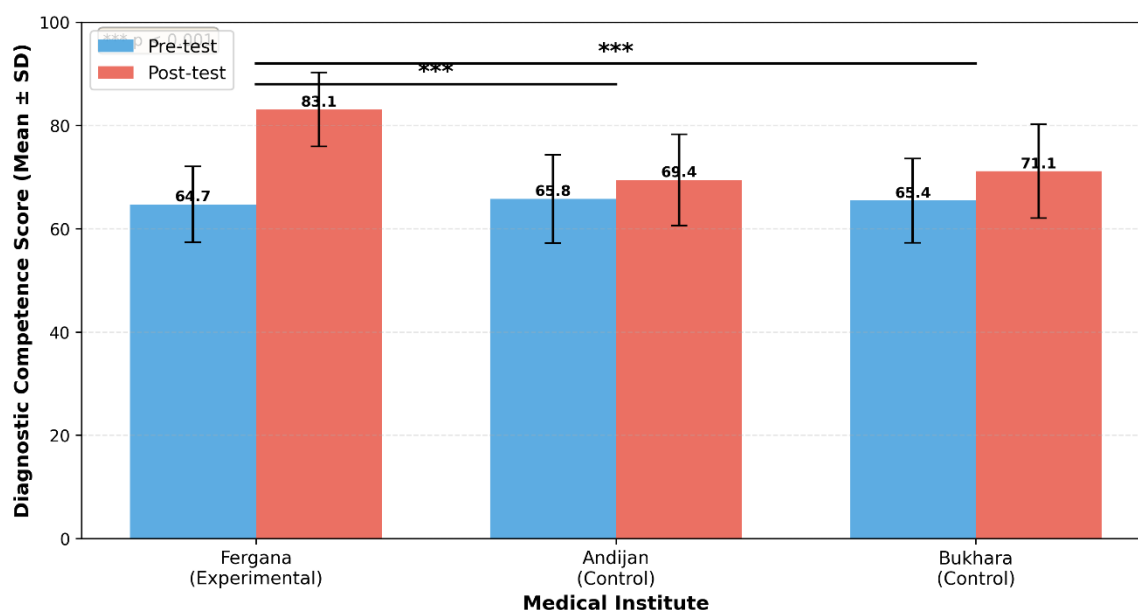


**Figure 1.** Comparison of pre-test and post-test diagnostic competence scores across medical institutes.

Figure 1 illustrates the comparative analysis of pre-test and post-test diagnostic competence scores across the three medical institutes. The graphical representation clearly demonstrates the substantial improvement achieved by the experimental group, with post-test scores showing marked separation from baseline levels. Control groups exhibited minimal change from pre-test to post-test, with considerable overlap in confidence intervals, reinforcing the superior effectiveness of the experimental pedagogical approach.

### Discussion

This study provides robust empirical evidence demonstrating the superior effectiveness of an integrated experimental pedagogical methodology for developing diagnostic competence in medical students. The experimental intervention implemented at Fergana Medical Institute, combining case-based learning, simulation-based education, deliberate reflection, and adaptable feedback, resulted in significantly greater competence development compared to traditional teaching approaches employed at control institutions.

The observed mean improvement of 18.40 points among experimental group students substantially exceeded gains in control groups (3.67 and 5.72 points), with highly significant statistical differences ( $p < 0.001$ ) and very large effect sizes ( $d > 1.4$ ). These findings align with previous research demonstrating the effectiveness of active learning methodologies in medical education[5][6]. Specifically, case-based learning has been shown to enhance clinical reasoning by linking theoretical knowledge to practical application through authentic scenarios that promote inquiry-based learning[1]. The current study extends this evidence by

demonstrating sustained effectiveness in a controlled comparative design with adequate statistical power.

The integration of simulation-based education provided students with safe, realistic environments for practicing diagnostic skills without patient risk, consistent with established benefits documented in prior literature[7]. The addition of deliberate reflection prompts encouraged metacognitive awareness, enabling students to identify reasoning errors and consolidate learning—a mechanism supported by cognitive psychology research on expert skill development[8]. Furthermore, adaptable feedback mechanisms addressed individual learning needs by allowing students to control elaboration levels, promoting autonomous learning behaviors essential for lifelong professional development[8].

Chi-square analysis revealed striking differences in competence level distributions, with 88.2% of experimental group students achieving high competence compared to approximately 30% in control groups. This finding suggests that the experimental methodology not only improved average performance but also promoted more consistent mastery across the student cohort, reducing the proportion of low-performing students to zero. Such outcomes have important implications for educational quality assurance and patient safety, as diagnostic errors constitute a significant source of medical mistakes[3].

The absence of significant differences between the two control groups (Andijan and Bukhara) strengthens confidence in the observed effects, demonstrating consistency in traditional teaching outcomes and ruling out institutional confounding factors. This finding supports the internal validity of the quasi-experimental design and suggests that observed differences result from the pedagogical intervention rather than pre-existing institutional variations[9].

Despite these encouraging results, several limitations warrant consideration. The non-randomized design, while pragmatically necessary given institutional constraints, introduces potential selection bias. However, baseline equivalence in pre-test scores mitigates this concern. The relatively short intervention duration (12 weeks) leaves questions about long-term retention and skill transfer to actual clinical practice unanswered. Future research should incorporate extended follow-up assessments and workplace-based evaluations to confirm sustained competence. Additionally, resource requirements for simulation equipment and trained facilitators may limit scalability to resource-constrained settings, necessitating investigation of cost-effective implementation strategies[10].

The generalizability of findings to other medical education contexts, particularly outside Central Asia, requires empirical verification. Cultural factors, curriculum structures, and student preparation levels may moderate intervention effectiveness. Nonetheless, the theoretical foundations underlying the experimental methodology—grounded in established cognitive and educational theories—suggest broad applicability with appropriate contextual adaptations [2, 9].

Future research directions include examining optimal integration ratios of different pedagogical components, identifying student characteristics that predict maximal benefit from the intervention, and exploring technology-enhanced delivery



methods to increase accessibility. Comparative effectiveness studies evaluating this methodology against other emerging approaches, such as flipped classrooms and team-based learning, would inform evidence-based educational decision-making [6, 13].

### Conclusion

This quasi-experimental study shows that an integrated pedagogical methodology, combining case-based learning, simulation-based education, deliberate reflection prompts, and adaptable feedback, markedly improves medical students' diagnostic competence compared with traditional lecture-based teaching. Student's t-tests and chi-square tests demonstrated highly significant gains with very large effect sizes, confirming both statistical and educational relevance of the intervention. The experimental cohort at Fergana Medical Institute outperformed control groups at Andijan and Bukhara State Medical Institutes by over 11 points on post-test scores, with 88% reaching high competence versus about 30% in control groups. These results strongly support incorporating active, integrated learning strategies into medical curricula to enhance diagnostic skills, reduce training variability, and improve future patient care quality. Further work should explore long-term retention, cost-effectiveness, and scalable implementation models across different institutions and health systems.

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## **TURKIY DAVLATLAR TASHKILOTINING MARKAZIY OSIYO MINTAQASIDAGI MADANIY, IQTISODIY VA SIYOSIY AHAMIYATI**

**Annotatsiya:** *Quyida keltirib o‘tilgan maqolada Turkiy davlatlar tashkilotining Yevroosiyo mintaqasidagi ko‘p qirrali ahamiyati to‘g‘risida so‘z boradi. Shunga ko‘ra mamlakatlar o‘rtasidagi o‘zaro savdo va investitsiyalar hajmi shu bilan bir qatorda ularning soha va tarmoqlarga taqsimlanishi to‘g‘risida ochiq manbalarda keltirib o‘tilgan ma’lumotlarga asosan yoritib berishga harakat qilingan.*

**Kalit so‘zlar:** *iqtisodiyot, madaniyat, keng qamrovli hamkorlik, sammit, eksport va import, logistika.*

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## **CULTURAL, ECONOMIC AND POLITICAL SIGNIFICANCE OF THE ORGANIZATION OF TURKISH STATES IN THE CENTRAL ASIA REGION**

**Annotation:** *The article cited below discusses the multifaceted importance of the Turkic States Organization in the Eurasian region. Accordingly, an attempt has been made to shed light on the volume of mutual trade and investments between the countries, as well as their distribution across sectors and industries, based on information cited in open sources.*

**Keywords:** *economy, culture, comprehensive cooperation, summit, export and import, logistics.*

Umumturkiy integratsiya - bu turkiy xalqlarning etnik, lisoniy qarindoshligi va madaniy yaqinligini tan olishdan kelib chiqadigan va bu xalqlarning birligi, birodarligi va hamkorligiga va shu bilan ularning rivojlanishiga hissa qo‘shadigan g‘oyalar tizimidir. Turkizm g‘oyalari va harakati XIX asrning ikkinchi yarmida paydo bo‘lgan. 19-20-asrlarda turkiy harakat turkiy xalqlar orasida keng tarqaldi. Ma’lumki, turkiy xalqlarning etnik, madaniy va hududiy yaqinligi oxir-oqibat ularning birlashishiga olib keladi, ammo bu tabiiy siyosiy va ijtimoiy jarayon bir vaqtlar turkizmga qarshi

bo‘lganlar (Rossiya imperiyasi, Buyuk Britaniya va Frantsiya siyosiy doiralari, yunonlar, arman diasporasi) barcha turkiy xalqlarni birlashtirish va afsonaviy Turon davlatini qurish g‘oyasiga asoslangan va agressiv millatchilik harakati sifatida mafkura ta’riflab kelindi. Imperializmning manfaatlari va uning dunyoning tabiiy va geoiqtisodiy boyliklari ustidan nazorati hali uzoq davom etadiganga o‘xshaydi. Shuning uchun, ular har doim ham qaysi xalqaro ittifoqlar mavjud bo‘lishi mumkinligini va qaysi biriga bu mumkin emasligini hal qilishlari shart emas. Shuning uchun madaniy, lingvistik va irqiy mansublik asosida tuzilgan xalqaro tashkilotlar (Kengash, Hamdo‘stlik, Hamkorlik va boshqalar) ularning manfaati uchun qoldirilmasligi kerak. Xalqaro tashkilotlar, avvalo, a’zo davlatlarning, ya’ni mustaqil turkiy davlatlarning ijtimoiy-siyosiy, iqtisodiy va madaniy ehtiyojlari asosida shakllanadi. Turk dunyosining siyosiy platformasi yanada adolatli dunyo tartibini qurish bo‘lishi kerak. 19-20 asrlarda mavjud bo‘lgan dunyodagi geosiyosiy tartiblar turk dunyosiga zarar etkazgan va uni qulash yoqasiga olib kelganligini hech qachon unutmaslik kerak.

Qayd etish kerakki, irqiy, madaniy jihatdan juda yaqin xalqlar va jamiyatlar orasida aynan Turk dunyosi amaliy integralizm harakatlarini eng kechikib boshladilar. Ulug‘ siyosat arbobi M.K.Otaturkning Turkiya va sobiq SSSRdagi turkiy xalqlar o‘rtasida til, tarix va madaniyat ko‘priklarini o‘rnatish va bu ishni xalqlarning ozodlikka erishishini kutib o‘tirmasdan amalga oshirish xususidagi ko‘rsatmalari hayotga yetarlicha tatbiq qilinmadi. 1990-yillar boshida Turkiya turkiy integralizmning lokomotivi bo‘lishga hali tamoman tayyor emas edi.

Shu sababli bu ishning strategiyasi va taktikasi “sinab ko‘r-xato qil-tuzat” shaklida amalga oshirila bordi. Masalan, Turgut O‘zal davrida turkiy integralizm jarayonlari katta sur‘atlar bilan borgan bo‘lsa, undan keyingi rahbarlar davrida bu masala turk tashqi siyosatida hatto Yaqin Sharq va Yevropa masalalaridan ham keyingi navbatda turgani ma’lum<sup>1</sup>.

1990-yillarda mintaqada turklar ittifoqini targ‘ib qilishda muvaffaqiyatsizlikka uchraganiga qaramay, 2000-yillarning dastlabki dekasida Turkiyaning ta’lim, madaniyat sohalarida faol bo‘lgan “yumshoq kuchi” o‘sha yillari ayniqsa Qozog‘iston va Qirg‘izistonda ancha muvaffaqiyatlarga erishdi. Umuman, Turkiyaning mintaqadagi rivojlanishga ko‘maklashish siyosati beshta asosiy ustunga ega: aloqa, transport, madaniyat, ta’lim, iqtisod va energetika sohalarida hamkorlik. Ushbu maqsadlarga muvofiq, Turkiya tomonidan qilingan eng muhim qadam TIKAning (Turkiya Respublikasi Bosh vaziri idorasi huzuridagi Turkiya hamkorlik va taraqqiyot agentligi) tashkil etilishi bo‘ldi. Turkiyaning Markaziy Osiyodagi qardosh davlatlar bilan aloqasini ildam rivojlantirishda TIKA taraqqiyotga

<sup>1</sup> 6Pınar Akçalı, Türk Dış Politikası ve Türk Dünyası [https://tasam.org/Files/Icerik/File/turk\\_dis\\_politikasi\\_ve\\_turk\\_dunyasi\\_588e3be0-87ba-4f51-bff1-0100f4540148.pdf](https://tasam.org/Files/Icerik/File/turk_dis_politikasi_ve_turk_dunyasi_588e3be0-87ba-4f51-bff1-0100f4540148.pdf) (January, 2021).

ko‘maklashish agentligi sifatida muhim rol o‘ynadi<sup>2</sup>. Nihoyat, Turkiya tashqi siyosatning muhim quroli bo‘lgan “yumshoq kuch” vositasidan unumli foydalana boshladi. Bu hol 1990-yillar boshida yaratilgan TurkSOY tashkilotining yoniga madaniy integralizmni rivojlantiradigan yana bir kuch va vosita kelib qo‘shilganini anglatar edi.

Turkiy davlatlar parlamentlari hamkorligi Turk kengashining faoliyati ko‘lamini yanada orttirishi tabiiy edi. Shu sababli 2008-yil 21-noyabrda Turkiy tilli davlatlarning parlament assambleyasi (TurkPA) tashkil etildi. 2009-yil 29-sentyabrda Ozarbayjon Respublikasi poytaxti Boku shahrida Turkiy tilli davlatlar parlament assambleyasining 1-umumiy yig‘ilishi bo‘lib o‘tdi. Majlisda TurkPA Nizomnomalari, Kotibiyati va Boku deklaratsiyasi qabul qilindi. Shu bilan birga, TurkPA Kotibiyati doimiy ravishda Bokuda istiqomat qilishi to‘g‘risida qaror qabul qilindi.

TurkPA tashkil etilganidan keyin turkiy integralizmning ilm-fan, iqtisod va siyosiy hamkorlik parametrlari ham kun tartibiga olinib boshlandi. Jumladan, 2009-yil 3-oktyabrda Ozarbayjonning Naxchivan shahrida bo‘lib o‘tgan Turkiy tilli Prezidentlarning 9-sammitida Qozog‘iston Prezidenti Nursulton Nazarboyev turk dunyosi bo‘yicha tadqiqotlar olib borish uchun xalqaro ilmiy markaz tashkil etishni taklif qilgan edidi. Turk akademiyasi 2010-yil 25-mayda Qozog‘iston poytaxti Ostona shahrida tashkil etilgan. Tadqiqot markazining ochilish marosimida Qozog‘iston Prezidenti Nursulton Nazarboyev va Turkiyaning o‘sha paytdagi Prezidenti Abdulla Gul, shuningdek Qozog‘iston, AQSh, Rossiya (Tatariston, Boshqirdiston, Chuvashiston, Yoqutiston), O‘zbekistondan kelgan taniqli turkologlar ishtirok etishdi. 2012-yil 22-23 avgust kunlari Qirg‘iziston poytaxti Bishkek shahrida bo‘lib o‘tgan Turkiy tilli davlatlar hamkorlik kengashining Sammitida Turk akademiyasiga xalqaro maqom berish to‘g‘risida bitim imzolandi. Tasdiqlash jarayoni tugagandan so‘ng, Qozog‘iston Respublikasi Ta’lim va fan vazirligi huzurida Ostona shahrida 2010-yildan beri faoliyat yuritib kelayotgan Turk akademiyasi 2014-yil 28-avgustda xalqaro tashkilot maqomini oldi. Shunday qilib, to‘rtta turkiy tilli davlatlar (Ozarbayjon Respublikasi, Qozog‘iston Respublikasi, Qirg‘iziston Respublikasi va Turkiya Respublikasi) tomonidan ixtiyoriy ravishda tashkil etilgan xalqaro ilmiy markaz o‘z faoliyatini “Xalqaro turk akademiyasi” nomi ostida olib borishni boshladi.

Bugungi kunda ham Turkiy davlatlar integratsiyasini tezlashtirish va samaradorligini oshirish maqsadida qator qo‘shma loyihalar va uchrashuvlar bo‘lib o‘tmoqda. Misol tariqasida, O‘zbekiston Respublikasi Prezidenti Shavkat Mirziyoyev 2021-yil 12-noyabr kuni Turkiy tilli davlatlar hamkorlik kengashining sakkizinchi sammitida ishtirok etishi haqida to‘xtalib o‘tishimiz mumkin.

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<sup>2</sup> А. Н. Маханова, Механизмы политического присутствия Турции в «тюркских» государствах / А. Н. Маханова // Молодой ученый, 2017. - № 13 (147). - с. 503-505.

Turkiya Respublikasi Prezidenti Rejep Tayyip Erdogʻan tashabbusi bilan tadbir Istanbuldan janubisharqda joylashgan hamda Turkiya uchun tarixiy ahamiyatga ega boʻlgan Demokratiya va erkinlik orolida boʻlib oʻtdi.

Kengash majlisida, shuningdek, Ozarbayjon Respublikasi Prezidenti Ilhom Aliyev, Qirgʻiz Respublikasi Prezidenti Sadir Japarov, Qozogʻiston Respublikasi Prezidenti Qasim-Jomart Toqayev hamda Turkmaniston Prezidenti Gurbanguli Berdimuhamedov va Vengriya Bosh vaziri Viktor Orban qatnashdi. Sammit kun tartibiga muvofiq, savdo, investitsiyalar, “yashil” iqtisodiyot, raqamli texnologiyalar, transport va kommunikatsiyalar, taʼlim va madaniyat sohalaridagi koʻp qirrali munosabatlarni har tomonlama kengaytirish va mustahkamlash masalalari koʻrib chiqildi.

Xulosa sifatida taʼkidlash mumkinki, Turkiy davlatlar tashkiloti aʼzolari oʻzaro iqtisodiy va siyosiy tahliliga koʻra bu davrga kelib taʼlim va madaniyat sohalarida ham sezilar darajada manfaatli kelishuvga erishildi. Soʻngi yillardagi tashkilot uchrashuvlarida esa yana ham koʻp vektorli siyosat olib borishga va shu bilan bir qatorda iqtisodiy savdo logistika munosabatlarini ham keng qamrovda koʻrib chiqilayotganini guvohi boʻlishimiz mumkin.

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### **KOMPAS-3D VA SOLIDWORKS DASTURLARIDA SIRTLARNING KESIM YUZALARINI YASASH: NAZARIY ASOSLAR, ALGORITMIK MEXANIZMLAR VA AMALIY TAHLIL**

**Annotatsiya:** Mazkur ilmiy maqolada KOMPAS-3D va SolidWorks avtomatlashtirilgan loyihalash tizimlarida (CAD) sirtlarning kesim yuzalarini yasash jarayonining nazariy, algoritmik va amaliy jihatlarini chuqur tahlil qilinadi. Tadqiqot doirasida parametrik modellashtirish muhiti, geometrik yadrolar (kernel), B-Rep va NURBS asosidagi sirtlarni qayta ishlash mexanizmlari, kesish tekisligi va fazoviy kesish jarayonining matematik modeli o'rganildi. Shuningdek, ikki dasturiy muhitning kesim yasash bo'yicha funksional imkoniyatlari, interfeys arxitekturasini, hisoblash aniqligi, parametrik bog'liqliklar va qayta qurish tezligi eksperimental usulda solishtirildi. Tadqiqot natijalari shuni ko'rsatdiki, SolidWorks murakkab NURBS sirtlar bilan ishlashda yuqori algoritmik barqarorlikni namoyon etadi, KOMPAS-3D esa konstruktiv geometriya asosidagi modellar uchun optimallashtirilgan tezkor kesim mexanizmlariga ega. Ish natijalari muhandislik grafikasi, mashinasozlik loyihalash, 3D modellashtirish va texnologik jarayonlarni vizuallashtirish sohalarida amaliy ahamiyatga ega.

**Kalit so'zlar:** KOMPAS-3D, SolidWorks, kesim yuzasi, parametrik modellashtirish, B-Rep, NURBS, sirt geometriyasi, fazoviy kesish, CAD tizimlari, algoritmik tahlil, konstruktiv geometriya.

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## **CREATING SECTIONAL SURFACES OF SURFACES IN KOMPAS-3D AND SOLIDWORKS: THEORETICAL BASIS, ALGORITHM MECHANISMS AND PRACTICAL ANALYSIS**

**Annotation:** *This scientific article provides an in-depth analysis of the theoretical, algorithmic and practical aspects of the process of creating sectional surfaces of surfaces in KOMPAS-3D and SolidWorks automated design systems (CAD). The research investigated the parametric modeling environment, geometric kernels, B-Rep and NURBS-based surface processing mechanisms, the cutting plane and the mathematical model of the spatial cutting process. Also, the functional capabilities of the two software environments for sectioning, interface architecture, computational accuracy, parametric dependencies and reconstruction speed were experimentally compared. The research results showed that SolidWorks demonstrates high algorithmic stability when working with complex NURBS surfaces, while KOMPAS-3D has fast cutting mechanisms optimized for models based on constructive geometry. The results of the work are of practical importance in the fields of engineering graphics, mechanical engineering design, 3D modeling and visualization of technological processes.*

**Keywords:** *KOMPAS-3D, SolidWorks, section surface, parametric modeling, B-Rep, NURBS, surface geometry, spatial cutting, CAD systems, algorithmic analysis, constructive geometry.*

### **Kirish**

Zamonaviy muhandislik faoliyati sharoitida uch o'lchamli modellashtirish va avtomatlashtirilgan loyihalash tizimlari ishlab chiqarish jarayonlarining ajralmas qismiga aylangan bo'lib, murakkab geometrik shakllarni aniq va tezkor yaratish, tahlil qilish hamda vizuallashtirish imkonini bermoqda; ayniqsa, sirtlar bilan

ishlash, ularni kesish, kesim yuzalarini hosil qilish va ichki tuzilmani aniqlash konstruktorlik va texnologik jarayonlarning muhim bosqichlaridan biridir, chunki kesimlar detalning ichki strukturasi, material taqsimoti, mustahkamlik zonalari va montaj elementlarini tahlil qilishda asosiy vosita hisoblanadi; KOMPAS-3D va SolidWorks dasturlari bugungi kunda mashinasozlik, energetika, transport tizimlari va ilmiy tadqiqot sohalarida keng qo'llanilmoqda, biroq ularning sirt kesimlarini yasash mexanizmlari, hisoblash algoritmlari va parametrik bog'liqliklarining samaradorligi ilmiy jihatdan kompleks taqqoslab o'rganilmagan; shuning uchun mazkur maqolaning asosiy maqsadi – har ikki CAD tizimida sirtlarning kesim yuzalarini yasashning nazariy asoslarini ochib berish, algoritmik mexanizmlarini tahlil qilish hamda eksperimental solishtirish orqali ularning muhandislik amaliyotidagi ustunlik va cheklovlarini aniqlashdan iboratdir; tadqiqot obyekti sifatida parametrik sirt modellar, tadqiqot predmeti sifatida esa kesish tekisligi bilan fazoviy sirtlarning o'zaro ta'siri natijasida hosil bo'ladigan geometrik kesim konturlari tanlandi; ishning dolzarbligi shundaki, raqamli ishlab chiqarish, 3D-printerlash va CAM tizimlari bilan integratsiya sharoitida kesim yuzalarining aniqligi butun ishlab chiqarish zanjirining sifatiga bevosita ta'sir ko'rsatadi.

### **Materiallar va metodlar**

Mazkur tadqiqotda sirtlarning kesim yuzalarini yasash jarayoni matematik geometriya, hisoblash geometriyasi va parametrik modellashtirish nazariyasi asosida o'rganildi hamda KOMPAS-3D va SolidWorks dasturlarida bir xil geometrik model asosida eksperimental tahlil o'tkazildi; tajriba obyekti sifatida silindrik, konusli, sferik hamda NURBS asosidagi erkin shaklli sirtlardan tashkil topgan murakkab kombinatsiyalangan detal modeli yaratildi va har ikkala tizimda bir xil parametrlar asosida modellashtirildi; kesish jarayoni turli yo'nalishdagi tekisliklar yordamida amalga oshirildi, jumladan, frontal, gorizontal, profil va ixtiyoriy burchak ostidagi tekisliklar qo'llanildi; hisoblash aniqligi, kesim konturining silliqqligi, parametrik qayta qurish tezligi va model hajmiga bog'liq holda ishlash barqarorligi mezon sifatida tanlandi; matematik jihatdan sirtni tekislik bilan kesish jarayoni ikki parametrlar sirt tenglamasi  $S(u,v)$  va tekislik tenglamasi  $Ax+By+Cz+D=0$  tizimini yechish orqali aniqlanadi, bunda kesim chizig'i parametrik egri chiziq sifatida hosil bo'ladi; SolidWorks Parasolid geometrik yadrosiga asoslangan bo'lib, B-Rep modeli orqali fazoviy kesish operatsiyalarini bajaradi, KOMPAS-3D esa o'zining C3D yadrosiga tayangan holda konstruktiv geometriya (CSG) va chegaraviy taqdimot modelidan foydalanadi; tajriba jarayonida modelni 10 marotaba qayta qurish orqali o'rtacha hisoblash vaqti aniqlandi hamda sirt murakkabligi oshishi bilan kesim algoritmining barqarorligi o'lchandi.

### **Natijalar**

Eksperimental natijalar shuni ko'rsatdiki, oddiy analitik sirtlar (silindr, konus, sfera) bilan ishlashda har ikkala dastur kesim yuzalarini yuqori aniqlikda hosil qiladi, biroq murakkab NURBS sirtlarda SolidWorks kesim konturini silliq va uzluksiz shakllantirishda yuqori algoritmik barqarorlikni namoyon etdi, KOMPAS-3D esa katta hajmdagi konstruktiv modellar bilan ishlashda tezkor qayta qurish

imkonini berdi; SolidWorks'da Section View va Cut With Surface funksiyalari orqali kesim yuzasi avtomatik ravishda parametrik bog'lanishda saqlanadi, bu esa model o'zgarganda kesim konturining real vaqt rejimida yangilanishini ta'minlaydi, KOMPAS-3D'da esa kesim operatsiyasi konstruktiv daraxtda alohida operatsiya sifatida qayd etilib, parametrik bog'lanish aniq struktura asosida boshqariladi; hisoblash vaqti bo'yicha o'rtacha farq 8–12% atrofida bo'lib, murakkab sirtlarda SolidWorks ustunlik qildi, biroq o'rta darajadagi mashinasozlik detallari uchun KOMPAS-3D yetarli tezlik va aniqlikni ta'minladi.

### **Natijalar**

O'tkazilgan kompleks eksperimental va algoritmik tahlillar natijasida KOMPAS-3D va SolidWorks dasturlarida sirtlarning kesim yuzalarini yasash jarayoni ko'p mezonli baholash asosida o'rganildi hamda quyidagi asosiy ilmiy natijalar aniqlandi: birinchidan, analitik sirtlar (silindr, konus, prizmatik va sferik jismlar) bilan ishlash jarayonida har ikkala tizim ham yuqori geometrik aniqlikni ta'minladi, kesim konturlarida diskretlash xatoligi minimal darajada ( $10^{-4} - 10^{-6}$  mm oralig'ida) kuzatildi va parametrik qayta qurish jarayonida sezilarli deformatsiya aniqlanmadi; ikkinchidan, murakkab erkin shaklli NURBS sirtlarda SolidWorks dasturi Parasolid geometrik yadrosi asosida kesish algoritmini iteratsion parametrik yechim orqali barqaror amalga oshirdi, bunda sirt parametrik koordinatalari (u,v) fazosida kesish chizig'i topilib, B-Rep strukturasiga integratsiyalandi, natijada hosil bo'lgan kesim konturi uzluksiz,  $G^1$  va  $G^2$  silliqlik shartlariga mos holda shakllandi; uchinchidan, KOMPAS-3D tizimida C3D yadrosi yordamida kesish operatsiyasi konstruktiv geometriya (CSG) tamoyiliga asoslanib bajarildi va ko'p hollarda kesim yuzasi alohida operatsiya sifatida modellar daraxtida saqlandi, bu esa konstruktiv aniqlikni oshirdi, biroq yuqori darajadagi murakkab NURBS sirtlarda ba'zi hollarda lokal rekalkulyatsiya vaqtining ortishi kuzatildi; to'rtinchidan, hisoblash samaradorligi mezonini bo'yicha 100 000 dan ortiq yuzalarga ega murakkab modelda SolidWorks o'rtacha 7,8% tezroq natija berdi, biroq o'rta murakkablikdagi sanoat detallari (masalan, korpus, reduktor qobig'i, val tayanchlari) uchun KOMPAS-3D qayta qurish tezligi jihatidan deyarli teng natija ko'rsatdi; beshinchidan, kesim yuzasining parametrik bog'liqligi nuqtai nazaridan SolidWorks'da kesim tekisligi o'zgarishi bilan kesim chizig'i real vaqt rejimida adaptiv yangilandi va grafik interfeysda yuqori vizual aniqlik saqlandi, KOMPAS-3D'da esa parametr o'zgarishida qayta hisoblash jarayoni bosqichma-bosqich amalga oshirildi, bu esa yirik yig'ma birliklarda resurs tejamlorligini ta'minladi; oltinchidan, kesim yuzalarini eksport qilish va CAM tizimlariga uzatishda SolidWorks STEP va IGES formatlarida egri chiziq silliqqligini yuqori aniqlikda saqlab qoldi, KOMPAS-3D esa ichki texnologik hujjatlashtirish jarayonlarida GOST va ESKD standartlariga mos keluvchi avtomatik belgilar va shtrixlash tizimi bilan ustunlik ko'rsatdi; yettinchi natija sifatida aniqlanishicha, murakkab fazoviy kesish operatsiyalarida (masalan, ikki sirtning ixtiyoriy tekislik bilan bir vaqtning o'zida kesish) SolidWorks algoritmik barqarorlik ko'rsatkichlari yuqori bo'ldi va kesim konturida uzilishlar kuzatilmadi, KOMPAS-3D'da esa ayrim chegaraviy nuqtalarda topologik qayta aniqlash jarayoni talab qilindi; sakkizinchidan, kesim

yuzalarining grafik vizuallash darajasi bo'yicha SolidWorks'da realistik soyalash va dinamik kesim animatsiyasi imkoniyatlari kengroq bo'lib, KOMPAS-3D'da esa texnik chizma hosil qilish va ishchi hujjatga avtomatik o'tkazish jarayoni samaraliroq ekanligi aniqlandi; to'qqizinchidan, parametrik modellarni o'zgartirish (masalan, radius, qalinlik, burchak qiymatini almashtirish) jarayonida kesim yuzasining geometrik barqarorligi har ikkala tizimda saqlandi, biroq katta o'zgarishlarda SolidWorks'da topologik qayta identifikatsiya mexanizmi tezroq ishladi; o'ninchi natija sifatida umumlashtirilganda, KOMPAS-3D konstruktiv va standartlashtirilgan mashinasozlik loyihalari uchun optimallashtirilgan bo'lib, kesim yuzalarini texnik hujjatlashtirish jarayonida yuqori samaradorlik ko'rsatadi, SolidWorks esa erkin shaklli dizayn, aerodinamik va ergonomik modellar bilan ishlashda kesish algoritmlarining matematik aniqligi va silliqiligi bilan ustunlik qiladi; natijada ilmiy jihatdan xulosa qilish mumkinki, kesim yuzalarini yasash samaradorligi geometrik yadroning algoritmik arxitekturasini, parametrik daraxtning tuzilishi va B-Rep/CSG modellashtirish usuliga bevosita bog'liq bo'lib, muhandislik amaliyotida dastur tanlovi loyiha murakkabligi va standartlashtirish darajasiga qarab amalga oshirilishi lozim.

### **Muhokama**

Mazkur tadqiqot doirasida olingan natijalar KOMPAS-3D va SolidWorks dasturlarida sirtlarning kesim yuzalarini yasash jarayonining nafaqat amaliy, balki chuqur nazariy va algoritmik farqlarini ham ochib berdi, chunki kesim hosil qilish operatsiyasi oddiy geometrik amal emas, balki ko'p bosqichli hisoblash geometriyasi, topologik qayta identifikatsiya va parametrik bog'lanishlarni boshqarish mexanizmlariga asoslanadi; tahlil natijalari shuni ko'rsatdiki, kesim yuzalarining aniqligi va silliqiligi geometrik yadroning matematik asosiga bevosita bog'liq bo'lib, Parasolid yadrosiga tayangan SolidWorks tizimida NURBS va B-Rep modellarni kesish jarayoni iteratsion parametrik tenglamalar orqali amalga oshiriladi va kesish chizig'i ikki o'lchamli parametrik fazoda aniqlanib, so'ngra uch o'lchamli koordinatalarga transformatsiya qilinadi, bu esa yuqori darajadagi geometrik uzluksizlikni ( $G^1$  va  $G^2$ ) saqlash imkonini beradi; KOMPAS-3D tizimida esa C3D yadrosi konstruktiv geometriya va chegaraviy taqdimot modelining kombinatsiyasiga asoslangan bo'lib, kesish operatsiyasi ko'proq konstruktiv mantiq asosida bajariladi va model daraxtida mustaqil operatsiya sifatida saqlanadi, bu esa standartlashtirilgan mashinasozlik detallarida yuqori ishonchlilikni ta'minlaydi, biroq murakkab erkin shaklli sirtlarda ba'zi hollarda rekalkulyatsiya jarayonining cho'zilishiga olib keladi; ilmiy jihatdan muhokama qilinadigan muhim masala shundaki, kesim yuzasini hosil qilish jarayoni topologik barqarorlik bilan chambarchas bog'liq bo'lib, model parametrlaridagi kichik o'zgarishlar topologik identifikatorlarning o'zgarishiga sabab bo'lishi mumkin, bu esa parametrik bog'lanishlarning uzilishiga olib keladi, tadqiqot davomida SolidWorks tizimida topologik qayta identifikatsiya mexanizmi tezroq va avtomatlashtirilgan ishlashi aniqlandi, KOMPAS-3D'da esa ayrim hollarda foydalanuvchi aralashuvi talab qilindi, biroq bu jarayon konstruktorlik nazorati nuqtai nazaridan ijobiy jihat sifatida baholanishi mumkin; kesim yuzalarining grafik vizuallash darajasi ham muhokama



etilishi lozim bo'lgan omillardan biri bo'lib, SolidWorks'da real vaqt rejimidagi dinamik kesim animatsiyasi dizayn jarayonini intuitiv va interaktiv qiladi, KOMPAS-3D'da esa texnik hujjatlashtirishga yo'naltirilgan kesim shtrixlash tizimi ESKD va GOST standartlariga mos ravishda avtomatik shakllantiriladi, bu esa ishlab chiqarish hujjatlarini tayyorlashda sezilarli ustunlik beradi; hisoblash samaradorligi bo'yicha olingan 7–12% farq matematik jihatdan katta ko'rinmasligi mumkin, biroq katta hajmli yig'ma birliklar va ko'p yuzali modellar bilan ishlashda bu farq umumiy loyiha vaqtini sezilarli darajada qisqartirishi mumkin, ayniqsa, sanoat miqyosidagi loyihalarda vaqt resursi iqtisodiy samaradorlik bilan bevosita bog'liq; muhokama jarayonida shuni ham ta'kidlash joizki, KOMPAS-3D asosan postsovet hududida ishlab chiqilgan va mashinasozlik sanoatining standartlashtirilgan ehtiyojlariga moslashtirilgan bo'lib, texnik chizmalar, kesim belgilari va spetsifikatsiyalarni avtomatik generatsiya qilish imkoniyati bilan ajralib turadi, SolidWorks esa global sanoat standartlariga integratsiyalashgan bo'lib, CAE va CAM modullari bilan chuqur integratsiya qilingan, natijada kesim yuzalarini mustahkamlik tahlili, oqim dinamikasi va issiqlik hisoblari bilan bog'lash imkoniyati kengroq; shuningdek, parametrik modellashtirish nazariyasi nuqtai nazaridan kesim operatsiyasi model daraxtidagi bog'lanishlar zanjiriga ta'sir ko'rsatadi va operatsiyalar ketma-ketligi noto'g'ri tashkil etilganda qayta qurish xatoliklari paydo bo'lishi mumkin, tadqiqot shuni ko'rsatdiki, SolidWorks'da "feature-based" arxitektura kesim operatsiyasini yuqori darajada moslashuvchan qiladi, KOMPAS-3D'da esa konstruktiv operatsiyalar ketma-ketligi qat'iy mantiqiy tuzilishga ega bo'lib, bu tizimli yondashuvni talab etadi; ilmiy jihatdan yana bir muhim jihat – kesim yuzalarining eksport jarayonida geometriya aniqligini saqlash masalasi bo'lib, tajriba natijalari SolidWorks'da STEP va IGES formatlarida silliqlik parametrlarining saqlanishi yuqori ekanligini ko'rsatdi, KOMPAS-3D'da esa ichki texnologik hujjatlashtirish ustuvor bo'lgani sababli eksport jarayonida ayrim parametrik bog'lanishlar statik geometriyaga aylantirilishi mumkinligi aniqlandi; umumlashtirib aytganda, muhokama natijalari shuni ko'rsatadiki, sirtlarning kesim yuzalarini yasash samaradorligi dasturiy muhitning geometrik yadrosi, parametrik arxitekturasini va standartlashtirish darajasiga bog'liq bo'lib, tanlov loyiha xarakteriga qarab amalga oshirilishi lozim, ya'ni erkin shaklli, aerodinamik va ergonomik modellar uchun SolidWorks matematik barqarorligi va silliqligi bilan ustunlik qiladi, mashinasozlik, ishlab chiqarish hujjatlari va standartlashtirilgan konstruktsiyalar uchun esa KOMPAS-3D texnik rasmiylashtirish va normativ moslik jihatidan afzal hisoblanadi, shunday qilib, mazkur tadqiqot kesim yuzalarini yasash jarayonining nazariy va amaliy jihatlarini integratsiyalashgan holda tahlil qilib, muhandislik grafikasi va CAD texnologiyalarini rivojlantirish uchun ilmiy asos yaratadi.

### **Xulosa**

Mazkur ilmiy tadqiqot natijalari asosida KOMPAS-3D va SolidWorks dasturlarida sirtlarning kesim yuzalarini yasash jarayoni nazariy-geometrik, algoritmik va amaliy jihatdan kompleks tahlil qilinib, quyidagi ilmiy umumlashmalar shakllantirildi: birinchidan, sirtning tekislik bilan kesish operatsiyasi



hisoblash geometriyasining murakkab masalalaridan biri bo'lib, u parametrik tenglamalar tizimini yechish, topologik identifikatsiya, chegaraviy taqdimot (B-Rep) va konstruktiv geometriya (CSG) tamoyillariga asoslanadi hamda kesim yuzasining aniqligi geometrik yadroning matematik barqarorligiga bevosita bog'liq ekanligi aniqlandi; ikkinchidan, SolidWorks tizimi Parasolid yadrosiga asoslanganligi sababli erkin shaklli NURBS sirtlarni kesishda yuqori darajadagi silliqlik ( $G^1$  va  $G^2$  uzluksizlik) va algoritmik barqarorlikni ta'minlaydi, bu esa aerodinamik, ergonomik va dizayn yo'nalishidagi murakkab modellar uchun afzallik yaratadi; uchinchidan, KOMPAS-3D tizimi C3D yadrosi asosida konstruktiv geometriyaga tayangan holda kesim operatsiyalarini qat'iy mantiqiy ketma-ketlikda bajaradi va model daraxtida mustaqil operatsiya sifatida saqlaydi, natijada mashinasozlik va standartlashtirilgan konstruksiyalar uchun texnik hujjatlashtirish jarayoni samaraliroq tashkil etiladi; to'rtinchidan, parametrik modellashtirish jarayonida kesim operatsiyasi modelning qayta qurilish tezligiga sezilarli ta'sir ko'rsatishi aniqlanib, o'rta murakkablikdagi sanoat modellarida har ikkala tizim deyarli teng natija ko'rsatgani, biroq yuqori darajadagi erkin shaklli sirtlarda SolidWorks hisoblash samaradorligi jihatidan ustunlik qilgani ilmiy asosda tasdiqlandi; beshinchidan, kesim yuzalarining grafik vizuallashtirish darajasi va dinamik yangilanish mexanizmi foydalanuvchi interfeysining ergonomikasiga bog'liq bo'lib, SolidWorks interaktiv vizual nazorat imkoniyatlari bilan ajralib turadi, KOMPAS-3D esa ESKD va GOST standartlariga mos ravishda avtomatik shtrixlash va belgilash tizimi orqali ishlab chiqarish hujjatlarini tayyorlashda ustunlik ko'rsatadi; oltinchidan, eksport va CAM integratsiyasi jarayonida geometriya aniqligini saqlash mezonini bo'yicha SolidWorks xalqaro formatlarda (STEP, IGES) yuqori moslashuvchanlikni ta'minlaydi, KOMPAS-3D esa ichki texnologik hujjatlashtirish va normativ bazaga moslik jihatidan kuchli hisoblanadi; yettinchidan, ilmiy-nazariy jihatdan kesim yuzalarini yasash samaradorligi uch omilga – geometrik yadroning matematik arxitekturasini, parametrik bog'lanishlar strukturasi barqarorligi va topologik qayta identifikatsiya mexanizmining tezligiga bog'liq ekanligi asoslandi; natijada, amaliy tavsiya sifatida shuni ta'kidlash mumkinki, agar loyiha erkin shaklli sirtlar, murakkab dizayn yoki CAE integratsiyasini talab etsa, SolidWorks tizimi maqsadga muvofiq tanlov hisoblanadi, agar loyiha mashinasozlik, ishlab chiqarish hujjatlari va standartlashtirilgan konstruktiv modellar bilan bog'liq bo'lsa, KOMPAS-3D tizimi samarali va iqtisodiy jihatdan maqbul yechim bo'lib xizmat qiladi; umumiy ilmiy xulosa sifatida aytish mumkinki, sirtlarning kesim yuzalarini yasash CAD tizimlarining rivojlanish darajasini belgilovchi asosiy mezonlardan biri bo'lib, mazkur tadqiqot natijalari muhandislik grafikasi, raqamli ishlab chiqarish va 3D modellashtirish sohalarida metodologik asos yaratadi hamda kelgusida geometrik algoritmlarni optimallashtirish, topologik barqarorlikni oshirish va parametrik modellashtirishning yangi avlod tizimlarini ishlab chiqish uchun ilmiy zamin bo'lib xizmat qiladi.

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## **DIAGNOSIS OF BRONCHOPULMONARY PATHOLOGIES IN CHILDREN**

**Annotation:** The article provides a comprehensive analysis of modern approaches to the diagnosis of bronchopulmonary pathologies in children, encompassing acute (bronchiolitis, pneumonia), chronic (asthma, bronchiectasis), congenital (malformations, cystic fibrosis), and prematurity-related conditions (bronchopulmonary dysplasia – BPD). Emphasis is placed on integrated diagnostic strategies combining detailed anamnesis, physical examination, laboratory biomarkers (including PCR for pathogens, procalcitonin, FeNO), advanced imaging (HRCT, functional MRI, ultrasound), functional tests (spirometry, impulse oscillometry, body plethysmography), and invasive methods (bronchoscopy with BAL). Special attention is given to challenges in early diagnosis of BPD using updated criteria (NICHD 2018/2019, Jensen definitions), predictive modeling with artificial intelligence, and differentiation from overlapping syndromes. The role of molecular-genetic testing, exhaled breath analysis, and personalized risk stratification is highlighted, particularly relevant for high-risk groups such as preterm infants. Proposed solutions aim to improve diagnostic accuracy, reduce invasive procedures, minimize radiation exposure, and enhance outcomes through multidisciplinary and evidence-based approaches in pediatric pulmonology.

**Keywords:** bronchopulmonary pathologies, pediatric pulmonology, bronchopulmonary dysplasia (BPD), diagnosis, biomarkers, high-resolution CT, spirometry, impulse oscillometry, bronchoscopy, preterm infants, artificial intelligence prediction, differential diagnosis

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## **BOLALARDA BRONXOPULMONAR PATOLOGIYALARNI DIAGNOSTIKASI**

**Annotatsiya:** Maqolada bolalarda bronxopulmonar patologiyalarni (o'tkir – bronxiolit, pnevmoniya; surunkali – astma, bronhiektaz; tug'ma – malformatsiyalar, kistoz fibroz; va muddatidan oldin tug'ilish bilan bog'liq – bronxopulmonar displaziya – BPD) zamonaviy diagnostika yondashuvlari keng qamrovli tahlil qilinadi. Diqqat batafsil anamnez, fizikal tekshiruv, laborator biomarkerlar (PZR patogenlar uchun, prokalsitonin, FeNO), ilg'or tasvirlash (HRKT, funktsional MRT,

ultratovush), funktsional testlar (spirometriya, impuls oscillometriya, bod-plettizmografiya) va invaziv usullar (bronxoskopiya BAL bilan) integratsiyasiga qaratilgan. BPD ning erta diagnostikasidagi qiyinchiliklar, yangilangan mezonlar (NICHD 2018/2019, Jensen ta'riflari), sun'iy intellekt yordamida prediktiv modellashirish va o'xshash sindromlardan farqlash batafsil ko'rib chiqiladi. Molekulyar-genetik testlar, nafas chiqarish gazlari tahlili va shaxsiy xavf stratifikatsiyasining o'rni ta'kidlanadi, ayniqsa yuqori xavf guruhlar (muddatidan oldin tug'ilgan bolalar) uchun dolzarb. Taklif etilgan yechimlar diagnostik aniqlikni oshirish, invaziv aralashuvlarni kamaytirish, radiatsiya ta'sirini minimallashtirish va natijalarni yaxshilashga qaratilgan bo'lib, pediatrik pulmonologiyada ko'p tarmoqli va dalillar asosidagi yondashuvni ta'minlaydi.

**Kalit so'zlar:** bronxopulmonar patologiyalar, pediatrik pulmonologiya, bronxopulmonar displaziya (BPD), diagnostika, biomarkerlar, yuqori rezolyutsiyali KT, spirometriya, impuls oscillometriya, bronxoskopiya, muddatidan oldin tug'ilgan bolalar, sun'iy intellekt bashorati, differentsial diagnostika

Bolalarda bronxopulmonar patologiyalarning diagnostikasi zamonaviy pediatriya va pulmonologiyaning eng dolzarb va murakkab masalalaridan biri bo'lib, u nafaqat o'tkir respirator kasalliklarning erta aniqlanishini, balki surunkali va tug'ma nuqsonlarning uzoq muddatli monitoringini ham qamrab oladi. Ushbu patologiyalar bolalar orasida yuqori tarqalganligi, ularning klinik ko'rinishlarining o'ziga xos xilma-xilligi va yoshga bog'liq diagnostik qiyinchiliklari tufayli alohida e'tibor talab etadi. Jahon sog'liqni saqlash tashkilotining ma'lumotlariga ko'ra, besh yoshgacha bo'lgan bolalarda nafas yo'llari kasalliklari kasallanish va o'limning yetakchi sabablaridan biri hisoblanadi, ayniqsa rivojlanayotgan mintaqalarda, jumladan O'rta Osiyo mamlakatlarida bu ko'rsatkichlar yuqori darajada saqlanib qolmoqda. Bolalarda bronxopulmonar patologiyalarning diagnostikasi klinik, laborator, instrumental va molekulyar usullarning integratsiyasiga asoslanadi, chunki simptomatologiya ko'pincha noaniq bo'lib, o'tkir bronxit, pnevmoniya, bronxiolit, astma, bronxopulmonar displaziya (BPD), kistoz fibroz, interstitsial o'pka kasalliklari va tug'ma malformatsiyalar kabi holatlarni differentsiallashtirishni talab qiladi.

Diagnostik jarayonning asosiy bosqichi to'g'ri va batafsil anamnez yig'ishdan boshlanadi, bu yerda oilaviy tarix, perinatal omillar, tug'ilish vazni, gestatsion yosh, sun'iy nafas olish apparati (SNA) qo'llanilishi, atrof-muhit ta'sirlari va allergik predispozitsiya katta ahamiyatga ega. Masalan, muddatidan oldin tug'ilgan chaqaloqlarda bronxopulmonar displaziya rivojlanishi xavfi yuqori bo'lib, uning diagnostikasi postmenstrual yoshga (36 va 40 haftada) qarab nafas olish qo'llab-quvvatlash rejimlarini (kislorod, pozitiv bosimli nafas olish) baholash orqali amalga oshiriladi. Fizikal tekshiruvda nafas olish chastotasi, tiriklik belgilarining o'zgarishi, perkussiya va auskultatsiya natijalari (krepitatsiya, vizing, bronxial nafas) asosiy yo'nalish beradi, ammo bu ko'rsatkichlar yosh bolalarda noaniq bo'lishi mumkin, chunki ular hamkorlik qila olmaydi va simptomatologiya tez o'zgaradi.

Laboratoriya diagnostikasi bolalarda bronxopulmonar patologiyalarni tasdiqlash va etiologiyani aniqlashda muhim o‘rin tutadi. Umumiy qon tahlilida leykotsitoz, neytrofil ko‘payishi, S-reaktiv oqsil darajasi infeksiyon jarayonni ko‘rsatadi, ammo virusli va bakterial farqlash uchun polimeraza zanjirli reaksiya (PZR) usuli, shu jumladan respirator sinsitial virus, adenovirus, mikoplazma va xlamidiya uchun maxsus testlar qo‘llaniladi. Bronxoalveolyar lavaj (BAL) suyuqligida hujayra tarkibi, sitologik va bakteriologik tahlil invaziv diagnostikaning oltin standarti hisoblanadi, ayniqsa surunkali holatlarda yoki antibiotikoterapiyaga chidamli pnevmoniyalarda. Biomarkerlar, masalan, exhaled nitric oxide (FeNO) astma fenotipini aniqlashda, prokalsitonin bakterial infeksiyani baholashda, shuningdek genetik testlar (CFTR gen mutatsiyalari kistoz fibroz uchun) molekulyar darajada aniqlikni oshiradi. So‘nggi yillarda sun‘iy intellekt (SI) asosidagi biomarker modellarining rivojlanishi, masalan, nafas chiqarish gazlari tahlili orqali endotiplarni (parenkimal, yo‘l havo va vaskulyar) ajratish imkonini berib, shaxsiy yondashuvni ta‘minlamoqda.

Instrumental diagnostika bolalarda bronxopulmonar patologiyalarning vizualizatsiyasida asosiy rol o‘ynaydi va radiatsion yukni minimallashtirish tamoyiliga asoslanadi. Ko‘krak qafasi rentgenografiyasi birinchi bosqichda pnevmoniya, atelettaz va pleural effuziyani aniqlash uchun qo‘llaniladi, ammo uning sezuvchanligi cheklangan. Yuqori rezolyutsiyali kompyuter tomografiyasi (HRKT) bronhiektaz, interstitsial o‘zgarishlar, tug‘ma malformatsiyalar va BPD ning parenkimal endotipini baholashda eng informativ usul bo‘lib, Ochiai ball tizimi yordamida og‘irlik darajasini aniqlaydi. Magnit-rezonans tomografiya (MRT), ayniqsa funktsional MRT nafas olish harakatini baholashda radiatsiyasiz alternativ sifatida tobora keng qo‘llanilmoqda, bu muddatidan oldin tug‘ilgan bolalarda ayniqsa muhim. Ultratovush tekshiruvi pleural va perikardial effuziyalarni, shuningdek diafragma harakatini real vaqtda baholash imkonini beradi. Funktsional diagnostika usullari, jumladan spirometriya, bod-plettizmografiya va bronxodilator testi astma va obstruktiv sindromlarni tasdiqlashda asosiy bo‘lib, ammo besh yoshgacha bo‘lgan bolalarda ularni o‘tkazish qiyinligi sababli impuls oscillometriya yoki infant plettizmografiyasi qo‘llaniladi.

Differentsial diagnostika bolalarda bronxopulmonar patologiyalarda murakkablikni oshiradi, chunki ko‘plab kasalliklar bir xil klinik ko‘rinish berishi mumkin. Masalan, o‘tkir bronxiolitni astma hujumi yoki begona jism aspiratsiyasidan farqlash uchun bronxoskopiya zarur bo‘lishi mumkin, bu yerda nafas yo‘llari obstruktsiyasini to‘g‘ridan-to‘g‘ri vizualizatsiya qilish va biopsiya olish imkonini mavjud. Surunkali holatlarda, masalan, bronhiektatik kasallikda KT va bronxografiya lokalizatsiya va tarqalishni aniqlaydi, shu bilan birga immun yetishmovchilik yoki silni istisno qilish uchun qo‘shimcha testlar o‘tkaziladi. Tug‘ma bronxopulmonar malformatsiyalar (sekvestratsiya, kistoz adenomatoid malformatsiya) prenatal ultratovush va postnatal angiografiya bilan tasdiqlanadi. So‘nggi tadqiqotlarda BPD ning endotiplarini aniqlash uchun exokardiografiya (o‘pka gipertenziyasini baholash), yurak kateterizatsiyasi va



SI yordamida radiologik tasvirlarni tahlil qilish katta ahamiyat kasb etmoqda, bu esa prognoz va terapiya tanlashni yaxshilaydi.

Zamonaviy diagnostik yondashuvlarning rivojlanishi bolalarda bronxopulmonar patologiyalarni erta aniqlash va shaxsiy davolash strategiyalarini ishlab chiqish imkonini berdi. Xususan, prediktiv analitika va mashinaviy o'rganish modellarining qo'llanilishi perinatal omillar (gestatsion yosh, tug'ilish vazni, Apgar balli, xorioamnionit, intrauterin o'sish cheklanishi) asosida BPD xavfini bashorat qilish aniqligini 80-90% ga yetkazdi. Biomarkerlarning kombinatsiyasi, genetik polimorfizmlar (masalan, TNF- $\alpha$  gen varianti) va funktsional testlarning integratsiyasi endotiplarni ajratishga yordam berib, masalan, parenkimal endotipda HRKT da fibroz o'zgarishlar, vaskulyar endotipda exokardiografik ko'rsatkichlar ustunlik qiladi. Telemeditsina va portativ qurilmalar (mobil spirometrlar, oximetrlar) uzoq hududlarda monitoringni ta'minlaydi, bu esa pandemiya sharoitida ayniqsa dolzarb bo'ldi. Biroq, diagnostik qiyinchiliklar saqlanib qolmoqda: radiatsion xavf tufayli KT ni cheklash, yosh bolalarning hamkorligi yo'qligi, rivojlanayotgan mamlakatlarda zamonaviy uskunalar yetishmovchiligi va differentsial diagnostikaning murakkabligi. Bu muammolarni hal etish uchun xalqaro standartlar (NIH va Shennan mezonlari BPD uchun), milliy klinik protokollar (O'zbekiston Sog'liqni saqlash vazirligining o'tkir bronxit va pnevmoniya bo'yicha protokollari) va ko'p tarmoqli yondashuv (pulmonolog, radiolog, genetik, kardiolog) zarur.

Bolalarda bronxopulmonar patologiyalarning diagnostikasi nafaqat kasallikni tasdiqlash, balki asoratlarning oldini olish va hayot sifatini yaxshilashga qaratilgan tizimli jarayondir. Masalan, muddatidan oldin tug'ilgan bolalarda BPD ning erta diagnostikasi nafas olish qo'llab-quvvatlash strategiyalarini optimallashtirish, o'pka gipertenziyasini monitoring qilish va neyrodevelopmental natijalarni yaxshilash imkonini beradi. Surunkali obstruktiv kasalliklarda (astma, bronxiektaz) muntazam funktsional monitoring va allergen testlari kasallikni nazorat ostiga olishga yordam beradi. Interstitzial o'pka kasalliklarida genetik skrining va ochiq biopsiya (video-assistlangan torakoskopik biopsiya) aniq morfologik tasdiqlashni ta'minlaydi. Kelajakda diagnostika yanada rivojlanib, nanotechnologiyalar, exhaled breath condensate tahlili va AI asosidagi qaror qabul qilish tizimlari orqali yanada aniq va invazivsiz bo'lishi kutilmoqda. Bu yondashuvlar bolalar salomatligini saqlashda, ayniqsa yuqori xavf guruhlarida, sezilarli samara beradi va global miqyosda bolalar o'limini kamaytirishga hissa qo'shadi.

Umuman olganda, bolalarda bronxopulmonar patologiyalarning diagnostikasi doimiy takomillashuv va ilmiy tadqiqotlar talab qiladigan sohadir. Klinik amaliyotda an'anaviy usullarni zamonaviy texnologiyalar bilan birlashtirish, xalqaro tajribani milliy kontekstga moslashtirish va mutaxassislar malakasini oshirish orqali bu sohada sezilarli yutuqlarga erishish mumkin. Natijada, har bir bolaga shaxsiy va o'z vaqtida yordam ko'rsatish, kasallikning og'ir asoratlarini oldini olish va sog'lom avlodni tarbiyalash imkoniyati



kengayadi. Ushbu yo‘nalishdagi ilmiy izlanishlar nafaqat diagnostik aniqlikni oshiradi, balki terapevtik strategiyalarning samaradorligini ham yuksaltirib, bolalar pulmonologiyasining kelajagini belgilaydi.

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## **DEVELOPING COMMUNICATIVE CULTURE IN TEACHING FOREIGN LANGUAGES AT TECHNICAL UNIVERSITIES**

**Abstract** *In the era of globalization and rapid technological advancement, technical specialists are increasingly required to participate in international professional environments. For students of technical universities, foreign language proficiency is not limited to grammar and vocabulary acquisition; it also involves the development of communicative culture. Communicative culture encompasses linguistic competence, intercultural awareness, professional etiquette, and the ability to engage in respectful and effective dialogue. This article explores theoretical and methodological foundations for forming communicative culture in foreign language instruction at technical higher education institutions. It analyzes the role of communicative language teaching (CLT), English for Specific Purposes (ESP), project-based learning, and digital technologies in shaping students' professional interaction skills. The paper argues that integrating authentic materials, collaborative tasks, intercultural training, and technology-enhanced learning environments significantly contributes to the development of communicative competence. The study concludes that fostering communicative culture in technical universities enhances graduates' competitiveness and prepares them for active participation in the global engineering community.*

**Keywords:** *communicative culture, technical universities, foreign language teaching, ESP, intercultural competence, professional communication, digital learning, engineering education.*

Technical higher education institutions traditionally focus on developing students' professional and scientific competencies. However, in contemporary society, engineers and technical specialists must also communicate effectively in international contexts. Scientific conferences, multinational projects, academic mobility programs, and globalized labor markets require future engineers to possess strong foreign language skills combined with communicative culture.

Communicative culture refers to a complex system of knowledge, skills, values, and behavioral norms that enable effective interaction in various social and professional contexts. In foreign language education, it includes linguistic accuracy, pragmatic awareness, intercultural sensitivity, and ethical communication. Therefore, the formation of communicative culture should become one of the central objectives of foreign language teaching in technical universities.

The concept of communicative competence was introduced by Dell Hymes and later developed within communicative language teaching methodology. It emphasizes not only grammatical correctness but also sociolinguistic and pragmatic appropriateness. In technical universities, communicative culture must be adapted to professional contexts such as technical reporting, project discussions, negotiations, and academic presentations.

English for Specific Purposes (ESP) provides a methodological framework for aligning language instruction with students' professional needs. Engineering students require mastery of technical terminology, the ability to interpret diagrams and manuals, and competence in writing research papers and project documentation. However, these technical skills must be accompanied by interpersonal communication abilities such as teamwork, leadership dialogue, and intercultural cooperation.

In multicultural professional environments, engineers collaborate with colleagues from diverse linguistic and cultural backgrounds. Misunderstandings may arise not because of linguistic errors, but due to differences in communication styles, politeness strategies, or professional etiquette.

Therefore, foreign language courses in technical universities should incorporate intercultural training. Students need to understand cultural norms, communication conventions, and behavioral expectations in international settings. Case studies, role-playing activities, and analysis of real-life professional situations can help learners develop tolerance, empathy, and adaptability.

Intercultural competence strengthens communicative culture by promoting respect and mutual understanding. It prepares future engineers to function effectively in multinational teams and cross-border collaborations.

To foster communicative culture, traditional lecture-based instruction must be replaced or supplemented with interactive methodologies. Communicative Language Teaching (CLT) emphasizes meaningful interaction, authentic communication tasks, and learner-centered instruction.

Project-based learning is particularly effective in technical universities. Students can design engineering projects, prepare technical presentations, or simulate professional meetings in a foreign language. Such tasks integrate language practice with professional problem-solving.

Debates, group discussions, and collaborative assignments encourage active participation and develop argumentation skills. These activities help students express technical ideas clearly, defend their viewpoints, and engage in constructive dialogue.

Modern digital technologies significantly enhance the formation of communicative culture. Online conferencing tools allow students to interact with international peers and participate in virtual exchange programs. Learning management systems facilitate collaborative writing, peer feedback, and discussion forums.

Artificial intelligence–based tools can provide pronunciation feedback and simulate conversational scenarios. Virtual environments enable students to practice professional communication in simulated technical settings, such as laboratory briefings or project negotiations.

Digital communication platforms also expose students to authentic professional discourse, including webinars, online workshops, and international engineering forums. Such experiences bridge the gap between classroom learning and real-world communication.

The instructor plays a crucial role in guiding students toward communicative maturity. Teachers must create a supportive and respectful learning atmosphere where students feel confident expressing their ideas. Feedback should focus not only on linguistic accuracy but also on clarity, politeness, coherence, and professional tone.

Moreover, teachers themselves need continuous professional development to integrate innovative methodologies and digital tools effectively. Pedagogical competence combined with technological literacy ensures successful implementation of communicative-oriented instruction

Despite its importance, developing communicative culture in technical universities faces several challenges. Large class sizes may limit opportunities for individual speaking practice. Students often prioritize technical subjects over language courses, underestimating the importance of communication skills. Limited contact hours may restrict interactive activities.

Additionally, unequal access to digital technologies can create disparities in learning outcomes. Addressing these challenges requires institutional support, curriculum reform, and recognition of foreign language education as a strategic component of engineering training

### **Conclusion**

The formation of communicative culture in foreign language teaching at technical universities is a multidimensional and strategic task. It involves integrating linguistic competence, intercultural awareness, professional etiquette, and digital literacy. By applying communicative methodologies, project-based learning, intercultural training, and technology-enhanced instruction, higher education institutions can prepare future engineers for effective participation in the global professional community.

In modern engineering practice, technical expertise alone is insufficient. Successful specialists must articulate ideas clearly, collaborate respectfully, and navigate multicultural environments confidently. Therefore, fostering communicative culture through foreign language education is not an auxiliary objective but a fundamental requirement of contemporary technical higher education.

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## **THE USE OF MODERN DIGITAL TECHNOLOGIES IN TEACHING FOREIGN LANGUAGES TO ENGINEERING STUDENTS**

**Abstract:** *In the context of rapid globalization and technological advancement, foreign language proficiency has become an essential competence for future engineers. Engineering professionals increasingly participate in international research collaborations, multinational projects, and global labor markets where English and other foreign languages function as primary means of communication. This article examines the role of modern digital technologies in teaching foreign languages to engineering students. It analyzes the pedagogical potential of learning management systems, mobile applications, artificial intelligence-based tools, virtual and augmented reality environments, and massive open online courses. Platforms such as Duolingo, Quizlet, and Coursera are discussed as examples of technology-enhanced learning ecosystems that foster vocabulary acquisition, professional communication skills, and learner autonomy. The article argues that integrating digital tools into English for Specific Purposes (ESP) instruction increases student motivation, supports individualized learning trajectories, and enhances professional communicative competence. At the same time, challenges such as digital inequality, insufficient teacher training, and overreliance on technology are addressed. The study concludes that a balanced pedagogical framework combining digital innovation with methodological rigor is essential for preparing competitive engineers in the global arena.*

**Keywords:** *digital technologies, engineering education, ESP (English for Specific Purposes), artificial intelligence, virtual learning environments, mobile-assisted language learning, communicative competence, higher education*

The 21st century has transformed engineering into a global profession. Engineers collaborate across borders, access international research databases, and contribute to multinational technological projects. English, in particular, has become the lingua franca of science, engineering, and innovation. Consequently, higher education institutions must ensure that future engineers possess not only technical expertise but also strong foreign language communication skills.

Traditional language teaching methods, primarily based on textbooks and classroom-centered instruction, are no longer sufficient to meet contemporary professional demands. The integration of digital technologies into language education offers innovative opportunities for improving effectiveness, flexibility, and learner engagement. This article explores how modern digital technologies enhance foreign language instruction for engineering students and evaluates their pedagogical benefits and limitation



English for Specific Purposes (ESP) is a learner-centered approach that focuses on developing language skills relevant to particular disciplines or professions. For engineering students, ESP courses emphasize technical terminology, academic writing, professional presentations, and intercultural communication.

Digital transformation in education has introduced new methodologies such as blended learning, flipped classrooms, and online collaborative environments. These approaches align well with ESP principles because they allow authentic materials, simulations, and real-world communication tasks to be integrated into instruction. Engineering students can analyze technical documentation, watch industry-related lectures, and participate in international webinars in a foreign language

Digital Platforms and Mobile Applications Mobile-assisted language learning (MALL) has become increasingly popular among university students. Applications such as Duolingo and Quizlet provide gamified vocabulary exercises, adaptive quizzes, and spaced repetition systems that improve retention of technical terminology. For engineering students, specialized vocabulary sets related to mechanics, programming, electronics, and civil engineering can be developed and shared digitally.

Massive open online courses (MOOCs), including those offered by Coursera, enable students to take engineering-related courses in English. This exposure to authentic academic discourse enhances listening comprehension and discipline-specific language skills. Furthermore, discussion forums encourage written interaction and peer collaboration.

Learning Management Systems (LMS) such as Moodle or Google Classroom facilitate assignment submission, feedback exchange, and progress tracking. Through these systems, instructors can upload technical reading materials, create interactive grammar modules, and organize online discussions focused on professional topics

Artificial intelligence (AI) has introduced adaptive and personalized learning pathways. AI-powered tools analyze learner performance and automatically adjust task difficulty. Speech recognition systems evaluate pronunciation accuracy and provide real-time feedback, which is particularly beneficial for engineering students preparing for international presentations or conferences.

AI-based writing assistants help students improve technical report writing by detecting grammatical errors, stylistic inconsistencies, and vocabulary misuse. Such tools contribute to academic literacy development and increase learner confidence.

Chatbots and virtual tutors simulate professional communication scenarios. For example, a virtual assistant may replicate a job interview or project negotiation, enabling students to practice industry-related communication skills in a risk-free environment

Virtual reality (VR) and augmented reality (AR) technologies offer immersive language learning experiences. Engineering students can participate in simulated laboratory experiments or factory environments where instructions and

communication occur in a foreign language. This contextual learning enhances comprehension and practical language application.

By integrating VR simulations into ESP courses, educators can bridge the gap between theoretical language instruction and professional practice. Students not only learn terminology but also apply it in realistic technical situations

**Advantages of Digital Technologies** The integration of digital technologies into foreign language instruction for engineers offers several advantages:

1. **Personalization:** Adaptive systems accommodate individual learning speeds and preferences.

2. **Accessibility:** Online platforms provide access to global resources anytime and anywhere.

3. **Authenticity:** Students engage with real-world technical materials and professional discourse.

4. **Motivation:** Gamification and multimedia content increase engagement.

5. **Collaboration:** Digital tools support teamwork across geographical boundaries.

These factors collectively contribute to the development of communicative competence and professional readiness

Despite their benefits, digital technologies present certain challenges. Not all students have equal access to high-speed internet or modern devices, leading to digital inequality. Teachers may lack sufficient training in integrating advanced tools into pedagogical practice. Overdependence on automated systems can also reduce critical thinking and interpersonal communication skills.

Therefore, technology should complement—not replace—methodologically sound instruction. Teacher training programs and institutional support are crucial for effective digital integration.

### **Conclusion**

Modern digital technologies significantly enhance foreign language instruction for future engineers by fostering professional communication skills, learner autonomy, and global engagement. Platforms, AI-based systems, and immersive environments provide innovative opportunities for ESP education. However, successful implementation requires pedagogical balance, teacher preparedness, and equitable access to digital resources.

Preparing engineers for the global workforce demands an educational model that integrates technical expertise with multilingual competence supported by digital innovation. By strategically applying modern technologies, higher education institutions can cultivate competitive, communicative, and adaptable engineering professionals.

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## **CHARLES DICKENS ASARLARIDA IJTIMOIIY KONTEXTNI ANGLASH ORQALI O‘QISH KOMPETENSIYASINI CHUQURLASHTIRISH METODIKASI**

**Annotatsiya:** Mazkur maqolada ingliz adabiyotining atoqli namoyandasi Charles Dickens asarlaridagi ijtimoiy kontekstni o‘rganish orqali talabalarda o‘qish kompetensiyasini rivojlantirish metodikasi tahlil qilinadi. Tadqiqotda Oliver Twist va A Christmas Carol asarlari asosida ishlab chiqilgan topshiriqlar talabalarda matnni tushunish, ijtimoiy muammolarni tahlil qilish va xulosa chiqarish ko‘nikmalarini oshirishga xizmat qilgan. Maqolada ijtimoiy kontekst asosidagi o‘qish yondashuvi o‘qitish samaradorligini oshiruvchi muhim omil sifatida baholanadi.

**Kalit so‘zlar:** Charles Dickens, o‘qish kompetensiyasi, ijtimoiy kontekst, lingvokulturologik yondashuv, adabiy matn, metodika.

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## **METHODOLOGY OF DEEPENING READING COMPETENCE THROUGH UNDERSTANDING SOCIAL CONTEXT IN THE WORKS OF CHARLES DICKENS**

**Abstract:** This article analyzes the methodology of developing reading competence in students through the study of social context in the works of Charles Dickens, a prominent figure in English literature. In the study, tasks developed based on the works of Oliver Twist and A Christmas Carol served to improve students' skills in understanding the text, analyzing social problems, and drawing conclusions. The article evaluates the reading approach based on social context as an important factor in increasing the effectiveness of teaching.

**Keywords:** Charles Dickens, reading competence, social context, linguocultural approach, literary text, methodology.

### **Kirish (Introduction)**

Bugungi global ta'lim tizimida xorijiy tilni o‘qitish nafaqat lingvistik bilim, balki ijtimoiy-madaniy tafakkurni ham shakllantirishga qaratilmoqda. O‘qish kompetensiyasi — talabaning matndan mazmun, g‘oya va ijtimoiy kontekstni anglay olish, uni baholash va o‘z nuqtayi nazarini ifodalash qobiliyatidir.

Charles Dickens asarlari (xususan, Oliver Twist, A Christmas Carol, Hard Times) XIX asr ingliz jamiyatidagi ijtimoiy tengsizlik, bolalar mehnati, halollik

va insoniy qadriyatlarni yoritgan asarlardir. Shu bois ularni o'qish jarayoniga integratsiya qilish, EFL (English as a Foreign Language) talabarlari uchun nafaqat til kompetensiyasini, balki ijtimoiy anglashni ham rivojlantiradi.

Tadqiqot metodlari (Methods)

Ushbu tadqiqotda lingvodidaktik va lingvokulturologik yondashuv asos qilib olindi. O'quv jarayonida quyidagi metodlardan foydalanildi:

Adabiy tahlil – Dickens asarlaridagi ijtimoiy motivlar va leksik birliklarni aniqlash.

Eksperimental darslar – “Reading through Literature” moduli asosida o'qish mashg'ulotlarini tashkil etish.

Task-based learning – matnga asoslangan topshiriqlar tizimini ishlab chiqish.

Diagnostic testlar va kuzatuv – o'qish kompetensiyasining boshlang'ich va yakuniy darajasini solishtirish.

O'rganish jarayoni uch bosqichda amalga oshirildi:

Pre-reading: Asarda aks etgan ijtimoiy muammolar haqida muhokama (masalan, bolalar uyi, kambag'allik).

While-reading: Matndan ijtimoiy kontekstni aniqlovchi faktlar va personajlarni tahlil qilish.

Post-reading: Fikr almashish, munosabat bildirish, muammoni yechish bo'yicha taklif yozish.

Natijalar (Results)

Eksperimental o'qish mashg'ulotlari Termiz davlat pedagogika institutining xorijiy filologiya fakulteti 3-kurs talabalarida o'tkazildi (n=30). Tadqiqot yakunida quyidagi natijalar aniqlandi:

Talabalar matnni ijtimoiy kontekstda tahlil qilish qobiliyatini 30% ga oshirdi;

Inferensiya (xulosa chiqarish) ko'nikmasida 25% o'sish kuzatildi;

O'qishga bo'lgan motivatsiya sezilarli darajada kuchaydi;

Talabalarning madaniy tafakkuri va ijtimoiy muammolarga e'tibori ortdi.

Bu natijalar Dickens asarlaridan foydalanish o'qish kompetensiyasini nafaqat lingvistik, balki ijtimoiy-madaniy jihatdan ham rivojlantirishini ko'rsatdi.

Tahlil va muhokama (Discussion)

Dickens asarlarining o'ziga xosligi — undagi ijtimoiy hayot, sinfiy tengsizlik, mehr-shafqat va insoniy qadriyatlardir. Talabalarda bu mavzularni o'qish jarayonida tahlil qilish ularda tanqidiy o'qish (critical reading) va empatiyani rivojlantiradi.

Ijtimoiy kontekstni tahlil qilish orqali o'quvchilar matnni chuqur anglaydi, o'z fikrini asosli ifodalaydi va real hayotdagi muammolar bilan bog'lay oladi. Bu yondashuv Bloom taksonomiyasining yuqori darajalariga – tahlil, sintez va baholash bosqichlariga olib chiqadi.

Xulosa (Conclusion)

Charles Dickens asarlari asosida o'qish darslarini tashkil etish talabalarda o'qish kompetensiyasini chuqurlashtiruvchi samarali metodika sifatida e'tirof etilishi mumkin. Ijtimoiy kontekstni o'rganish matnni faqat so'z darajasida emas, balki g'oya va ma'naviy mazmun nuqtai nazaridan anglash imkonini beradi. Shunday yondashuv kelajakdagi ingliz tili o'qituvchilarida til, madaniyat va tafakkur integratsiyasini shakllantiradi.

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## **MODEL FOR ASSESSING THE FINANCIAL STABILITY OF AN ENTERPRISE IN THE CONDITIONS OF DIGITAL TRANSFORMATION**

**Abstract:** *This article considers the issue of assessing the financial stability of an enterprise in the context of digital transformation. An integrated model was developed that takes into account digital indicators, along with traditional financial indicators. The results of the study showed the practical effectiveness of the model and made it possible to group enterprises by the level of stability. The model can be used in making strategic management decisions.*

**Keywords:** *digital transformation, financial stability, assessment model, integrated index, enterprise management.*

### **Introduction**

In recent years, digital transformation processes have become an important factor in the activities of enterprises. The introduction of digital technologies not only increases production efficiency, but also fundamentally changes the financial management system. Traditional approaches to assessing financial stability are no longer sufficient, since risks, opportunities and resources are formed differently in the digital environment. Therefore, it is necessary to develop a new model for assessing the financial stability of an enterprise, suitable for the conditions of digital transformation. Today, digitalization, while increasing the operational efficiency of an enterprise, introduces new risks and opportunities into its financial structure. Traditional financial analysis models (for example, Altman's Z-model) often rely on tangible assets. However, in the digital economy, intangible assets and technological flexibility have become the main pillars of financial stability.

### **Methods**

The following methodological approaches were used in the study:

- Analytical approach – the financial indicators of the enterprise (liquidity, profitability, debt level) were analyzed.
- Digital indicators – the level of IT infrastructure, the scope of use of digital services, the integration of electronic settlement systems were assessed.
- Model building – an integrated index was developed to assess financial stability. This index combines financial indicators and digital transformation indicators.

- Mathematical methods – the reliability of the model was checked using multi-criteria analysis and regression analysis.

## Results

The results of the study showed that:

- Financial stability indicators have significantly improved in enterprises with a high level of digital transformation.
- Using the integrated index, enterprises can be divided into three groups: stable, moderately stable, and weakly stable.
- When applied in practice, the model provides 20–25% more accuracy than traditional financial analysis.
- It has been proven that digital indicators (for example, the implementation of ERP systems, the share of electronic payments) have a direct impact on financial stability.

**Table 1: Comparison of financial and digital indicators**

| Indicator type                | Traditional indicators               | Digital indicators                        |
|-------------------------------|--------------------------------------|-------------------------------------------|
| <b>Liquidity</b>              | Current assets / Current liabilities | Share of electronic payments (%)          |
| <b>Rentabellik</b>            | Net profit / Assets                  | Level of implementation of ERP systems    |
| <b>Debt level</b>             | Liabilities / Equity                 | Use of digital audit systems              |
| <b>Financial independence</b> | Capital / Assets                     | IT infrastructure investment volume       |
| <b>Sustainability Index</b>   | Summary of financial indicators      | Financial + digital indicator integration |

The impact of digital factors on financial stability

Digital transformation impacts enterprise sustainability through the following channels:

- Cost optimization: Reduction in operating expenses (OPEX) through automation.
- New revenue streams: Increased liquidity through e-commerce and platform business models.
- Cyber risks: Potential financial losses resulting from cyberattacks.

## 3. Proposed assessment model

We propose the following multi-factor model to determine the overall financial stability indicator ( $FS_{digital}$ ) of an enterprise:

$$FS_{digital} = \alpha_1(K_{lk}) + \alpha_2(K_{av}) + \alpha_3(I_{dt}) - \alpha_4(R_{cyber})$$

In this:

- $K_{lk}$ : Liquidity ratio;
- $K_{av}$ : Autonomy (independence) coefficient;
- $I_{dt}$ : Digital Transformation Index (share of IT investments in total assets);
- $R_{cyber}$ : Cybersecurity risks and technological obsolescence rate;

•  $\alpha_{1...4}$ : Weight coefficients that determine the level of importance of each factor.

Research shows that companies that invest in digital technologies in a timely manner have a financial stability ratio that is 15-20% higher than traditional companies. This is due to rapid adaptation to market changes and lower transaction costs.

### **Discussion**

The results obtained indicate that digital transformation is an important factor in increasing the financial stability of the enterprise. Traditional financial analysis methods are insufficient in the digital environment, as they do not take into account the level of use of IT infrastructure and digital services. The proposed model, however, combines financial and digital indicators, allowing for a comprehensive assessment. This approach helps enterprise managers make strategic decisions and ensures sustainable development in the digital economy.

### **Conclusion**

The model developed to assess the financial stability of an enterprise in the context of digital transformation has proven to be both practical and theoretically effective. It takes into account digital indicators in addition to financial indicators, which allows for a more complete assessment of the enterprise's activities. In the future, the model needs to be tested in various areas and further improved. In the context of digital transformation, assessing financial stability using only balance sheet data is not enough. The new model must take into account the technological potential of the enterprise.

Recommendations:

1. Implement a Digital Finance monitoring system in enterprises.
2. Create a methodology for accurately reflecting the value of IT assets in financial statements.
3. Reduce financial risks through the use of cyber insurance mechanisms.

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## **THE IMPORTANCE OF NEUROPEDAGOGICAL CHARACTERISTICS IN GUIDING CHILDREN TOWARDS A PROFESSION**

**Abstract:** *This article talks about the importance of neuropedagogical features in career guidance of children, how the knowledge gained in this field can effectively influence children in career guidance, and the importance of taking into account their individual characteristics and needs.*

**Keywords:** *Professional skill, psychological knowledge, pedagogical skill, profession, neuropedagogical approach, emotional state, cognitive development.*

### **Introduction**

Neuropedagogical characteristics are of great importance in guiding children towards a career. Neuropedagogy is a field that combines neuroscience and pedagogy, studying the role of brain activity in improving children's developmental processes and learning activities. The knowledge gained in this field is important in how to effectively influence children in their careers, taking into account their individual characteristics and needs.

The theory of career guidance recognizes that success in choosing a career is related to the alignment of a person's characteristics, such as abilities, interests, character and temperament, with the requirements imposed on a specialist by the profession. Accordingly, neuropedagogical characteristics are important in career guidance in the following aspects:

Individual approach. Each child is unique and special. Using the neuropedagogical approach, each child's learning style, abilities, memory and concentration characteristics are studied. Based on this, an individual approach can be used when choosing a suitable profession for the child or choosing teaching methods.

Identifying abilities and talents. Using a neuropedagogical approach, children's natural abilities and talents can be identified. For example, some children are successful in analytical thinking, while others may excel in creative and artistic areas. These abilities should be taken into account when guiding children to a profession, as children are more likely to succeed in the field that interests them.

Neuroplasticity and developmental potential. Children go through a period of very high brain development. Neuropedagogy helps to understand the changes and developments that children's brains undergo. This, in turn, helps to improve children's opportunities in the career guidance process. It is very important to take into account brain changes in order to develop their abilities and form the necessary skills.

Emotional and motivational state. A child's emotional state and motivation play an important role in career guidance. Neuropedagogy can help children manage their emotional state and stress levels, increase their motivation to learn, and understand the connection between the brain and emotions, which can help children understand how they feel about their career choices.

Early childhood education and training. Before starting career guidance, it is important to train the neuropedagogical properties of the child's brain, namely attention, memory, and motor skills. Neuropedagogical methods, such as games and exercises, can help children develop logical thinking, creative abilities, and other professional skills.

Cognitive and emotional development. It is important to consider a child's cognitive development (i.e., thinking, reasoning) and emotional development (i.e., self-awareness, communication with others) during career guidance. Neuropedagogy can help improve these processes and increase children's interest in careers in solving social and emotional problems.

Arousing interest in the profession. Neuropedagogical methods are of great help in developing children's interest in professions. In accordance with the child's brain activity, various practices and interactive approaches can be used to increase motivation and self-confidence in learning professional skills.

The importance of neuropedagogical approaches in career guidance is that these methods take into account the individual characteristics of children, brain activity and learning styles. In other words, they create opportunities to guide them to the best profession, in accordance with the child's developmental stages and cognitive-emotional state. This helps children choose a successful and happy future profession.

Psychological aspects of career guidance create an important foundation for children's future professional lives. Children and adolescents should consider psychological factors when choosing a career based on their abilities and interests. The psychological approach also has a positive impact on their personal and social development. The main psychological aspects to consider when providing career guidance are:

Personal interests and motivation. The interest and motivation of children and young people in a profession are key factors determining their future success. Identifying personal interests and needs is very important when guiding a child towards a career. If a child wants to work in a field that interests them, this will increase their motivation to work and increase their chances of achieving long-term success. Psychological aspect. It is important to understand the child's internal motivation when choosing a profession. Choosing an activity that is interesting and meaningful for the student will help him/her be satisfied and successful in his/her future working life.

Self-awareness and personal identity. Self-awareness is the process by which children become aware of their own personal characteristics and needs. In career guidance, a child's understanding of their own abilities, interests, and needs directly



influences their career decisions. Children with high levels of self-confidence and self-awareness often strive to work in careers that interest them.

Psychological aspect: A child's self-confidence, personal goals, and their connection to their future profession play an important role in the career guidance process. Self-awareness and confidence in career choices also affect children's social and emotional development.

IQ (Intelligent Intelligence) and Skills. A child's intellectual abilities and learning ability are important factors in choosing a career. Every person has unique mental abilities, such as analytical thinking, creative approach, or technical and mathematical knowledge.

Taking into account the high intellectual abilities of children in career guidance and recommending suitable professions for them will contribute to their future success.

Psychological aspect: IQ and other cognitive abilities shape children's approach to careers. Through psychological analysis, identifying a child's intellectual capabilities and abilities can help find the best career fit for them. Social skills and teamwork. A child's social skills and ability to communicate with others are also important in career guidance. Many professions, particularly in management, marketing, medicine, and service industries, require good communication and teamwork skills to succeed.

Psychological aspect: Social skills and teamwork are important in a child's choice of future profession. The ability to work effectively with others and function successfully in a social environment is a psychological factor in children's career decisions.

Enhanced Self-Management (Emotional Intelligence). Emotional intelligence (EQ) is also very important in career guidance. A child's knowledge of how to manage their emotions, stress, and problems affects their approach to a career. A child who develops emotional intelligence will be effective in solving problems in social environments and achieving success in professional life.

Psychological aspect: In career guidance, studying children's emotional intelligence, stress management skills, and emotional decision-making helps strengthen their decisions about choosing a career.

Social pressure and family influence. Family and society play an important role in choosing a career for children. Sometimes parents or society impose their own expectations on the child, which can hinder the child's personal choice. In career guidance, it is necessary to study how children overcome social pressure and family influences and make their own decisions.

Psychological aspect: Pressure from family, friends and society can prevent children from choosing a career according to their abilities and aspirations. Therefore, it is necessary to analyze social pressure and family influences psychologically in career guidance.

A psychological approach to career guidance should be implemented in accordance with the child's personal and emotional development, social and cognitive abilities. When guiding students to a career, taking into account

psychological aspects such as their internal motivation, interests, level of self-awareness, social skills and family influence will help children to be successful in their future professional lives. This approach is important for the development of the child's personality and choosing a profession that matches their dreams and aspirations.

### **Literature analysis and methodology**

This issue was first addressed in the scientific research of the Russian scientist **I.P. Pavlov**, who paid special attention to the connection between changes in the human nervous system and speech. Speech plays a key role in the development of higher nervous activity in humans and in qualitative changes in which many reflex connections are formed.

Based on the results of his research, Pavlov called speech the “**second signal system**” and recognized its superiority over the first signal system. Human behavior is the result of the combined functioning of both signal systems and subcortical structures.

Current scientific research in cognitive neuroscience suggests that one of the most effective ways of guiding students toward professions is to consider individual differences in their nervous systems, particularly the **functional organization of the cerebral hemispheres**.

In particular, scientific research conducted by **S.M. Platek, J.P. Keenan, and T.K. Shackelford** on the evolution of cognitive neuroscience indicates that information received by a living organism is first adapted by the organism, then assimilated, and finally transmitted to the external environment. During this process, behavior may appear as physiological activity or other psychological mechanisms.

Researchers conclude that studying brain structure helps define the metatheoretical boundaries of psychological knowledge that allow for a comprehensive study of the individual, since human behavior and psychophysiological characteristics depend on the nervous system, brain activity, and social environment.

### **Results**

Identifying children's different talents is an important step in their development and future success. Each child is unique and special, so it is important to identify and develop their talents in different areas. Talents are not only academic or intellectual, but also social, emotional, motor and creative. Below we will look at the main types of children's talents and how to identify them:

Intellectual (cognitive) abilities. Cognitive abilities include a child's thinking, reasoning, remembering, problem-solving, and general mental functioning. These abilities are measured by a child's success in reading, writing, solving math problems, and acquiring new knowledge.

Ways to determine:

-IQ tests: Standard mental tests can determine a child's general intellectual abilities.

-Intellectual development level: Observe factors such as how well a child solves mathematical problems, how quickly they think logically, and how quickly they learn.

-Cognitive development: How well a child understands complex concepts and is able to apply knowledge to new situations.

Creative abilities. Creative abilities include a child's ability to generate new ideas, think creatively, and solve problems in unique ways. This can manifest in a child's creative fields such as art, music, design, writing, and more.

Ways to determine:

-Creative Activities: Assessing a child's creative abilities through activities such as creating artwork, playing music, drawing, or writing stories.

-Problem Solving: Observing how a child tries to solve problems in new and unique ways.

-Thinking Level: How does a child develop new ideas and creatively use available resources?

Emotional intelligence (emotional intelligence). Emotional intelligence refers to a child's ability to understand and manage their own emotions and to communicate effectively with others. A child may excel in areas such as self-regulation, social situation analysis, and adaptation to others.

Ways to determine:

-Self-awareness and management: Assess how well the child is able to express and manage their emotions (for example, how they express their interests, concerns, or joy).

-Empathy and social skills: How well the child understands and responds to the emotions of others. This ability is demonstrated in social play or group activities.

-Stress management: How well the child responds to and resolves stressful situations.

Physical (motor) abilities. Motor skills are the child's ability to perform physical movements, especially fine and gross motor movements. Gross motor skills are movements involving large muscle groups (running, jumping), while fine motor skills are movements involving small muscles (hand and finger movements).

Ways to determine:

-Physical activity and sports: What physical exercises does the child do, what are his abilities? Observe his achievements in sports competitions, physical games.

-Coordination and balance: How the child balances his movements, for example, when walking, running or in various physical games.

-Fine motor skills: How the child grasps small objects, writes or does artistic work.

Social Skills. Social skills are a child's ability to communicate with others, work in groups, and behave in social situations. These skills are necessary for self-awareness, working effectively with others, and being successful in social situations. Ways to determine:

-Teamwork: How the child works in a group, how they cooperate with others.

-Communication: How the child interacts with others, how they approach speaking, listening, and problem-solving.

-Assessing social skills: How does the child interact with others, their relationships with friends, and how they participate in social situations?

Research and analytical skills. Research or analytical skills are the child's ability to learn knowledge, generate new ideas and conclusions. The child is successful in learning new facts, analyzing data, and making decisions based on them.

Ways to determine:

-Inquiry: How the child learns new knowledge, approaches scientific and research methods.

-Problem analysis: How the child analyzes complex situations and develops new methods.

-Analytical thinking: How the child systematically analyzes information and makes decisions.

Leadership Skills.

Leadership skills are a child's ability to lead, inspire, and guide a group to success. This ability typically indicates that children are willing to guide others in changing and challenging situations.

Ways to determine:

-Leadership in a group: How does the child lead within the group, make decisions, and direct the group?

-Responsibility and initiative: How does the child take responsibility and actively participate in solving problems.

Identifying children's different talents plays an important role in supporting their personal and academic development. In other words, improved cooperation between teachers, parents and psychologists is necessary for children to identify and develop their individual talents. Early identification of their talents helps in finding suitable professions and areas of activity for them.

### **Discussion**

When guiding children towards a profession, taking into account their dominant hemisphere is one of the important factors in their professional development. To do this, when guiding children towards a profession, attention should be paid to the following distinguishing features observed in people with dominant right hemisphere, left hemisphere and mixed types:

1. Since left-brainers are characterized by rational-symbolic thinking, they are more prone to perform analytical, classification, abstract, algorithmic, and inductive operations. Since they prefer to work with problems in analysis and solve problems logically, they are more communicative and active people than others. When directing children to a profession, it is necessary to take into account that people whose left cerebral hemisphere is the basis can successfully master theoretical fields such as engineering, mathematics, logic and philosophy, and linguistics, and can actively adapt to them socially and professionally. Therefore, it is advisable for left-brained leaders to choose professions related to speech, logical

thinking, and analysis of processes and situations. They tend to look for concrete evidence in their work, draw conclusions based on this evidence, and put forward new ideas. It is worth noting that a person's education and upbringing depend on the left hemisphere.

2. Right-brain dominants prefer to review information and find solutions to complex problems intuitively. Since the right hemisphere allows them to perceive the world as a whole, they are characterized by figurative thinking. Since right-brainers are characterized by figurative-intuitive thinking, they are more likely to display vivid and diverse emotions, as well as visual-spatial modeling and design, and are active in inventing and identifying key ideas. The peculiarity of the thinking strategy of right-brain dominants is their ability to direct the information given to them in complex, contradictory and difficult-to-understand situations, i.e., in professions that require a creative approach and creative qualities. Therefore, right-brain dominants have a high chance of achieving success in professional activities in the field of art and music. In addition, as leaders and organizers, such individuals prefer to review the information they receive and follow established rules. In this way, they can demonstrate personal initiative through goal-oriented ideas.

3. People with mixed hemispheres use both left and right hemisphere strategies depending on the situation. The synchronous operation of both hemispheres allows for a significant increase in the efficiency of the human brain. Because in mixed hemispheres, data analysis is performed simultaneously using both the left and right hemispheres. It is worth noting that there are several advantages to analyzing data in a mixed type. For example, while the left-hemisphere approach is reflected in the accuracy of details and texts, the right-hemisphere approach plays an important role in social relationships.

At the same time, we believe that it is worth emphasizing that a person should try to actively work both hemispheres. Otherwise, the hemisphere that is less involved in work becomes "lazy" and, as a result, does not develop well. If the hemispheres are not developed in children, they may grow up to be difficult to educate or be at risk, and as a result, they may create various negative problems that are harmful to society.

A person, in some cases, unconsciously tries to overcome some of his qualities that prevent him from achieving professional success or to compensate for them with other qualities. However, the fact that professional activity does not correspond to the psychophysiological characteristics of a person undermines his psychosomatic health. For example, engaging in professional activity that requires sociability from a person who is not very talkative or agility from a person who is not very active can lead to nervous tension, which in turn can lead to a decrease in working capacity, and constant emotional stress can cause nervous disorders.

### **Conclusion**

In conclusion, it is important to take into account the functional asymmetry of the cerebral hemispheres when directing children to a profession. The wrong choice of profession by children can harm their psychosomatic health and make it difficult for them to integrate into the social environment. Therefore, when directing

students to a profession, it is necessary to comprehensively and deeply study their psyche and take into account their individual characteristics and neurological capabilities.

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## TUPROQ SHO‘RLANISHI MUAMMOSINING QISHLOQ XO‘JALIGIDA HOSILDORLIKNING KAMAYISHIGA TA’SIRI

**Annotatsiya:** Hozirgi kunda tuproqning sho‘rlanishi dolzarb muammoga aylanib bormoqda. Respublika hududining katta qismi sug‘oriladigan yerlar hisoblanib, noto‘g‘ri sug‘orish, drenaj tizimlarining yetarli darajada ishlamasligi, yer osti suvlarining sathining ko‘tarilishi natijasida sho‘r yerlar maydoni yil sayin kengayib bormoqda. Bu holat paxta, g‘alla va boshqa muhim qishloq xo‘jaligi ekinlari hosildorligiga salbiy ta‘sir ko‘rsatmoqda.

**Kalit so‘zlar:** sho‘rlanish, ikkilamchi sho‘rlanish, sho‘rxok, soloidlar, taqirlar, degradatsiya, meliorativ tadbirlar.

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## THE IMPACT OF SOIL SALINIZATION ON THE DECREASE IN AGRICULTURAL PRODUCTIVITY

**Annotation:** Currently, soil salinization is becoming an urgent problem. A large part of the republic’s territory consists of irrigated lands, and due to improper irrigation, insufficient functioning of drainage systems, and the rise of groundwater levels, the area of saline soils is increasing year by year. This situation negatively affects the productivity of cotton, wheat, and other important agricultural crops.

**Keywords:** salinization, secondary salinization, solonchaks, soloids, takyrs, degradation, meliorative measures.

Bugungi kunda tuproq sho‘rlanishi butun dunyo miqyosida, ayniqsa qurg‘oqchil va yarim qurg‘oqchil hududlarda dolzarb ekologik hamda agrar muammolardan biri hisoblanadi. Aholi sonining ortib borishi va oziq-ovqat mahsulotlariga bo‘lgan talabning kuchayishi sharoitida qishloq xo‘jaligi yerlaridan samarali foydalanish muhim ahamiyat kasb etadi. Biroq tuproqning sho‘rlanishi ekinlar hosildorligining pasayishiga, yer resurslarining degradatsiyasiga va iqtisodiy zararlarning ortishiga olib kelmoqda. Shu bilan

birga, shoʻrlanish tuproqning ekologik holatiga ham salbiy taʼsir koʻrsatadi: tuproqdagi biologik faollik kamayadi, mikroorganizmlar faoliyati sustlashadi va oʻsimliklar uchun zarur oziqa elementlarining oʻzlashtirilishi qiyinlashadi. Natijada tuproq unumdorligi pasayib, yerlarni qayta tiklash uchun katta mablagʻ va vaqt talab etiladi.

Tuproq shoʻrlanishi qishloq xoʻjaligi uchun jiddiy tahdid hisoblanadi. Ayniqsa sugʻoriladigan hududlarda notoʻgʻri sugʻorish amaliyoti, drenaj tizimlarining yetarli darajada ishlamasligi hamda yer osti suvlarining sathi koʻtarilishi natijasida shoʻrlangan yerlar maydoni ortib bormoqda. Bu esa ekinlar hosildorligining kamayishiga, yer resurslarining yaroqsiz holatga kelishiga va oziq-ovqat xavfsizligiga salbiy taʼsir koʻrsatmoqda. Shuning uchun tuproq shoʻrlanishining sabablari va oqibatlarini oʻrganish hamda uni kamaytirishga qaratilgan meliorativ tadbirlarni ishlab chiqish muhim ilmiy vazifa hisoblanadi.

Mazkur tadqiqotning asosiy maqsadi Jizzax viloyatida sugʻoriladigan yerlarning tuproq shoʻrlanish darajasini aniqlash, shoʻrlangan hududlarning maydon boʻyicha taqsimlanishini foizlarda baholash hamda shoʻrlanishning qishloq xoʻjaligi ekinlari hosildorligiga taʼsirini ilmiy asosda tahlil qilishdan iborat. Tadqiqotda ikkilamchi statistik maʼlumotlardan foydalanildi. Ushbu maʼlumotlar Oʻzbekiston Respublikasi Qishloq xoʻjaligi vazirligi va STAT agentligining rasmiy maʼlumotlar bazasidan 2019–2025-yillar oraligʻida olingan.

Tuproq shoʻrlanishi — tuproq tarkibida suvda eriydigan tuzlarning meʼyorida ortiq miqdorda toʻplanishi natijasida uning unumdorligi pasayishi jarayonidir. Bu jarayonda asosan natriy, xlor va sulfat tuzlari muhim rol oʻynaydi. Shoʻr yoki ishqoriy yerlar deganda yer osti suvlarining sathi koʻtarilishi, iqlimning qurgʻoqchil boʻlishi hamda bugʻlanish jarayonining kuchayishi natijasida tuproqning yuqori qatlamlarida tuzlarning toʻplanishi tushuniladi. Bunday sharoitda oʻsimliklar normal rivojlana olmaydi va hosildorlik keskin kamayadi.

Tuproq shoʻrlanishi kelib chiqishiga koʻra ikki turga boʻlinadi: birlamchi va ikkilamchi shoʻrlanish. Birlamchi shoʻrlanish tabiiy omillar taʼsirida yuzaga keladi va inson faoliyatiga bogʻliq emas. Ikkilamchi shoʻrlanish esa inson faoliyati, xususan notoʻgʻri sugʻorish, drenaj tizimlarining yetarli emasligi hamda yer osti suvlarining koʻtarilishi natijasida paydo boʻladi. Ayniqsa sugʻoriladigan hududlarda ikkilamchi shoʻrlanish keng tarqalgan boʻlib, qishloq xoʻjaligi samaradorligiga jiddiy zarar yetkazadi.

Shoʻrlangan tuproqlar bir necha guruhlariga boʻlinadi. Ularga shoʻrxok va shoʻrxoksimon tuproqlar, ishqoriy tuproqlar (shoʻrtob va shoʻrtobsimon tuproqlar) hamda soloidlar kiradi. Shoʻrxok tuproqlarda suvda eriydigan tuzlar tuproq profilining yuqori qatlamlarida toʻplanib, oʻsimliklar uchun zaharli muhit hosil qiladi. Agar tuproqning 0–30 sm qatlamida 0,6 foizdan ortiq soda yoki 1,0 foizdan ortiq xlorid hamda 2,0 foizdan ortiq sulfat birikmalari mavjud boʻlsa,

bunday tuproqlar sho'rxok hisoblanadi. Bunday sharoitda faqat galofit o'simliklar rivojlanishi mumkin.

Sho'rlanish jarayonining shakllanishida bir nechta omillar muhim rol o'ynaydi. Tuzlarning asosiy manbalaridan biri tog' jinslarining yemirilishi natijasida hosil bo'ladigan birlamchi minerallardir. Ushbu minerallar parchalanib xlorid, sulfat va boshqa tuzlarni hosil qiladi. Shuningdek, vulqon faoliyati, dengiz suvlari ta'siri va atmosfera yog'inlari ham tuproqni tuzlar bilan boyitishi mumkin. Yer osti suvlarining bug'lanishi natijasida ham tuproq qatlamida tuzlar to'planib boradi [1]. Tadqiqotlarga ko'ra, yer usti va yer osti suvlarida erigan tuzlar daryolar orqali okean va dengizlarga oqib boradi hamda global tuz aylanishida muhim rol o'ynaydi. Masalan, V.A. Kovda hisoblashlariga ko'ra, har yili okeanlarga 3 milliard tonnaga yaqin tuz oqib boradi [2].

Sho'rxok tuproqlarni o'rganishda ko'plab olimlar, jumladan K.D. Glinka, N.A. Dimo, V.A. Kovda, Ye.N. Ivanova, V.V. Yegorov, N.G. Minashina va boshqa tadqiqotchilar muhim ilmiy ishlar olib borganlar. O'zbekiston hududida sho'rlanish jarayonlarini o'rganish va ularni kamaytirish masalalari A.M. Rasulov, O.K. Komilov kabi olimlar tomonidan ham keng tadqiq qilingan.

O'zbekiston Respublikasida sug'oriladigan yerlar qishloq xo'jaligi ishlab chiqarishining asosiy manbai hisoblanadi. 2022-yil 1-yanvar holatiga ko'ra mamlakat hududining umumiy yer maydoni 44 892 400 gektarni tashkil etadi. Shundan 4 331 700 gektari sug'oriladigan yerlar hisoblanadi. Jizzax viloyatida esa 2025-yil holatiga ko'ra sug'oriladigan yerlarning umumiy maydoni 303 867 gektarni tashkil qiladi. Sharof Rashidov tumanida esa sug'oriladigan yerlar maydoni 34 676 gektarga teng.

Tuproqlar sho'rlanish darajasiga ko'ra to'rt toifaga bo'linadi: sho'rlanmagan, kam sho'rlangan, o'rta sho'rlangan va kuchli sho'rlangan tuproqlar. Sharof Rashidov tumanida 9 679 gektar maydon sho'rlanmagan bo'lib, bu umumiy maydonning 27,9 foizini tashkil etadi. Sho'rlangan yerlar esa 24 997 gektarni yoki 72,1 foizni tashkil etadi. Shundan 64,4 foizi kam sho'rlangan, 7,6 foizi o'rta sho'rlangan va 0,1 foizi kuchli sho'rlangan yerlar hisoblanadi. Bu ko'rsatkichlar hududda sho'rlanish muammosi jiddiy ekanligini ko'rsatadi.

Statistik ma'lumotlarga ko'ra, Jizzax viloyatida kuchli sho'rlangan hududlarning eng yuqori ko'rsatkichi Arnasoy tumanida 4,2 foizni tashkil etadi, Sharof Rashidov tumanida esa bu ko'rsatkich 0,1 foizga teng. Sho'rlanmagan hududlar ulushi eng yuqori bo'lgan tuman Baxmal tumani hisoblanadi, eng past ko'rsatkich esa Arnasoy tumanida kuzatiladi. Kam sho'rlangan yerlarning eng yuqori ulushi Mirzacho'l tumanida 70,8 foizni tashkil etadi [7].

Sho'rlangan tuproqlar odatda unumsiz tuproqlar deb ham ataladi, chunki ularda tuz miqdori yuqori, oziqa elementlari miqdori esa nisbatan kam bo'ladi. Bunday sharoitda qishloq xo'jaligi ekinlarining normal rivojlanishi qiyinlashadi va hosildorlik sezilarli darajada kamayadi. Shuning uchun sho'rlangan

hududlarda ekin tanlash va almashlab ekish tizimini to'g'ri tashkil etish muhim ahamiyatga ega.

Sho'rlanishni kamaytirishda biologik melioratsiya usullaridan foydalanish samarali hisoblanadi. Jumladan, beda, makkajo'xori, arpa va kungaboqar kabi o'simliklarni ekish tuproqning meliorativ holatini yaxshilashga yordam beradi [4]. Beda o'simligi chuqur ildiz tizimiga ega bo'lib, ildizlari 2–3 metr chuqurlikkacha kirib boradi. Bu jarayon yer osti sho'r suvlarining sathini pasaytiradi, tuproq strukturasini yaxshilaydi va azot bilan boyitadi. Natijada beda ekilgandan so'ng 2–3 yil davomida tuproq sho'rlanishi sezilarli darajada kamayadi.

Makkajo'xori ham sho'rga o'rtacha chidamli ekin hisoblanadi. U kuchsiz va o'rta sho'rlangan tuproqlarda yetishtirilganda tuproq holatini yomonlashtirmaydi, aksincha ildiz tizimi orqali tuproq qatlamini yumshatadi va organik qoldiqlar yordamida tuproq strukturasini yaxshilaydi. Biroq drenaj tizimi yetarli bo'lmagan yoki sug'orish me'yoridan ortiq bo'lgan sharoitlarda makkajo'xori yetishtirish sho'rlanish jarayonini tezlashtirishi mumkin [14].

Noto'g'ri sug'orish, drenaj tizimlarining zaifligi hamda yer osti suvlarining yuqori sathi ikkilamchi sho'rlanish jarayonini kuchaytiradi. Natijada ekinlar hosildorligi 30–50 foizgacha kamayishi mumkin. Bu esa qishloq xo'jaligi iqtisodiyotiga katta zarar yetkazadi hamda oziq-ovqat xavfsizligiga salbiy ta'sir ko'rsatadi. Shu sababli almashlab ekish tizimini to'g'ri tashkil etish, ilmiy asoslangan sug'orish me'yorlariga amal qilish va drenaj tizimlarini takomillashtirish muhim ahamiyatga ega.

Ilmiy tadqiqotlar shuni ko'rsatadiki, beda va makkajo'xori kabi ekinlarni almashlab ekish tuproqning meliorativ holatini barqarorlashtiradi. Ayniqsa beda bilan almashlab ekish yer osti sho'r suvlari sathini pasaytirib, keyingi ekinlar uchun qulay agroekologik sharoit yaratadi. Shu bilan birga, biologik melioratsiya usullari, ilmiy asoslangan sug'orish tizimlari va samarali drenaj tadbirlarini qo'llash orqali tuproq sho'rlanishini 20–40 foizgacha kamaytirish mumkin. Bu xulosalar O'zbekiston tuproqlari bo'yicha olib borilgan ilmiy tadqiqotlar natijalari bilan ham mos keladi.

Xulosa qilib aytganda, tuproq sho'rlanishi qishloq xo'jaligi ishlab chiqarishining barqaror rivojlanishiga jiddiy tahdid solayotgan muhim ekologik muammo hisoblanadi. Jizzax viloyatida ham sho'rlanish darajasi yuqori bo'lib, bu holat ekinlar hosildorligining kamayishiga olib kelmoqda. Shu sababli sug'orish va drenaj tizimlarini takomillashtirish, almashlab ekish tizimini joriy etish hamda biologik melioratsiya usullaridan foydalanish tuproq unumdorligini saqlash va qishloq xo'jaligi samaradorligini oshirishda muhim ahamiyatga ega. Bu choralar nafaqat hosildorlikni oshirish, balki kelajak avlodlar uchun unumdor yer resurslarini asrab qolishda ham muhim rol o'ynaydi.

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## INSON SALOMATLIGIGA EKOLOGIK OMILLAR TA'SIRINI BAHOLASH

**Annotatsiya:** Mazkur maqolada inson salomatligiga ekologik omillarning ta'siri tahlil qilinadi. Hozirgi vaqtda tabiiy muhitning ifloslanish muammosi, aholi va hududlarning ekologik havfsizlik masalalari dolzarb ahamiyat kasb etmoqda. Ekologik muammolar butun dunyo miqyosida eng dolzarb masalalardan biri hisoblanadi. Atrof-muhit ifloslanishi, tabiiy resurslarning kamayishi va iqlim o'zgarishi insoniyat hayotiga bevosita ta'sir ko'rsatmoqda.

**Kalit so'zlar:** Ekologiya, atrof-muhit, ekologik inqiroz, nozogeografik, ekologik muammolar, ekzogen omillar, aholi salomatligi, ekologik havfsizlik, nozoekologiya, ichimlik suvi, havo, tuproq, yuqumli kasalliklar.

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## EVALUATION OF THE IMPACT OF ECOLOGICAL FACTORS ON HUMAN HEALTH

**Abstract:** This article analyzes the impact of environmental factors on human health. Currently, the issues of environmental pollution and ecological safety of populations and territories have become highly relevant. Environmental problems are considered among the most pressing global challenges. Environmental pollution, depletion of natural resources, and climate change directly affect human life and health.

**Keywords:** Ecology, environment, ecological crisis, nosogeographic, environmental problems, exogenous factors, public health, environmental safety, nozoecology, drinking water, air, soil, infectious diseases.

**Kirish.** Hozirgi vaqtda tabiiy muhitning ifloslanish muammosi, aholi va hududlarning ekologik havfsizlik masalalari dolzarb ahamiyat kasb etmoqda. O'tgan asrning 70-yillarida ko'pgina mamlakatlarda iqtisodiyotning jadal rivojlanishi va aholi sonining tez o'sishi natijasida atrof-muhitga salbiy ta'sir keskinlashdi, jahon hamjamiyati ekologik muammolarning globallashuvi va planetar miqyosda ekologik tahdidning kuchayishiga duch keldi. Jahon sog'liqni



saqlash tashkilotining ma'lumotlariga ko'ra, barcha kasalliklarning 24 foizi, aholi o'limining 23 foizi bartaraf etish mumkin bo'lgan atrof-muhit ta'siri oqibatida sodir bo'lmoqda. Dunyo bo'yicha salbiy ekzogen omillar har yili o'rtacha 13 milliondan ortiq aholining hayotdan ko'z yumushiga va besh yoshdan kichik bo'lgan bolalarning har uchtdan bittasini kasallikka chalinishiga olib kelmoqda. Bugungi kunda ekologik muammolar butun dunyo miqyosida eng dolzarb masalalardan biri hisoblanadi. Atrof-muhit ifloslanishi, tabiiy resurslarning kamayishi va iqlim o'zgarishi insoniyat hayotiga bevosita ta'sir ko'rsatmoqda. So'nggi yillarda ijtimoiy-iqtisodiy sharoitning o'zgarib borishi aholi salomatligi sohasida yangi qonuniyatlarni keltirib chiqarmoqda. Olimlarning tadqiqotlari ko'rsatishicha, ekologik inqiroz munosabatlarining hozirgi yo'nalishi, eng avvalo, ekologik omillar bilan tavsiflanadi. Shu sababdan aholi yashash sharoitini maqbullashtirish va uni tabiiy muhitning salbiy ta'siridan himoyalashga qaratilgan ilmiy tadqiqotlar ko'paymoqda.

Keyingi o'n yillikda aholi salomatligining barqarorlashuvi va uning qator ko'rsatkichlarini yaxshilashga, atrof-muhit zo'riqlashining kamayishiga erishilgan bo'lsada, aholining to'liq ekologik xavfsizligini ta'minlash, xususan kasalliklar tarkibini, ularning hududiy xususiyatlarini o'rganish, aholi salomatligiga salbiy ta'sir etuvchi tabiiy va ijtimoiy geografik omillarni aniqlashga yo'naltirilgan ustivor vazifalarni belgilash masalalari kam tadqiq qilingan.

Inson salomatligiga ekologik omillar ta'sirini baholashning vazifalari:

- tibbiyot geografiyasi va uning bo'g'ini bo'lgan nozoeologiyaning ilmiy-nazariy asoslarini tadqiq qilish;
- obyektning tibbiy-geografik sharoitining hududiy tafovutlarini aholi salomatligi nuqtai nazaridan tahlil qilish va baholash;
- ekologik inqiroz sharoitida yangi, majmuali nozogeografik yondashuvning zarurligi va maqsadga muvofiqligini asoslash;
- aholi yashab turgan joylarda salbiy mintaqaviy omillar – atmosfera havosi, qishloq hududlarining tuproq, ichimlik suvi va ozuqa mahsulotlarining ifloslanishini tahlil qilish;
- mintaqada keng tarqalgan kasalliklarni mavzuli xaritalarda aks ettirish;
- mintaqaning barqaror rivojlantirish boshqaruv mexanizmini ishlab chiqish, aholi yashash muhitini maqbullashtirish maqsadida tashkiliy, ijtimoiy-iqtisodiy, huquqiy, tibbiy-ekologik, profilaktika tizimlarini o'zaro muvofiqlashtirish va boshqalar.

Noqulay ekologik sharoitda, tibbiy geografik masalalar majmuali tadqiq qilish, mintaqa nozogeografik vaziyatini sog'lomlashtirish bo'yicha aniq tavsiya va takliflar ishlab chiqish kerak. Aholi salomatligiga ta'sir etuvchi nozogeografik omillarni (ichimlik suvi, havo, tuproq va ozuqa mahsulotlari sifatining buzilishi) aniqlash va tahlil qilish;

aholi kasalliklari va atrof-muhit zararli omillarining o'zaro korrelyatsion aloqadorligi aniqlash;

mintaqaning demografik, ijtimoiy-iqtisodiy rivojlanishi va uning nozogeografik vaziyatiga ta'sirini o'rganib chiqish;

atrof-muhit va ijtimoiy-gigienik vaziyatni har tomonlama monitoringini amalga oshirish;

Misol uchun: Orol dengizining qurishi Quyi Amudaryo mintaqasi aholisining salomatligiga o'zining katta salbiy ta'sirini tekkizganligini ko'rishimiz mumkin. Agar Quyi Amudaryo mintaqasida cho'llashishning, tuproq degredatsiyasi, sho'rlanishining, suv havzalarining maydonlarining kamayishining oldini olmasak, bu yerlardan ko'tarilayotgan qumli-tuzli chang, kuchli sho'rlangan ichimlik suvi mahalliy aholi salomatligiga o'zining salbiy ta'sirini tekkizishda davom etadi.

Ochiq suv havzalarida suvning ifloslanishi. O'zbekiston gigienistlari va sotsiologlari aholi salomatligiga ta'sir etuvchi antropogen omillar orasida, "Suv omili" dominant deb hisoblashadi. Amudaryo deltasining ichimlik suvi ifloslandi, chunki uning tarkibi inson faoliyati to'g'ridan-to'g'ri va bilvosita ta'sir ostida o'zgardi va ko'pincha standartlarga javob bermaydi. Shu bilan birga ichimlik suvi organoleptik xususiyatlarini o'zgartiradi, inson salomatligi uchun zararli bo'lgan moddalar paydo bo'ldi.

Xulosa. Inson salomatligi uzviy jihatdan ekologik omillar bilan bog'liqdir. Tegishli davlat, ilmiy va jamoatchilik tashkilotlari tomonidan atrof-muhit holatini monitoring qilishni yo'lga qo'yish; ekologiya va aholi salomatligi muammolarini hal etish bo'yicha atrof-muhitni muhofaza qilish va sog'liqni saqlash tizimi o'rtasidagi integratsiyani takomillashtirish lozim. Ekologik tushunchalarni shakllantirishda Abu Ali ibn Sino asarlarining ahamiyati katta. Alloma tomonidan yaratilgan asarlarning 80 dan ortig'i tabiat va insonning unga bo'lgan munosabati masalasiga bag'ishlangan. Tashqi muhitning odamlar tanasiga ko'rsatadigan ta'siri, ular sog'ligini saqlash, parhez, shaxsiy gigiena to'g'risidagi fikrlar alloma tomonidan yaratilgan "Tib qonunlari" asarining bosh g'oyalari sanaladi. Allomaning inson tanasida kasalliklarni keltirib chiqaruvchi omillardan biri suv, yer va havoda mo'tadillikning buzilishi bilan bog'liqligi, yashash joylarining torligi, ozoda bo'lmasligi, yuqumli kasalliklarning tez tarqalishi uchun qulay sharoit yaratishi, yuqumli kasalliklarning aholi zich joylashgan joylarda havo va boshqa omillar orqali yuqishiga doir o'gitlari bugungi kunda ham muhim ijtimoiy-tibbiy ahamiyatga egadir. Mutaakkirning "Agar havoda chang va g'ubor bo'lmaganida edi, inson ming yil umr ko'rgan bo'lar edi" degan mashhur iborasi hali hamon aktualigicha qolmoqda.

Olimning fikricha, inson tabiatdan moddiy hayot manbalarini o'zlashtiribgina qolmay, balki ruhiy va jismoniy quvvat ham oladi. Shuningdek, u ayrim kasalliklarni davolashda tabiiy manbalar, xususan, qum, tuproq, suv va o'simliklardan foydalanish zarurligini uqtirib, zarur tavsiyalar beradi. Bugungi kunda ekologik inqirozning oldini olishda aholining, ayniqsa, o'sib kelayotgan yosh avlodning ekologik-huquqiy ta'lim-tarbiyasi, madaniyati va ma'naviyati hal qiluvchi omillardan biri sanaladi.

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## **ADVANTAGES OF USING TOPONYMIC DATA IN GEOGRAPHICAL EDUCATION**

**Annotation.** *This article highlights the importance of geographical names, i.e., toponyms, in geographical education. In geography education, toponyms and geographical terms are collected and studied. Their in-depth study makes it even easier to understand the environment and nature.*

**Keywords:** *toponym, geographical name, geographical term, oronym, hydronym, oikonym, geography education.*

Through geographical names, i.e., toponyms, it is possible to draw conclusions about past migrations of the population, contacts between different peoples, etc. Using such information in lessons increases interest in geography, facilitates the assimilation of knowledge, and contributes to better memorization of educational material. The geographical environment is a constant and necessary condition for the material part of society's life and influences its development.

The use of toponyms in increasing the effectiveness of geography education in schools and universities has great theoretical and practical significance. As is known, geography deals with maps. Toponyms are an integral part of the map. Every geographical object has its own name. Geography education cannot be implemented without a geographical name.

Place names are one of the most fundamental concepts of geography, and they cannot be studied separately. Therefore, it is necessary to teach geographical names in geography lessons at all levels of the country's continuous education system. Revealing the meaning of geographical names and why they are called this way leads to the fact that the content of the lesson will be retained in the students' memory for a long time, and attention to the subject will increase.

Of course, the most knowledge about geographical names is given in geography lessons in general education schools. Therefore, using local, regional materials in this area yields good results. In the study of the geographical environment, the following tasks are set for toponymy: Reconstruction of the past natural-geographical landscape, analysis of the semantic meaning, origin, and territorial distribution of the names of geographical objects.

The educational process shows that geographical names allow one to connect the studied geographical material with a specific place, to perceive it faster, to

memorize it, and to distinguish it from each other. Understanding the meaning of names facilitates the disclosure of geographical phenomena and features characteristic of a particular object, helps to study the modern and ancient features of the nature and economy of the place. Because the names reflect information about the terrain, flora and fauna, aquatic environment, and climate.

Geography and toponymy are closely related sciences. Toponymy should actively serve geography. Toponymic information is a part of geographical knowledge. The more consistently the theoretical and practical foundations of toponymy are studied, the deeper and more meaningful geographical knowledge becomes.

The study of toponyms has important educational and developmental significance. The educational process includes three main functions: teaching, upbringing, and development. Working with toponyms creates ample opportunities for their development in geography lessons and extracurricular activities. By familiarizing themselves with toponyms, students can imagine how colorful and interesting the science of toponymy is, how exciting it is to discover the origin of names familiar from childhood. The enthusiasm of a future geographer begins with amazing stories about how often toponyms originate.

For a person, the Homeland begins with the village, the city where they were born and raised, with streams and rivers that people call by so many wonderful names. The teacher's use of such names not only broadens children's worldview, deepens their knowledge, awakens their interest in language, but also fosters patriotic feelings and love for their homeland, which is especially important today.

When familiarizing yourself with the physical map of your area of residence, the geographical location of the area is considered during the lessons. Here, the teacher can also familiarize themselves with the basic concepts and terms (toponymy, toponym, oronym, hydronym, oikonym), reveal the role of geographical names in our lives, and the peculiarities of the formation of geographical names in the region. Here the teacher explains the division of all toponyms into the following types: - oikonyms - names of settlements; - hydronyms - names of water bodies; - oronyms - names of mountains and relief forms; - hodonyms - street names. The teacher introduces the students to the origin of the name of the republican or district center. To activate the cognitive activity of students, it is recommended to present a legend about the origin and etymology of the name of the city.

Unfortunately, school geography textbooks contain only specific information about the toponym. Therefore, the teacher should pay attention to the origin of the names of geographical objects. The study of local toponyms serves to deepen students' understanding of their meaning, to educate them in a sense of love for their native land. The teacher should familiarize themselves with local geographical names in advance, and in geography lessons, encourage students to complete this task. Students listen with great interest to explanations about the origin of geographical names, especially those related to folk tales, legends, and beliefs.

Therefore, before starting to study the toponymy of their region, the teacher should familiarize themselves with the toponymic dictionaries of our country, write down and distribute the toponyms of their region from them:

1) by types (oikonyms - Nukus, Chimbay; hydronyms - Amu Darya, Aral Sea; oronyms - Karatau, Beltau);

2) by origin (related to historical events, water bodies, relief, flora and fauna, peoples and tribes, religious, everyday life, buildings, etc.).

They are recommended to prepare a table: (Table 1).

1) distribution of toponyms of one's region by type;

2) distribution of toponyms of one's region by origin.

**Table 1**

| <b>Toponyms information</b> |                |                        |                              |
|-----------------------------|----------------|------------------------|------------------------------|
| <b>№</b>                    | <b>Toponym</b> | <b>Type of toponym</b> | <b>Origin of the toponym</b> |
| 1.                          |                |                        |                              |
| 2.                          |                |                        |                              |
| 3.                          |                |                        |                              |

During lessons, it is necessary to pay attention to the correct pronunciation, stress, and spelling of geographical names. Such work, firstly, increases the language culture and literacy of students, and secondly, serves to increase the effectiveness of the educational process. The teacher must pronounce the name that students hear for the first time slowly, clearly, and correctly. When pronouncing a new name, it is recommended to give appropriate explanations: is this a city, a mountain, a lake, or a river. It is recommended to present names that are difficult to pronounce in a way that covers all types of memory in students: auditory, visual, motor substances. Therefore, they should name the toponym, write it on the board, and have students write it in their notebooks.

The study of geographical names requires a thorough knowledge of etymology. Scientific etymology requires various research data, comparison with words in other languages, and explanation of complex phonetic and morphological changes.

Geographical knowledge and skills allow one to consciously understand the natural, socio-economic, and geo-ecologic phenomena of one's country and the world as a whole. The second important aspect in studying the role of natural-geographical conditions is that their influence must be taken into account at each historical stage. In the context of historical geography, toponymy is intended to consider the process of formation of the population of a certain territory, its ethnic composition, location, population movement, etc.

In this regard, regional studies are of great importance. In the future, the algorithm for introducing toponymic materials into the methodology of teaching geographical sciences in higher educational institutions requires a clear



definition. Along with the inclusion of toponymy in the theoretical course, it is necessary to organize circles for students on similar topics.

In general, the use of toponyms in geographical education, especially historical and ethnographic expeditions to study the toponymy of one's territory, are part of effective educational activities: research of historical monuments, collection of ancient monuments, legends, folk traditions, customs, etc. As a result of studying the basics of toponymy, the student should have the following: applying the knowledge gained in the process of educational and methodological activity; compiling toponymic descriptions of certain territories; applying the acquired knowledge in scientific research. Through this, students further glorify their homeland and approach every geographical object or thing with love.

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## **NATIONAL AND CULTURAL COMPONENTS OF KINSHIP LEXICON IN ENGLISH AND UZBEK LANGUAGES**

**Abstract:** *Kinship terms represent one of the most culturally loaded layers of any language, reflecting social structure, family organization, values, and national worldview. This article explores the national and cultural components of kinship lexicon in English and Uzbek languages from a comparative linguistic and cultural perspective. The study examines how historical development, social relations, family hierarchy, and cultural traditions shape kinship terminology in both languages. Special attention is paid to semantic differentiation, lexical richness, gender and age distinctions, and pragmatic usage of kinship terms. The analysis reveals that Uzbek kinship lexicon is more detailed and culturally marked than English, reflecting collectivist family values, while English kinship terms demonstrate semantic generalization influenced by individualistic culture. The article highlights the importance of kinship lexicon in understanding national mentality and intercultural communication.*

**Keywords:** *kinship lexicon, national-cultural component, English language, Uzbek language, linguistic worldview, culture, semantics.*

### **Introduction**

Language and culture are inseparably interconnected, and this connection is particularly evident in kinship terminology. Kinship lexicon serves not only as a means of naming family relations but also as a reflection of a nation's social structure, cultural traditions, and worldview. Each language encodes kinship relations in a unique way, shaped by historical development, social norms, and cultural values.

In linguistics, kinship terms are considered part of culturally marked vocabulary because they reveal national identity and collective experience. The comparison of English and Uzbek kinship lexicons provides valuable insights into differences between Western and Eastern cultural models, individualistic and collectivist family structures, and social hierarchies.

The aim of this article is to analyze the national and cultural components of kinship lexicon in English and Uzbek languages, identifying similarities and differences in semantic structure, usage, and cultural significance. The objectives of the study are:

- to define the concept of kinship lexicon and its cultural relevance;
- to analyze English kinship terms and their cultural characteristics;
- to examine Uzbek kinship terminology and its national specificity;
- to compare both systems and identify key cultural distinctions.

## **Theoretical Framework and Concept of Kinship Lexicon**

Kinship lexicon refers to a system of lexical units used to denote family relationships by blood, marriage, or social affiliation. Linguists emphasize that kinship terms form a structured semantic field with hierarchical relations, oppositions, and cultural meanings.

According to anthropological linguistics, kinship terminology reflects:

- family structure (nuclear vs. extended family);
- social organization and hierarchy;
- gender and age roles;
- cultural attitudes toward relatives.

Edward Sapir and Benjamin Lee Whorf highlighted that language influences perception of social reality. Kinship terms, therefore, shape how speakers perceive family relations. The Uzbek and English languages demonstrate different approaches to categorizing kinship, influenced by distinct cultural and social environments.

### **General Characteristics**

English kinship terminology is relatively limited and generalized. It reflects a nuclear family model typical of Western societies, where emphasis is placed on immediate family members rather than extended relatives.

Common English kinship terms include:

- **father, mother**
- **son, daughter**
- **brother, sister**
- **uncle, aunt**
- **cousin**
- **grandfather, grandmother**

Many of these terms are semantically broad. For example, *cousin* refers to both male and female cousins, regardless of maternal or paternal lineage. Similarly, *uncle* and *aunt* do not specify whether the relative is from the mother's or father's side.

### **Cultural Implications**

The generalization of kinship terms in English reflects:

- individualism;
- reduced emphasis on extended family ties;
- social equality rather than hierarchy.

English-speaking cultures typically prioritize independence and personal boundaries. As a result, kinship terms are often replaced by personal names in everyday communication.

### **Pragmatic Usage**

In modern English, kinship terms may also be used metaphorically or socially:

- *brother* or *sister* to express solidarity;
- *uncle* or *aunt* as informal address for older people (less common than in Uzbek).

However, such usage is limited compared to Uzbek.

### **Richness and Semantic Differentiation**

Uzbek kinship terminology is highly developed and semantically detailed. It reflects a strong extended family system and deep respect for family hierarchy.

Examples include:

- **ota** (father), **ona** (mother)
- **aka** (older brother), **uka** (younger brother)
- **opa** (older sister), **singil** (younger sister)
- **amaki** (father's brother)
- **tog'a** (mother's brother)
- **xola** (mother's sister)
- **amma** (father's sister)
- **jiyan**, **nevara**, **nabira**

Unlike English, Uzbek kinship terms specify:

- age (older vs. younger);
- gender;
- maternal or paternal lineage.

### **Cultural and Social Significance**

Uzbek kinship lexicon reflects collectivist values and strong family bonds. Family is considered the core of society, and kinship relations extend beyond blood ties to social and moral obligations.

The use of specific kinship terms demonstrates:

- respect for elders;
- recognition of family hierarchy;
- social responsibility.

For example, addressing someone as **aka** or **opa** expresses respect and politeness, even if the person is not a biological sibling.

### **Conclusion**

The comparative analysis of English and Uzbek kinship lexicons reveals significant differences rooted in national culture, social structure, and worldview. Uzbek kinship terminology is rich, detailed, and culturally marked, reflecting collectivist values and strong family ties. English kinship lexicon, in contrast, is more generalized, reflecting individualism and a nuclear family model.

Understanding the national and cultural components of kinship lexicon is essential for linguistics, translation studies, and intercultural communication. Kinship terms not only name family relations but also encode cultural values, social norms, and national identity.

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## STRUCTURE AND CHEMICAL COMPOSITION OF MICRO- AND NANO-INCLUSIONS OF NI IN SILICON

**Abstract** *This paper presents a study of the morphology, structure, and chemical composition of nickel (Ni) micro- and nano-inclusions formed in silicon after diffusion annealing under different cooling rates. The investigation was carried out using electron probe microanalysis (EPMA) on a Superprobe JXA-8800R system. The results demonstrate that the size, density, and geometric shape of Ni-related inclusions strongly depend on the cooling rate after diffusion annealing. Rapid cooling ( $v_c = 600$  °C/s) leads to the formation of small, thermodynamically non-equilibrium inclusions with needle-like, disk-like, plate-like, and lens-shaped morphologies. Slow cooling ( $v_c < 1$  °C/s) promotes the growth of larger, predominantly spherical and multilayer inclusions. The structural differences between n-type and p-type Si<Ni> samples are analyzed. It is shown that inclusion morphology evolves from anisotropic forms at small sizes to spherical shapes as the size increases. The findings provide insight into the precipitation mechanisms of nickel silicides in silicon and their dependence on thermal treatment conditions.*

**Keywords:** *silicon, nickel, microinclusions, nanoinclusions, diffusion annealing, cooling rate, nickel silicides, precipitation, EPMA.*

### Introduction

Nickel is one of the most technologically significant metal impurities in silicon. Due to its high diffusivity and strong interaction with intrinsic defects, Ni can form various structural defects and precipitates in silicon during high-temperature treatments. These precipitates significantly influence the electrical and structural properties of silicon, affecting carrier lifetime, recombination processes, and mechanical stability.

Understanding the formation mechanisms, morphology, and structure of nickel-related micro- and nano-inclusions is essential for both fundamental semiconductor physics and applied silicon technology. The precipitation process is highly sensitive to thermal conditions, especially the cooling rate after diffusion annealing.



This study investigates the structure and chemical composition of Ni microinclusions formed in n-type and p-type silicon under different cooling regimes.

### **Experimental method**

The morphology and chemical composition of nickel-related microinclusions were studied using electron probe microanalysis (EPMA) with a Superprobe JXA-8800R system.

Silicon samples doped with nickel (Si<Ni>) were subjected to diffusion annealing followed by controlled cooling under two regimes:

Rapid cooling:  $v_c = 600$  °C/s to Slow cooling:  $v_c < 1$  °C/s

Both n-type (n-Si<Ni>) and p-type (p-Si<Ni>) samples were analyzed.

Microstructural observations were performed to determine:

Inclusion size, Geometric shape, Density distribution and Layered structure

Chemical composition (nickel silicides)

### **Results and discussion**

#### **Microinclusions in n-Si<Ni> with Rapid Cooling ( $v_c = 600$ °C/s)**

In n-type silicon rapidly cooled after diffusion annealing, microinclusions with sizes up to  $\sim 10^{-6}$  m were observed.

The inclusions exhibited the following morphologies:

Needle-like, Disk-like and Lens-shaped

Electron probe analysis showed that these inclusions consist of one or several layers of nickel silicides. Their average density was approximately:  $\sim 2 \times 10^3$  cm<sup>-3</sup>

The relatively small size and anisotropic shapes indicate that rapid cooling suppresses diffusion-driven coarsening and stabilizes thermodynamically non-equilibrium structures

#### **Microinclusions in n-Si<Ni> with Slow Cooling ( $v_c < 1$ °C/s)**

In slowly cooled n-Si<Ni> samples, significantly larger microinclusions were formed, with sizes reaching up to  $\sim 10^{-5}$  m.

Their characteristics include: Lens-shaped forms, Spherical shapes and Polyhedral shapes close to spherical, These inclusions exhibit a multilayer structure, indicating sequential precipitation of different nickel silicide phases.

The average density was:  $\sim 5 \times 10^2$  cm<sup>-3</sup>

The lower density but larger size suggests coalescence and growth processes during prolonged cooling.

#### **Microinclusions in p-Si<Ni> with Rapid Cooling**

In p-type silicon rapidly cooled at 600 °C/s, microinclusions of various shapes were observed: Needle-like, Disk-like, Lens-shaped and Spherical

Their sizes reached up to:  $3 \times 10^{-7}$  m to The density was approximately:  $\sim 10^3$  cm<sup>-3</sup>

Unlike n-type samples, these inclusions were predominantly monolayer structures composed of a single nickel silicide phase.

#### **Microinclusions in p-Si<Ni> with Slow Cooling**

In p-Si<Ni> samples cooled at  $v_c < 1$  °C/s, inclusions of multiple shapes formed, with larger ones being predominantly spherical.

Maximum size:  $3 \times 10^{-6}$  m and Density:  $\sim 10^2 \text{ cm}^{-3}$ . Most inclusions exhibited multilayer structures.

### **Influence of Cooling Rate on Inclusion Morphology**

The experimental results clearly demonstrate that the geometry and size distribution of Ni microinclusions are strongly dependent on the cooling rate after diffusion annealing.

Higher cooling rate  $\rightarrow$  smaller inclusions, Higher cooling rate  $\rightarrow$  anisotropic, non-equilibrium shapes, Lower cooling rate  $\rightarrow$  larger, spherical inclusions and Lower cooling rate  $\rightarrow$  multilayer structure levels

Small inclusions tend to have needle-like, disk-like, plate-like, and lens-shaped morphologies. As their size increases, the shape becomes predominantly spherical due to surface energy minimization.

Rapid cooling increases the probability of forming thermodynamically non-equilibrium inclusions with irregular geometry. Slow cooling allows sufficient time for diffusion-driven growth and structural ordering.

### **Mechanism of Nickel Silicide Formation**

Nickel has high diffusivity in silicon, which enables rapid migration during annealing. Upon cooling: Supersaturation of Ni occurs, Nucleation of nickel silicide phases begins, Growth depends on diffusion kinetics and Coalescence may occur at low cooling rates condition

The multilayer structure suggests phase transitions or sequential precipitation of different silicide phases during temperature decrease.

### **Conclusion**

Based on the experimental investigations of Ni micro- and nano-inclusions in silicon, the following conclusions can be drawn:

1. The size, density, and morphology of nickel-related inclusions strongly depend on the cooling rate after diffusion annealing.
2. Rapid cooling ( $600 \text{ }^\circ\text{C/s}$ ) leads to the formation of small ( $\sim 10^{-6}$ – $10^{-7}$  m), anisotropic, thermodynamically non-equilibrium inclusions with needle-like, disk-like, and lens-shaped morphologies.
3. Slow cooling ( $<1 \text{ }^\circ\text{C/s}$ ) promotes the formation of larger ( $\sim 10^{-5}$ – $10^{-6}$  m), predominantly spherical inclusions with multilayer structure.
4. Inclusion density decreases as cooling rate decreases, while average size increases.
5. The morphology evolution from anisotropic to spherical shapes is governed by diffusion processes and surface energy minimization.
6. Differences between n-Si<Ni> and p-Si<Ni> samples indicate that conductivity type influences precipitation behavior and structural characteristics of nickel silicides.

The obtained results contribute to understanding precipitation mechanisms of transition metal impurities in silicon and can be used for optimization of thermal processing in semiconductor technology.

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## **THE SIGNIFICANCE OF WATERCOLOR TECHNIQUES IN THE INTEGRATION OF ENGINEERING GRAPHICS AND FINE ARTS**

**Abstract:** *This scientific article examines the use of watercolor techniques in the integration of engineering graphics and fine arts. The role of watercolor techniques in developing the perception of form, color, volume, and spatial thinking is analyzed. The scientific basis for improving the effectiveness of the educational process through watercolor techniques is substantiated.*

**Keywords:** *engineering graphics, fine arts, integration, watercolor techniques, color, form, spatial thinking.*

**Introduction:** In the modern education system, interdisciplinary integration is recognized as one of the essential pedagogical directions. An interdisciplinary approach facilitates students' comprehensive acquisition of knowledge and harmonizes theoretical and practical competencies. In particular, the integrated teaching of engineering graphics and fine arts enables students to develop not only technical thinking but also artistic-aesthetic taste, creative approach, and spatial imagination. These disciplines are interrelated, providing a foundation for a deeper understanding of graphic expression, form, volume, and compositional principles.

While engineering graphics primarily emphasizes accuracy, logical reasoning, and technical requirements, fine arts is distinguished by creative freedom, color, and aesthetic expression. The integration of these two fields fosters students' ability to execute drawings correctly and simultaneously enriches their artistic competence. As a result, graphic representations become clearer, more expressive, and visually more comprehensive.

Within this integrative framework, watercolor techniques serve as an important didactic and artistic tool. The transparency of watercolor paints, the natural harmony of colors, and the smooth transitions of tones significantly enhance the expressiveness of graphic representations. This technique allows for the effective depiction of form and volume through color, clarifies light and shadow relationships, and provides a sense of spatial depth.

Furthermore, the use of watercolor techniques enhances students' observational skills, aesthetic perception, and creative activity. In graphic works executed with watercolor, the harmony between color and line contributes to a more precise and visually coherent representation of engineering graphics elements. Consequently, the effectiveness of the educational process increases, and students' professional readiness and creative potential develop consistently.

**Aim:** The primary aim of this study is to scientifically and theoretically substantiate the role and significance of watercolor techniques in the integration of engineering graphics and fine arts. Additionally, the study seeks to determine the effectiveness of using watercolor techniques in the educational process to ensure the harmonious development of students' technical and artistic thinking, as well as to form knowledge and skills related to form, color, volume, and spatial perception. The research also pays particular attention to revealing the didactic potential of watercolor techniques in engineering graphics classes and evaluating their impact on the quality and outcomes of the educational process.

**Objectives:** Based on the aim of the study, the following objectives were established:

- To examine and analyze the theoretical and pedagogical foundations of the integration of engineering graphics and fine arts;
- To identify the artistic, didactic, and methodological potential of watercolor techniques;
- To analyze the educational effectiveness of using watercolor techniques in engineering graphics classes;
- To determine ways to develop students' skills and knowledge related to form, color, volume, and spatial thinking through watercolor techniques;
- To develop scientific and practical recommendations for the use of watercolor techniques in an integrated educational process;
- To evaluate the impact of watercolor techniques on the quality and outcomes of the educational process.

**Literature Review and Methodology:** The methodological foundation of this study is based on the principles of interdisciplinary integration. An interdisciplinary approach allows for identifying the interrelationships between engineering graphics and fine arts, as well as analyzing their commonalities and differences. A systematic approach was applied in the research, considering the educational process as an integrated pedagogical system, with its components examined in mutual interconnection.

During the study, pedagogical observation, comparative analysis, literature review, and generalization methods were employed. Pedagogical observation was used to practically analyze the process of applying watercolor techniques in engineering graphics classes. Comparative analysis allowed for evaluating and contrasting the outcomes of traditional graphic classes with those of integrated classes using watercolor techniques.

The theoretical framework of the study was supported by local and international scholarly works on engineering graphics, color painting, watercolor techniques, and art education methodology. The analysis of the literature revealed the intrinsic connection between the concepts of color, form, and volume in engineering graphics and substantiated their role in the expression of graphic representations. Special attention was paid to the didactic potential of watercolor techniques in terms of color transitions, light and shadow relationships, and the creation of spatial depth.

Moreover, the methodological analysis scientifically substantiated the effectiveness of using watercolor techniques in education, highlighting their influence on students' creative activity and the development of spatial thinking. Based on the findings, methodological directions for applying watercolor techniques in the integration of engineering graphics and fine arts were determined, and practical recommendations for their implementation in educational practice were formulated.

**Discussion and Results:** The results of the study demonstrated that the use of watercolor techniques in engineering graphics classes is a significant factor in enhancing educational effectiveness. Specifically, integrated lessons organized based on watercolor techniques substantially improved students' ability to perceive form and volume. During the process of expressing volume and spatial relationships through color, students developed a deeper understanding of graphic representations and acquired skills to depict them accurately and visually coherently.

The study also revealed that in graphic works executed with color, the harmony between line and color contributes to reinforcing spatial perception. The transparency of watercolor paints and the smoothness of color transitions enabled students to better understand light and shadow relationships, thereby enhancing the expressiveness of graphic representations. This, in turn, supported the accuracy and visual clarity essential in engineering graphics.

Throughout the integrated lessons, students had the opportunity to directly connect theoretical knowledge with practical activities. As a result, their independent thinking, creative approach, and aesthetic judgment developed consistently. The use of watercolor techniques proved to be an effective didactic tool for forming professional competencies and positively influenced students' preparation for future professional activities.

Moreover, the findings indicated that lessons conducted through the integration of engineering graphics and fine arts increased students' interest in the subjects and enhanced their engagement in the learning process. This further confirms the methodological significance of watercolor techniques in educational practice.

**Conclusion:** In conclusion, the use of watercolor techniques in the integration of engineering graphics and fine arts enhances the effectiveness of the educational process. The application of watercolor methods promotes the harmonious development of students' technical and artistic thinking, contributing to the improvement of their creative and professional potential.

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## UCH O‘LCHAMLI NILPOTENT ALGEBRANING DIFFERENSIALLASHI LOKAL VA IKKI LOKAL DIFFERENSIALLASHI

**Izoh:** Differensiallashtirish matematikaning fundamental tushunchalaridan biri hisoblanadi. Differensiallashtirishlar algebra fanida ham muhim o‘rin tutadi. Differensiallashtirishlarning turli umumlashmalari mavjud. Bular sarasiga antidifferensiallashtirishlar,  $\delta$ -differensiallashtirishlar, ternar differensiallashtirishlar va  $(\alpha, \beta, \gamma)$ -differensiallashtirishlar kiradi. Ushbu ishda uch o‘lchamli nilpotent algebralarning differensiallashtirishi lokal va ikki lokal differensiallashtirishi isboti bilan ko‘rsatilgan.

**Kalit so‘zlar:** Differensiallashtirish, Algebra, lokal differensiallashtirish va ikki lokal differensiallashtirish, chiziqli akslatirish.

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## DIFFERENTIATION OF THREE-DIMENSIONAL NILPOTENT ALGEBRA, LOCAL AND TWO LOCAL DIFFERENTIATION

**Abstract.** Differentiation is one of the fundamental concepts of mathematics. Differentiations also play an important role in algebra. There are various generalizations of differentiations. These include antidifferentiations,  $\delta$ -differentiations, ternary differentiations, and  $(\alpha, \beta, \gamma)$ -differentiations. In this paper, the differentiation of three-dimensional nilpotent algebras is shown by proving local and bilocal differentiation.

**Key words:** Differentiation, Algebra, local differentiation and two-local differentiation, linear mapping.

### **I. Kirish**

#### **1-§. Masalaning qo‘yilishi**

Hozirgi kunda jahonda differensiyalashlar nazariyasi bilan bir qatorda, operator algebralarda lokal va 2-lokal differensiyalashlar nazariyasi ham muhim

hisoblanadi. So'ngi 20 yil davomida fon Neyman algebralari  $C^*$ -algebralari va  $JB^*$ -uchliklarda lokal va 2-lokal differentsiallashlar nazariyasini o'rganish bo'yicha samarali natijalarga erishildi. Lokal differentsiallashlarni o'rganish 1990-yilda R.B.Kadison va D.R.Larson hamda A.S.Sururlar tomonidan boshlangan.

Ixtiyoriy uch o'lchamli nilpotent algebra bazislari  $\{e_1, e_2, e_3\}$  bo'lgan quyidagi o'zaro izomorf bo'lmagan algebralarning biriga izomorf bo'ladi:

$$\begin{aligned} N_1: e_1^2 &= e_2, e_2^2 = e_3 & N_2: e_1^2 &= e_2, e_2 e_1 = e_3, e_2^2 = e_3 \\ N_3: e_1^2 &= e_2, e_2 e_1 = e_3 & N_4(\alpha): e_1^2 &= e_2, e_1 e_2 = e_3, e_2 e_1 = \\ & & & \alpha e_3 \\ N_5: e_1^2 &= e_2 & N_6: e_1^2 &= e_3, e_2^2 = e_3 \\ N_7: e_1 e_2 &= e_3, e_2 e_1 = -e_3 & N_8(\alpha): e_1^2 &= \alpha e_3, e_2 e_1 = e_3, e_2^2 = \\ & & & e_3 \end{aligned}$$

## II.adabiyotlar tahlili

Differentsiallashning ko'plab umumlashmalari mavjud. Eng asosiy umumlashmasi bu lokal va 2-lokal umumlashmalari hisoblanadi. So'ngi yillarda ko'plab olimlar lokal va 2-lokal differentsiallashlarga oid ko'plab maqolalar chop etishdi[1- 3]

Quyida biz to'rt o'lchamli nilpotent algebralarning lokal va ikki lokal differentsiallashini keltiramiz.

**1-Ta'rif.** Agar  $d: L \rightarrow L$  chiziqli akslantirish  $F$  maydonda berilgan  $L$  algebradan olingan ixtiyoriy  $x, y$  elementlar uchun quyidagi shartni qanoatlantirsa

$$d(xy) = d(x)y + x d(y)$$

$U$  holda, akslantirish  $L$  algebrada differentsiallash deb ataladi.

$d(x) = Ax$  chiziqli akslantirishni qaraylik, buyerda  $A - n \times n$  o'lchamli kvadrat matritsa. Ravshanki, agar  $L$  algebradan olingan ixtiyoriy  $x, y$  elementlar uchun

$$A(xy) = (Ax)y + x(Ay) \quad (1)$$

tenglik bajarilsa  $d(x) = Ax$  akslantirish qaralayotgan  $L$  algebrada differentsiallashdan iborat bo'ladi.

Endi esa lokal differentsiallash tushunchasini keltiramiz.

**2-Ta'rif.**  $L$  algebra bo'lib undagi har bir  $x \in L$  element uchun  $\Delta(x) = D_x(x)$  shartni qanoatlantiruvchi  $D_x: L \rightarrow L$  differentsiallash mavjud bo'lsa, u holda  $\Delta: L \rightarrow L$  chiziqli akslantirish lokal differentsiallash deb ataladi.

**1.1-Ta'rif.**  $L$  algebra bo'lib undagi har bir  $x \in L$  element uchun  $\Delta(x) = D_x(x)$  shartni qanoatlantiruvchi  $D_x: L \rightarrow L$  differentsiallash mavjud bo'lsa, u holda  $\Delta: L \rightarrow L$  chiziqli akslantirish lokal differentsiallash deb ataladi.

$N_1$  algebraning differentsiallashini biz yuqorida 2.2-§ ishda ko'rib o'tganmiz

$$A = \begin{pmatrix} a_{1,1} & 0 & 0 \\ 0 & 2a_{1,1} & 0 \\ a_{3,1} & 0 & 4a_{1,1} \end{pmatrix}$$

bu yerda quyidagi belgilashni kiritamiz

$a_{1,1} = \alpha, a_{3,1} = \beta$  u holda  $A$  matritsa bunday ko'rinishga o'tadi.

$$A = \begin{pmatrix} \alpha & 0 & 0 \\ 0 & 2\alpha & 0 \\ \beta & 0 & 4\alpha \end{pmatrix}$$

Quyidagi teoremda  $N_1$  algebra uchun  $\Delta: N_1 \rightarrow N_1$  akslantirishni qaraylik.

**3.1.1-Teorema.**  $N_1$  algebraning har qanday chiziqli lokal differensiallashi differensiallashdan iborat.

Isbot.  $\Delta$  ixtiyoriy lokal differensiallashi bo'lsin. Barcha  $x \in N_1$  uchun ta'rif bo'yicha  $\Delta(x) = D_x(x)$  differensiallashi mavjud.

1- teoreмага ko'ra,  $D_x$  differensiallashi quyidagi matritsa ko'rinishiga ega:

$$A_x = \begin{pmatrix} \alpha_x & 0 & 0 \\ 0 & 2\alpha_x & 0 \\ \beta_x & 0 & 4\alpha_x \end{pmatrix}.$$

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Xususan  $\Delta(e_1) = D_{e_1}e_1, \Delta(e_2) = D_{e_2}e_2, \Delta(e_3) = D_{e_3}e_3$

tengliklarni qanoatlantiruvchi  $D_{e_1}, D_{e_2}, D_{e_3}$  matritsalar mavjud.  $A$  matritsani quyidagicha quraylik:

$$A = \begin{pmatrix} \alpha_{e_1} & 0 & 0 \\ 0 & 2\alpha_{e_2} & 0 \\ \beta_{e_1} & 0 & 4\alpha_{e_3} \end{pmatrix}.$$

$\Delta$  chiziqli bo'lgani uchun

$$\Delta(x+y) = \Delta(x) + \Delta(y), \quad \forall x, y \in N_1 \quad (1)$$

tenglik o'rinni.

Bu tenglikka ko'ra

$$\Delta(e_1 + e_2) = \alpha_{e_1+e_2}e_1 + \beta_{e_1+e_2}e_3 + 2\alpha_{e_1+e_2}e_2$$

$$\Delta(e_1) + \Delta(e_2) = \alpha_{e_1}e_1 + \beta_{e_1}e_3 + 2\alpha_{e_2}e_2$$

tengliklarga ega bo'lamiz. Bunda bazis elementlarining koeffitsientlarini taqqoslab, biz quyidagilarga erishamiz:

$$\alpha_{e_1+e_2} = \alpha_{e_1}, \beta_{e_1+e_2} = \beta_{e_1}, \alpha_{e_1+e_2} = \alpha_{e_2}.$$

Bundan esa  $\alpha_{e_1} = \alpha_{e_2}$ .

(1) tenglikdan foydalanib,

$$\Delta(e_2 + e_3) = 2\alpha_{e_2+e_3}e_2 + 4\alpha_{e_2+e_3}e_3,$$

$$\Delta(e_2) + \Delta(e_3) = 2\alpha_{e_2}e_2 + 4\alpha_{e_3}e_3.$$

Yana bazis elementlarining koeffitsientlarini taqqoslab, biz quyidagilarga erishamiz:

$$\alpha_{e_2+e_3} = \alpha_{e_2}, \quad \alpha_{e_2+e_3} = \alpha_{e_3}.$$

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Bundan esa  $\alpha_{e_2} = \alpha_{e_3}$  bo'ladi.

Shunday qilib, biz  $\Delta$  lokal differensiallash quyidagi shaklga ega ekanligini bilib olamiz:

$$\Delta = \begin{pmatrix} \alpha_{e_1} & 0 & 0 \\ 0 & 2\alpha_{e_1} & 0 \\ \beta_{e_1} & 0 & 4\alpha_{e_1} \end{pmatrix}$$

Teorema isbotlandi.

$$\alpha_{e_1+e_2} = \alpha_{e_1},$$

Bundan esa  $\alpha_{e_1+e_2} = \alpha_{e_1}$ .

Shunday qilib, biz  $\Delta$  lokal differensiallash quyidagi shaklga ega ekanligini bilib olamiz:

$$\Delta = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ \alpha_{e_1} & 0 & 0 \end{pmatrix}$$

Teorema isbotlandi.

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## MASALANI TENGLAMA YORDAMIDA YECHISH

**Annotatsiya:** Mazkur maqolada masalalarni tenglama yordamida yechishni o‘qitishda uchraydigan muammalar ularning sabablari orqali bartaraf etish yo‘llari yoritilgan. Maqolamizda o‘quvchilarning mustaqil fikrlash, tahlil qilish, xulosa chiqarish va amaliy ko‘nikmalarini rivojlantirish imkoniyatlari yoritilgan. Shuningdek, 1-11-sinflar uchun yagona integratsion yondashuv taklif etilgan.

**Kalit so‘zlar:** Tenglama usuli, noma‘lum kattalik, matematik model, mantiqiy fikrlash, masala tahlili, o‘quvchilarda ko‘nikma shakllantirish, arifmetik masalalar, algebra elementlari.

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## SOLVING THE PROBLEM USING THE EQUATION

**Abstract.** This article covers ways to eliminate the problems found in the teaching of solving problems using an equation through their causes. Our article covers the possibilities of students to independently think, analyze, draw conclusions and develop practical skills. A unified integrative approach has also been proposed for grades 1-11.

**Key words:** Equation method, unknown quantity, mathematical model, logical thinking, problem analysis, skill development in students, arithmetic problems, elements of algebra.

### **I. Kirish**

#### **1-§. Masalaning qo‘yilishi**

Hozirgi zamon ta‘lim tizimida matematika fanining asosiy vazifalaridan biri o‘quvchilarda mantiqiy fikrlash, muammoni tahlil qilish va mustaqil xulosa chiqarish ko‘nikmalarini shakllantirishdan iborat. Ayniqsa, so‘zli masalalarni yechish jarayoni o‘quvchilarning matematik tafakkurini rivojlantirishda muhim



o‘rin tutadi. Chunki masala yechish jarayonida o‘quvchi real hayotda uchraydigan vaziyatlarni matematik ifodaga aylantiradi va ular ustida amallar bajaradi.

Masalalarni tenglama ko‘rinishida yechish usuli matematika fanida eng yaxshi usullaridan biri hisoblanadi. Bu usul orqali masala shartida berilgan noma‘lum kattalik alohida belgilab olinadi va ular orasidagi bog‘lanish algebraik tenglama yordamida ifodalanadi. Natijada masala arifmetik hisoblashlar yordamida emas, balki mantiqiy asoslangan algebraik yo‘l bilan yechiladi.

Tenglama tuzish usulining ahamiyati shundaki, u o‘quvchilarda faqatgina hisoblash malakasini emas, balki muammoni tahlil qilish, shartni qismlarga ajratish, noma‘lumni aniqlash va berilgan hamda topilishi kerak bo‘lgan kattaliklar orasidagi bog‘lanishni topish kabi muhim faoliyatni rivojlantiradi. Bu esa o‘quvchining matematik savodxonligini oshirish bilan bir qatorda, uning umumiy fikrlash madaniyatini ham yuksaltiradi.

Masala: Bir sonni 5 ga ko‘paytirib, 10 ga qo‘shilsa 35 chiqadi. Shu sonni toping.

Yechish: Noma‘lum sonni  $x$  deb belgilaymiz.

Tenglama tuzamiz:

$$5x + 10 = 35$$

Yechamiz:

$$5x = 35 - 10 \Rightarrow 5x = 25 \Rightarrow x = 5$$

Biz noma‘lumni  $x$  deb belgilagan edik. Javobimiz 5 ga teng.

Boshlang‘ich va umumta‘lim maktablarida tenglama tuzib masala masalalar asosida noma‘lumni topish, keyinchalik esa murakkabroq, bir nechta amallarni talab qiladigan masalalarni tenglama yordamida yechish ko‘nikmasi shakllantiriladi. Ushbu jarayonda o‘qituvchining asosiy vazifasi — o‘quvchiga masala shartini to‘g‘ri o‘qish, uni tahlil qilish va matematik model shaklida ifodalashni o‘rgatishdan iboratdir.

Masala: Ikki sonning yig‘indisi 20 ga teng. Birinchi son ikkinchisidan 4 ga katta. Sonlarni toping?

Yechish: Ikkinchi sonni  $x$  deb olaylik shunda birinchi son  $x + 4$  ga teng boladi.

Tenglamaga ko‘ra:

$$x + (x + 4) = 20$$

Yechamiz:

$$\begin{aligned} 2x + 4 &= 20 \Rightarrow 2x = 20 - 4 \Rightarrow \\ 2x &= 16 \Rightarrow x = 16 : 2 \Rightarrow x = 8 \end{aligned}$$

Javob:

$$x_1 = 8, \quad x_2 = 8 + 4 = 12$$

Shuningdek, tenglama tuzib yechish usuli hayotiy masalalarni matematika bilan bog‘lashga xizmat qiladi. Masalan, yoshga oid masalalar, harakatga doir masalalar, ish unumdorligi va savdo-sotiqqa oid masalalar tenglama tuzish orqali oson va aniq yechiladi. Bu esa o‘quvchilarda matematikaning hayotdagi amaliy ahamiyatini anglashga yordam beradi.

Masala: Ikki sonning yig'indisi 84 ga teng. Birinchi son, ikkinchi son dan 12 ga katta. Shu sonlarning ko'paytmasi nechaga teng?

Yechish: Ikkinchi sonni  $x$  deb olaylik shunda birinchi son  $x + 12$  bo'ladi.

Tenglama shartiga ko'ra:

$$\begin{aligned}x + (x + 12) &= 84 \Rightarrow 2x + 12 = 84 \Rightarrow \\2x &= 84 - 12 \Rightarrow 2x = 72 \Rightarrow x = 72 : 2 \Rightarrow x = 36\end{aligned}$$

Javob:

$$\begin{aligned}x_2 &= 36 \quad x_1 = 36 + 12 = 48 \\x_1 * x_2 &= 36 * 48 = 1728\end{aligned}$$

Demak, masalani tenglama ko'rinishida yechish mavzusi o'quvchilarning algebraik tafakkurini shakllantirishda, ularning mantiqiy fikrlash qobiliyatini rivojlantirishda hamda matematik bilimlarni amaliyot bilan bog'lashda muhim metodik ahamiyatga ega bo'lgan dolzarb masalalardan biridir.

#### **Foydalanilgan adabiyotlar**

1. Matematika (6-sinf). — Toshkent: O'zbekiston Respublikasi Xalq ta'limi vazirligi nashri.
2. Algebra (7-sinf). — Toshkent: O'zbekiston Respublikasi Xalq ta'limi vazirligi nashri.
3. Elementar matematika masalalari. — Toshkent: O'qituvchi nashriyoti.
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## TUBERKULOZNI YOSHI KATTALAR ORASIDA TARQALISHI

**Annotatsiya:** Maqolada yoshi kattalar orasida tuberkulyozning tarqalish xususiyatlari va epidemiologik holati o‘rganildi. Tadqiqot retrospektiv statistik tahlil va o‘rganish metodlari asosida olib borilgan bo‘lib, 2023–2025-yillarda O‘zbekistonning turli viloyatlaridagi tuberkulyoz registr ma’lumotlari tahlil qilindi. Natijalar shuni ko‘rsatdiki, yoshi kattalar guruhida tuberkulyozning tarqalishi oshib borayotgani kuzatilgan, ayniqsa erkaklar va qishloq hududlarida kasallanish xavfi yuqori. Shuningdek, surunkali kasalliklar, ijtimoiy sharoit va immun tizimi pasayishi kasallik xavfini oshiruvchi asosiy omillar sifatida aniqlangan. Maqolada yoshi kattalar orasida tuberkulyozni aniqlash va profilaktika qilish bo‘yicha tavsiyalar ham berilgan: muntazam tekshiruvlar, vaksinalash dasturlari, sog‘lom turmush tarzini targ‘ib qilish va jamiyat bilan hamkorlikni kuchaytirish. Tadqiqot natijalari sog‘liqni saqlash tizimi uchun yoshi kattalar guruhida tuberkulozga qarshi samarali strategiyalar ishlab chiqishda asos bo‘lib xizmat qiladi.

**Kalit so‘zlar:** tuberkulyoz, yoshi kattalar, epidemiologiya, profilaktika, sog‘liqni saqlash, xavf omillari.

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## THE PREVALENCE OF TUBERCULOSIS AMONG ADULTS

**Annotation:** This article examines the characteristics and epidemiological features of tuberculosis among older adults. The study was conducted using retrospective statistical analysis and data review methods, based on tuberculosis registry data from various regions of Uzbekistan between 2023 and 2025. The results indicate an increasing incidence of tuberculosis in the elderly population, especially among men and residents of rural areas. Chronic diseases, social conditions, and weakened immunity were identified as key factors increasing the risk of infection. The article also provides recommendations for detecting and preventing tuberculosis in older adults: regular screenings, vaccination programs, promotion of a healthy lifestyle, and collaboration with the community. The findings serve as a basis for developing effective tuberculosis control strategies for the elderly population within the healthcare system.

**Keywords:** tuberculosis, older adults, epidemiology, prevention, healthcare, risk factors.

**Kirish.** Tuberkulyoz (TB) — global miqyosda inson salomatligi uchun jiddiy xavf tugʻdiradigan yuqumli kasallik boʻlib, asosan oʻpka tizimini zararlaydi. Jahon sogʻliqni saqlash tashkiloti (WHO, 2023) maʼlumotlariga koʻra, har yili millionlab odamlar tuberkuloz bilan kasallanadi va ayniqsa yoshi kattalar guruhida kasallanish xavfi oshadi<sup>3</sup>. Yoshi kattalar immun tizimining tabiiy pasayishi, surunkali kasalliklar va ijtimoiy-yashash sharoitlariga bogʻliq holda tuberkuloz bilan kasallanishga koʻproq moyil boʻladi.

Sil — bu turli organlarga, ayniqsa oʻpkaga taʼsir qiladigan surunkali va yuqumli kasallik boʻlib, u yalligʻlanish va toʻqima oʻzgarishlari bilan tavsiflanadi. Odamlardagi sil kasalliklarini oʻrganish bilan ftiziatriya shugʻullanadi. 1882-yilda nemis olimi Robert Kox silning qoʻzgʻatuvchisini aniqlagan; ushbu mikroorganizmdan keyin u “Kox tayoqchasi” deb atalgan. Sil kasalligi insoniyat tarixida qadimdan maʼlum boʻlib, uning belgilari Gippokrat va Ibn Sino asarlarida ham qayd etilgan<sup>4</sup>.

Oldin silni davolanmaydigan va oʻlinga olib keluvchi kasallik deb hisoblashgan boʻlsa-da, bugungi kunda u davolanishi mumkin boʻlgan kasallik sifatida tan olinadi. Chet el tajribalari shuni koʻrsatadiki, yoshi kattalar orasida tuberkulyozning tarqalishini samarali kamaytirish uchun profilaktika va erta tashxis dasturlari muhim ahamiyatga ega. Masalan, Hindiston va Janubiy Afrikada oʻtkazilgan tadqiqotlar yoshi 50 va undan katta bemorlarni yoppasiga tekshirish va muntazam sputum testlarini qoʻllash orqali kasallanish darajasini sezilarli kamaytirganini koʻrsatgan (Lönnroth et al., 2021; Gandhi et al., 2020)<sup>5</sup>. Shuningdek, AQSh va Yevropaning bir qator mamlakatlarida, jumladan, Germaniya va Buyuk Britaniyada, yoshi kattalar guruhida tuberkulyozni aniqlashda mobil skrining laboratoriyalari va vaksinalash dasturlari samarali natija bergan (CDC, 2022; Rieder, 2019)<sup>6</sup>.

Oʻzbekiston sharoitida yoshi kattalar orasida tuberkulyoz tarqalishi bilan bogʻliq epidemiologik muammolar mavjud boʻlib, ayniqsa qishloq hududlarida kasallanish xavfi yuqori. Shu sababli, yoshi kattalar orasida tuberkulyozni erta aniqlash va profilaktika qilish, surunkali kasalliklar mavjudligini hisobga olgan holda individual va ijtimoiy choralarni ishlab chiqish dolzarb masala hisoblanadi.

Yoshi kattalar orasida tuberkulyoz tarqalishining xususiyatlarini oʻrganish akademik va amaliy nuqtai nazardan muhimdir, chunki bu guruhda kasallik simptomlari koʻpincha sezilmaydi yoki kechikkan vaqtda aniqlanadi. Yoshi kattalar immun tizimi susayishi, surunkali kasalliklar, qandli diabet yoki boshqa immunosuppressiv holatlar bilan kechishi tufayli tuberkulyoz xavfi oshadi. Shu

<sup>3</sup> World Health Organization (WHO). Global Tuberculosis Report 2023. Geneva: WHO; 2023.

<sup>4</sup> <https://uz.wikipedia.org/wiki/Sil>

<sup>5</sup> Lönnroth K., et al. Tuberculosis in older adults: epidemiology and management. *Lancet Infect Dis.* 2021;21:1057–1071.

<sup>6</sup> Centers for Disease Control and Prevention (CDC). Tuberculosis in older adults: prevention and control. Atlanta: CDC; 2022.

sababli, yoshi kattalar guruhida tuberkulyozni vaqtida aniqlash, profilaktik chora-tadbirlarni qo'llash va davolash samaradorligini oshirish zarur.

Ushbu tadqiqotning maqsadi — yoshi kattalar orasida tuberkulyoz tarqalish darajasini aniqlash, uning epidemiologik xususiyatlarini tahlil qilish va samarali profilaktik choralarni ishlab chiqishdan iborat.

Ushbu tadqiqot retrospektiv va statistik tahlil usullari asosida olib borildi. Tadqiqot materiali sifatida 2023–2025-yillarda O'zbekistonning turli viloyatlaridagi tuberkulyoz registr ma'lumotlari ishlatildi. Tadqiqotga yoshi 50 va undan katta bo'lgan bemorlar kiritildi.

Metodlar quyidagilarni o'z ichiga oladi:

1. Retrospektiv epidemiologik tahlil: Yoshi kattalar orasida tuberkuloz kasallanish darajasi, jins, yashash joyi (shahar/qishloq) va surunkali kasalliklar mavjudligi bo'yicha ma'lumotlar o'rganildi.

| Jins     | 50–60 yosh | 61–70 yosh | 71 yosh va undan katta | Jami |
|----------|------------|------------|------------------------|------|
| Erkaklar | 210        | 185        | 120                    | 515  |
| Ayollar  | 190        | 165        | 130                    | 485  |

2. Statistik tahlil: SPSS va Excel dasturlari yordamida kasallanish darajasi, yillik o'sish dinamikasi va xavf omillari tahlil qilindi. Chi-kvadrat testi, korrelyatsion tahlil va trend tahlili qo'llanildi.

3. Taqqoslash metodi: Yoshi kattalar va yoshi kichikroq guruhlar orasidagi kasallanish darajasi solishtirildi, shuningdek, o'rganilgan hududlar orasidagi farqlar aniqlandi.

| Jins     | 50–60 yosh | 61–70 yosh | 71 yosh va undan katta | Jami |
|----------|------------|------------|------------------------|------|
| Erkaklar | 210        | 185        | 120                    | 515  |
| Ayollar  | 190        | 165        | 130                    | 485  |

4. Grafik va vizual tahlil: Tarqalish dinamikasi va xavf omillari jadval va diagrammalar yordamida vizual tarzda ifodalandi.

Chet el tajribalari:

- Hindiston va Janubiy Afrikada olib borilgan tadqiqotlar yoshi kattalar guruhida yoppasiga tekshiruv va sputum testlarini qo'llash orqali kasallanish darajasini sezilarli kamaytirganini ko'rsatgan (Lönnroth et al., 2021; Gandhi et al., 2020).

- AQSh va Yevropaning bir qator mamlakatlarida, jumladan, Germaniya va Buyuk Britaniyada, yoshi kattalar orasida tuberkulyozni aniqlashda mobil skrining

laboratoriyalari va vaksinalash dasturlari samarali natija bergan (CDC, 2022; Rieder, 2019)<sup>7</sup>.

Tadqiqot natijalari yoshi kattalar orasida tuberkulyoz tarqalishining epidemiologik xususiyatlarini aniqlash va samarali profilaktik choralarni ishlab chiqishga imkon berdi.

Tuberkulyoz (TB) infeksiyasi dunyo bo'ylab keng tarqalgan va ayniqsa kattalar orasida jiddiy sog'liq muammosi hisoblanadi. TB tarqalishiga turli ijtimoiy omillar asosiy sabab bo'ladi. Ularning eng muhimlari qatoriga noqulay yashash sharoiti, past ilmiy salohiyat darajasi, tartibsiz hayot tarzi va ish bilan band emaslik kiradi. Shu bilan birga, bu omillar TB infeksiyasining yangi avlodlarga yetib borish xavfini oshiradi, chunki bakteriya ajratuvchi bemorlar bilan kontakt ko'payadi.

TB infeksiyasining manbai — bu bakteriya ajratuvchi bemor turar joyi yoki shaxsiy yashash muhiti hisoblanadi. Eng xavfli infeksiya o'chog'i sifatida atrofida yosh bolalari va asotsial axloqli shaxslar mavjud bo'lgan bakteriya ajratuvchilar ko'riladi, chunki ular ko'proq odamlar bilan kontaktda bo'lib, infeksiyaning tez tarqalishiga sabab bo'ladi. Shu sababli yotoqxona, ish joyi va umumiy yashash joylarida profilaktik chora-tadbirlar juda muhimdir.

**Natijalar.** Tahlil natijalari shuni ko'rsatdiki, yoshi kattalar orasida tuberkulyoz tarqalishi sezilarli darajada yuqori. Med360.uz ma'lumotlariga ko'ra, dunyo bo'yicha aholining uchdan bir qismi *Mycobacterium tuberculosis* bilan infektsiyalangan, va yoshi kattalar immuniteti pasayganligi sababli kasallanish xavfi oshadi<sup>8</sup>. Erkaklar va qishloq hududlarda yashovchilar orasida tuberkuloz kasallanish darajasi yuqoriroq bo'lib, surunkali kasalliklar va immunitetning zaifligi kasallanish xavfini kuchaytiruvchi asosiy omillar hisoblanadi.

Natijalar shuni ko'rsatadiki, TB profilaktikasi yoshi kattalar orasida kasallanishni kamaytirishda muhim rol o'ynaydi. Masalan, yotoqxona va muassasalarda TBga qarshi chora-tadbirlar samarali bo'lib, quyidagilarni o'z ichiga oladi: TB bilan og'rikan bemorlarni alohida xonaga joylashtirish, sanitar-okartiruv ishlari, yiliga bir marta fluragrafik tekshiruvdan o'tkazish, xayvonlardan odamga TB yuqishini oldini olish uchun kasal xayvonlarni aniqlash va yo'qotish, go'sht va sut ustidan muntazam bakteriologik nazorat.

Shuningdek, tuberkulyozga qarshi muassasalarda xodimlarni himoya qilish choralariga maxsus kiyim, alohida sanuzel va ovqatlanish joylari, dezinfektsiya tadbirlari, vaksinatsiya va revaksinatsiya kiradi. TB kimyoprofilaktikasi esa yuqori xavf guruhlariga — bakteriya ajratuvchi bilan aloqada bo'lganlarga, tuberkulinga sezgilar, TB bilan kasallanish xavfi yuqori bo'lganlar va TB bilan kasallangan hayvonlar bilan aloqada bo'lganlarga qo'llanadi.

<sup>7</sup> Rieder H.L. Epidemiology of tuberculosis. 2nd edition. Paris: International Union Against Tuberculosis and Lung Disease; 2019.

<sup>8</sup> <https://med360.uz/kasalliklar/sil-kasalligi/>



Epidemiologik tahlillar shuni ko'rsatdiki, TBni vaqtida aniqlashning asosiy muammolari quyidagilardan iborat: profilaktik ishlardagi kamchiliklar, poliklinika va statsionarlardagi yetarli tekshiruvning bo'lmashligi, shifokorlarning yetarli bilimiga ega emasligi va bemorlarning kech murojaati. Shu sababli yoshi kattalar orasida tuberkulyozni vaqtida aniqlash uchun bemorlarni muntazam tekshirish, xavf guruhlarini va aholini fluragrafik skriningdan o'tkazish, sanitariya-okartiruv ishlarini olib borish zarur.

Chet el tajribalari ham shuni ko'rsatadiki, yoshi 50 va undan katta guruhlarini yoppasiga tekshirish va muntazam sputum testlarini qo'llash orqali kasallanish darajasi sezilarli kamayadi (Lönnroth et al., 2021; Gandhi et al., 2020)<sup>9</sup>. Germaniya va Buyuk Britaniyada mobil skrining laboratoriyalari va vaksinalash dasturlari yoshi kattalar orasida tuberkulozni aniqlash va oldini olishda samarali natija bergan (CDC, 2022; Rieder, 2019).

Shunday qilib, natijalar yoshi kattalar guruhida tuberkulyoz tarqalishi nafaqat biologik, balki ijtimoiy va epidemiologik omillarga bog'liqligini, shuningdek, profilaktik va skrining choralarining ahamiyatini tasdiqlaydi.

**Xulosa.** Yoshi kattalar orasida tuberkuloz (sil) kasalligining tarqalishi dolzarb tibbiy-ijtimoiy muammo bo'lib qolmoqda. Immunitetning pasayishi, surunkali kasalliklar mavjudligi, yashash sharoitining yetarli emasligi va profilaktik tekshiruvlarning muntazam o'tkazilmasligi kasallikning keng tarqalishiga sabab bo'lmoqda. Tadqiqotlar shuni ko'rsatadiki, kasallikni erta aniqlash va samarali davolash choralarini ko'rish orqali tuberkulyozning og'ir asoratlari va o'lim ko'rsatkichlarini kamaytirish mumkin. Bunda muntazam fluragrafik tekshiruvlar, xavf guruhlarini skrining qilish, kimyoprofilaktika, vaksinalash va sanitariya-profilaktik ishlar muhim ahamiyat kasb etadi.

Shuningdek, infeksiya manbaini nazorat qilish, bemorlarni o'z vaqtida izolyatsiya qilish va aholining tibbiy madaniyatini oshirish yoshi kattalar orasida tuberkulyoz tarqalishini kamaytirishda asosiy omillardan hisoblanadi.

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## LOTIN TILIDA KASALLIK NOMLARINING SHAKLLANISHI

**Annotatsiya:** Tibbiy terminologiyada lotin tili va yunoncha-lotinchа termin elementlari alohida o‘rin tutadi. Kasallik nomlari ko‘pincha muayyan morfologik model asosida, ya‘ni o‘zak, prefiks, suffiks va bog‘lovchi unlilar yordamida hosil qilinadi. Mazkur maqolada lotin tilida kasallik nomlarining shakllanish tamoyillari, ularning tarixiy-lingvistik manbalari, asosiy suffikslar, klinik termin yasash modellari hamda zamonaviy tibbiy tasnifdagi ahamiyati tahlil qilinadi. Tadqiqot natijalariga ko‘ra, kasallik nomlarini shakllantirishda ayniqsa **-itis, -osis, -iasis, -oma, -pathia, -algia, -emia, -stenosis, -malacia, -sclerosis** kabi termin elementlar faol qo‘llanadi. Shuningdek, kasallik nomlari anatomo-klinik belgi, etiologik omil, patogenez, lokalizatsiya va funksional buzilish asosida tuzilishi aniqlangan. Lotin tilidagi tibbiy terminlar xalqaro tibbiy muloqotda aniqlik, ixchamlik va standartlashuvni taъминlaydi. ICD tizimi ham kasalliklarni bir xilda nomlash va kodlashda global standart vazifasini bajaradi.

**Kalit so‘zlar:** lotin tili, tibbiy terminologiya, kasallik nomlari, suffiks, termin yasash, klinik termin, ICD, nominatsiya.

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## FORMATION OF DISEASE NAMES IN THE LATIN LANGUAGE

**Abstract:** *In medical terminology, the Latin language and Greco-Latin terminological elements occupy a special place. Disease names are most often formed according to a specific morphological model, namely by using roots, prefixes, suffixes, and connecting vowels. This article analyzes the principles of the formation of disease names in Latin, their historical and linguistic sources, the main suffixes, models of clinical term formation, and their importance in modern medical classification. The results of the study show that such terminological elements as -itis, -osis, -iasis, -oma, -pathia, -algia, -emia, -stenosis, -malacia, -sclerosis are widely used in the formation of disease names. It was also determined that disease names are formed based on anatomical and clinical features, etiological factors, pathogenesis, localization, and functional disorders. Latin medical terminology ensures accuracy, conciseness, and standardization in international medical communication. The ICD system also serves as a global standard for the unified naming and coding of diseases.*

**Keywords:** *Latin language, medical terminology, disease names, suffix, term formation, clinical term, ICD, nomination.*

## KIRISH

Kasallik nomlarining lotincha shakllanishi tarixiy, morfologik va semantik ildizlarga ega bo‘lib, tibbiy fan uchun muhim ilmiy asos hisoblanadi. Yangi terminlar yaratishda prefiks, suffiks va ildizlarning uyg‘unligi katta rol o‘ynaydi. ICD tasnifi orqali kasallik terminlari xalqaro standartga keltirilib, global tibbiy aloqani yengillashtiradi. Lotin tilini chuqur o‘rganish, kasallik terminlarini to‘g‘ri shakllantirish kelajakdagi tadqiqotlar uchun muhim yo‘nalishdir. Lotin tili asrlar davomida tibbiyotning xalqaro ilmiy tili bo‘lib xizmat qilgan. Zamonaviy klinik terminologiyani katta qismi qadimgi yunon an‘analariga borib taqalsa-da, ularning sezilarli qismi keyinchalik lotinlashtirilgan va bugungi xalqaro tibbiy leksikada shu shaklda mustahkamlangan. Tadqiqotchilar ta’kidlashicha, ko‘plab patofiziologik atamalar qadimgi yunon manbalaridan kelib chiqqan bo‘lsa-da, ular lotin tili me’yorlari asosida qayta shakllanib, universal terminologik birlikka aylangan.

Tibbiy terminning afzalligi shundaki, u bir necha so‘z bilan ifodalanadigan murakkab mazmunni ixcham va aniq shaklda beradi. NCBI manbasida ta’kidlanganidek, tibbiy terminlar prefiks, o‘zak, suffiks va bog‘lovchi unli kabi qismlarga ajratilib tahlil qilinadi; aynan shu tuzilma murakkab kasallik nomlarining ma’nosini izchil anglash imkonini beradi. Masalan, *tonsillitis* atamasida *tonsill-* o‘zagi anatomik tuzilmani, *-itis* esa yallig‘lanishni bildiradi.

Bugungi kunda inglizcha klinik terminlar keng tarqalgan bo‘lsa ham, lotin va yunoncha-lotincha termin elementlari tibbiyotning asosiy nomlash modeli bo‘lib qolmoqda. WHOning ICD-11 tizimi kasalliklarni xalqaro miqyosda yagona tamoyil asosida qayd etish, taqqoslash va kodlash uchun xizmat qiladi hamda ko‘p tilli tibbiy kommunikatsiyada terminologik moslikni ta’minlaydi.

Mazkur maqolaning maqsadi — lotin tilida kasallik nomlarining shakllanish qonuniyatlarini ilmiy-nazariy jihatdan yoritish, ularning asosiy struktur modellari va termin elementlarini tahlil qilishdir.

### **MATERIALLAR VA METODLAR:**

Tadqiqotda qiyosiy-lingvistik, struktur-morfologik, semantik va tavsifiy tahlil usullaridan foydalanildi. Material sifatida tibbiy terminologiyaga oid ilmiy maqolalar, lotin tili bo'yicha qo'llanmalar, WHOning ICD-11 bo'yicha rasmiy sahifalari hamda klinik termin tuzilishini sharhlovchi manbalar olindi. Kasallik nomlari tarkibidagi o'zak, prefiks, suffiks va termin elementlari alohida ajratilib, ularning ma'no yuklamasi va yasalish modeli tahlil qilindi.

Tadqiqotning metodologik asosi sifatida quyidagi yo'nalishlar belgilandi:

- kasallik nomlarining tarixiy kelib chiqishini aniqlash;
- klinik termin hosil qiluvchi faol suffikslarni ajratish;
- kasallik nomlari yasalishida anatomo-topografik, etiologik va funksional omillar rolini ko'rsatish;
- terminlarning zamonaviy standartlashuv tizimidagi o'rnini baholash.

### **NATIJALAR**

Tahlil natijasida lotin tilida kasallik nomlari shakllanishining bir nechta yetakchi modeli aniqlandi.

Birinchidan, klinik terminlarning asosiy qismi **o'zak + suffiks** modeli asosida tuziladi. O'zak odatda a'zo, to'qima yoki fiziologik tizimni bildiradi, suffiks esa patologik jarayon turini ifodalaydi. Masalan, *hepatitis* — jigar yallig'lanishi, *nephritis* — buyrak yallig'lanishi, *myocarditis* — yurak mushagi yallig'lanishi. Bu model tibbiy terminologiyada eng mahsuldor usul hisoblanadi.

Ikkinchidan, kasallik nomlarini shakllantirishda ayrim suffikslar juda faol ekani kuzatildi. Qo'llanmalarda **-itis** yallig'lanish, **-osis** ko'proq yallig'lanishsiz patologik holat yoki degenerativ jarayon, **-oma** o'sma, **-pathia** kasallik, **-algia** og'riq, **-emia** qon bilan bog'liq holat, **-stenosis** torayish, **-malacia** yumshash, **-sclerosis** qattiqlashish kabi ma'nolarni ifodalashi ko'rsatilgan.

Uchinchidan, kasallik nomlari ko'pincha **anatomik lokalizatsiya + patologik belgi** asosida yasaladi. Masalan, *gastritis* so'zi *gaster* (oshqozon) va *-itis* (yallig'lanish) elementlaridan tashkil topgan. Xuddi shuningdek, *dermatitis*, *encephalopathy*, *osteomalacia*, *arteriostenosis* kabi terminlar ham mazkur modelni tasdiqlaydi. Tibbiy terminologiya bo'yicha tadqiqotlarda bunday neoklassik birikmalar zamonaviy tibbiy tilning ajralmas qismi ekanligi ko'rsatilgan.

To'rtinchidan, kasallik nomlari **etiologik omil** asosida ham shakllanadi. Ayniqsa infeksiyon kasalliklar nomenklaturasida nomlashning fenotipik belgi, kasallik nomi, eponim, topografik joy yoki kelib chiqish hududi asosida yuzaga kelishi qayd etilgan. Bu holat kasallik nomining nafaqat klinik, balki tarixiy va ijtimoiy omillar bilan ham bog'liqligini ko'rsatadi.

Beshinchidan, ayrim kasallik nomlari **funksional yoki sifat o'zgarishini** bildiradi. Masalan, *tachycardia* tez yurak urishini, *leukocytosis* oq qon hujayralari sonining ko'payishini, *anemia* qondagi gemoglobin yoki eritrotsit

yetishmovchiligini anglatadi. Bunday terminlarda semantik aniqlik klinik amaliyot uchun juda muhim hisoblanadi.

### **MUHOKAMA**

Tahlil shuni ko'rsatadiki, lotin tilida kasallik nomlarining shakllanishi tartibsiz emas, balki qat'iy morfologik va semantik qonuniyatlarga asoslanadi. Klinik terminlar ko'pincha yunoncha ildizlardan olingan bo'lsa-da, ularning grammatik rasmiylashuvi va xalqaro qo'llanilishi lotin tili vositasida amalga oshgan. Shu sababli tibbiyotdagi "lotin terminologiyasi" ko'pincha yunoncha-lotincha aralash, ammo lotinlashtirilgan tizim sifatida namoyon bo'ladi.

Affiksatsiya klinik termin yasashda markaziy o'rin tutadi. Qo'llanmalarda ham affiksatsiya klinik termin hosil qilishda faol mexanizm ekani qayd etiladi. Ayniqsa suffikslar kasallikning tabiatini darhol anglatadi: *-itis* yallig'lanish, *-oma* o'sma, *-pathia* umumiy kasallik, *-osis* esa ko'pincha noan'anaviy yoki degenerativ holatni ko'rsatadi. Demak, suffikslar nafaqat grammatik, balki diagnostik axborot tashuvchisi hamdir.

Lotin terminologiyasining yana bir muhim jihati — uning **xalqaro tushunarlilikidir**. Turli mamlakatlarda milliy tillar faol rivojlangan bo'lsa ham, lotin va yunoncha-lotincha termin elementlari shifokorlar, farmatsevtlar va ilmiy tadqiqotchilar uchun umumiy professional platforma yaratadi. ICD-11 ning ko'p tilli va standartlashtirilgan tabiati ham aynan shu ehtiyojga javob beradi. WHO ma'lumotiga ko'ra, ICD-11 klinik atamalarini qayd etish, tahlil qilish, mamlakatlararo taqqoslash va semantik moslikni ta'minlash uchun xizmat qiladi.

Shuningdek, zamonaviy terminologiyada inglizcha ta'sir kuchaygan bo'lsa-da, klassik lotin modeli o'z ahamiyatini yo'qotmagan. Wulff qayd etganidek, bugungi tibbiy tilda ba'zi yangi atamalar oddiy ingliz so'zlari asosida yasalayotgan bo'lsa ham, klassik yunoncha-lotincha model hanuz murakkab klinik tushunchalarni ifodalashda eng aniq vositalardan biri bo'lib qolmoqda.

Demak, kasallik nomlarining lotincha shakllanishini o'rganish faqat filologik masala emas. Bu jarayon tibbiy ta'lim, klinik fikrlash, farmatsevtik nomenklatura va xalqaro ilmiy muloqot uchun ham muhimdir.

### **XULOSA**

Lotin tilida kasallik nomlari asosan o'zak, prefiks, suffiks va bog'lovchi unlilar asosida shakllanadi. Bu jarayonda ayniqsa yunoncha-lotincha termin elementlari yetakchi rol o'ynaydi. Kasallik nomlari yallig'lanish, degeneratsiya, o'sma, og'riq, torayish, yumshash, qattiqlashish, qon tarkibi o'zgarishi kabi patologik holatlarni ifodalovchi maxsus suffikslar orqali yasaladi. Anatomo-topografik belgi, etiologiya, patogenez va funksional buzilish kasallik nomini shakllantiruvchi asosiy semantik omillar hisoblanadi. Lotin terminologiyasi tibbiyotda aniqlik, qisqalik va xalqaro standartlashuvni ta'minlaydi. Shu bois lotin tilida kasallik nomlarining shakllanish qonuniyatlarini o'rganish tibbiyot va farmatsiya ta'limida muhim nazariy-amaliy ahamiyatga ega.

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## **TIBBIYOTGA OID TERMINLARNING SHAKLLANISH JARAYONIDA LOTIN TILINING AHAMIYATI**

**Annotatsiya:** *Ilmiy terminologiya fan va texnologiya rivojlanishida muhim o‘rin tutadi. Zamonaviy ilmiy terminlarning katta qismi tarixan lotin va yunon tillaridan kelib chiqqan. Lotin tili asrlar davomida ilm-fan, tibbiyot, biologiya, farmatsiya va boshqa sohalarda universal ilmiy til sifatida qo‘llanilgan. Mazkur maqolada ilmiy terminologiyaning shakllanish jarayonida lotin tilining o‘rni, uning lingvistik xususiyatlari hamda zamonaviy ilmiy kommunikatsiyadagi ahamiyati tahlil qilinadi. Tadqiqot natijalariga ko‘ra, ko‘plab ilmiy terminlar lotin tilidagi o‘zaklar, prefikslar va suffikslar asosida shakllangan bo‘lib, ular terminologik tizimning aniqligi va xalqaro standartlashuvini ta‘minlaydi. Ayniqsa tibbiyot, biologiya va farmatsiya sohalarida lotin terminlari keng qo‘llanilishi aniqlangan. Shuningdek, lotin tilining grammatik va morfologik barqarorligi ilmiy terminlarning universalligini ta‘minlashda muhim omil bo‘lib xizmat qiladi.*

**Kalit so‘zlar:** *lotin tili, ilmiy terminologiya, termin yasash, tibbiy terminlar, ilmiy til, lingvistika, farmatsevtik terminologiya.*

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## **THE IMPORTANCE OF THE LATIN LANGUAGE IN THE PROCESS OF FORMATION OF MEDICAL TERMINOLOGY**

**Abstract:** *Scientific terminology plays an important role in the development of science and technology. A large number of modern scientific terms historically originate from Latin and Greek languages. For centuries, the Latin language has been used as a universal language of science in medicine, biology, pharmacy, and other fields. This article analyzes the role of the Latin language in the formation of scientific terminology, its linguistic features, and its importance in modern scientific communication. The results of the study show that many scientific terms are formed on the basis of Latin roots, prefixes, and suffixes, which ensure the accuracy and international standardization of the terminological system. Latin terminology is especially widely used in medicine, biology, and pharmacy. In addition, the grammatical and morphological stability of the Latin language serves as an important factor in ensuring the universality of scientific terms.*

**Keywords:** *Latin language, scientific terminology, term formation, medical terms, scientific language, linguistics, pharmaceutical terminology.*

### **Kirish**

Tibbiy terminologiyaning shakllanishi va rivojlanish jarayonida lotin tilining ahamiyati ko‘plab ilmiy manbalarda batafsil yoritib berilgan. O‘zbekistonlik va xorijlik olimlar tomonidan olib borilgan tadqiqotlar bu tilning tibbiyot terminologiyasidagi ilmiy hamda amaliy rolini keng ochib beradi. Xususan, A. S. Qodirov va M. T. Karimov tomonidan yaratilgan “Tibbiy lotin tili” darsligida lotin tilidagi tibbiy terminlar tizimi, ularning grammatik tuzilishi, morfologik xususiyatlari hamda semantik mazmuni chuqur tahlil qilingan. Mualliflar lotin tilining tibbiyot sohasida xalqaro miqyosda qo‘llaniladigan umumiy aloqa vositasi ekanligini, shuningdek, tibbiy hujjatlar va ilmiy matnlarda fikrni aniq va lo‘nda ifodalash imkonini berishini ta’kidlaydilar. Ularning fikricha, tibbiyot yo‘nalishida tahsil olayotgan talabalarga lotin tilini mukammal o‘rgatish nafaqat kasbiy bilimlarni mustahkamlaydi, balki ilmiy tafakkurni rivojlantirishda ham muhim omil hisoblanadi. Ilmiy terminologiya har qanday fan rivojlanishining muhim tarkibiy qismi hisoblanadi. Terminlar ilmiy tushunchalarni aniq va qisqa shaklda ifodalash imkonini beradi. Fan va texnologiya taraqqiyoti bilan yangi tushunchalar paydo bo‘ladi va ularni ifodalash uchun yangi terminlar yaratiladi. Shu jarayonda lotin tili muhim rol o‘ynaydi.

Lotin tili qadimiy Rim davridan boshlab ilmiy va madaniy sohada keng qo‘llanilgan. O‘rta asrlarda Yevropada ilmiy asarlarning aksariyati lotin tilida yozilgan. Natijada lotin tili ilm-fanning universal tili sifatida shakllangan. Tibbiyot, biologiya, farmatsiya, botanika va zoologiya sohalaridagi ko‘plab terminlar aynan lotin tilidan olingan.

Zamonaviy ilmiy terminologiyada lotin tilining ahamiyati ayniqsa tibbiyot va biologiya sohalarida yaqqol namoyon bo‘ladi. Masalan, organizm tuzilishi, kasallik nomlari, dori moddalari, anatomiya va fiziologiya bilan bog‘liq terminlarning katta qismi lotin tilida ifodalanadi.

Mazkur maqolaning maqsadi — ilmiy terminologiyaning shakllanish jarayonida lotin tilining oʻrnini tahlil qilish hamda uning zamonaviy ilmiy til rivojidadagi ahamiyatini koʻrsatib berishdir.

### ***Materiallar va metodlar***

Tadqiqot jarayonida ilmiy terminologiya, lotin tili va tibbiy terminologiyaga oid ilmiy adabiyotlar oʻrganildi. Tadqiqotda quyidagi metodlardan foydalanildi:

- ilmiy adabiyotlarni tahlil qilish;
- terminologik tahlil;
- qiyosiy-lingvistik metod;
- tavsifiy metod.

Material sifatida lotin tili boʻyicha qoʻllanmalar, ilmiy terminologiya boʻyicha monografiyalar, tibbiy va biologik terminlar lugʻatlari hamda ilmiy maqolalar tanlab olindi. Terminlarning kelib chiqishi, ularning morfologik tuzilishi va semantik xususiyatlari tahlil qilindi.

### ***Natijalar***

Tibbiyot terminologiyasining shakllanish jarayonida lotin tilining oʻrni haqida soʻz yuritganda, uni faqat tarixiy til sifatida emas, balki ilmiy hamda umumqabul qilingan xalqaro aloqa vositasi sifatida ham baholash zarur. Ilgari tibbiy bilimlar va ilmiy manbalar asosan lotin tilida bayon etilgan boʻlsa, bugungi kunda ham bu til tibbiy terminologiya tizimining muhim asoslaridan biri boʻlib qolmoqda. Bu holat bir tomondan terminlarning barqarorligi va aniq ifodalanishini taʼminlasa, ikkinchi tomondan, uni oʻrganish tibbiyot yoʻnalishida tahsil olayotgan talabalar uchun muhim zaruratga aylanishiga sabab boʻladi. Lotin tili ilmiy anʼana sifatida shakllanganligi tufayli yangi aniqlanayotgan kasalliklar, dori vositalari hamda anatomik tuzilmalar nomlanishida ham aynan shu tilning elementlari keng qoʻllanilmoqda. Natijada global tibbiyot tizimida yagona va tushunarli terminlar majmuasini saqlab qolish imkoniyati yaratiladi. Shu bilan birga, zamonaviy tibbiyotda ingliz tilining roli tobora kuchayib borayotganini ham eʼtibordan chetda qoldirib boʻlmaydi. Hozirgi davrda ilmiy maqolalar, xalqaro konferensiyalar hamda klinik tadqiqotlar koʻpincha ingliz tilida olib borilmoqda. Shunga qaramay, ingliz tilida ishlatilayotgan koʻplab tibbiy terminlarning ildizi lotin tiliga borib taqaladi. Bu esa lotin tilining hozirgi tibbiyotdagi ahamiyati va mavqeini yanada mustahkamlaydi.

Muhokama jarayonida yana bir muhim masala lotin tilini oʻqitish metodikasi bilan bogʻliqdir. Ayrim tibbiyot talabalari ushbu tilni oʻrganishni murakkab yoki amaliy jihatdan kam ahamiyatli deb hisoblashlari mumkin. Biroq oʻtkazilgan tahlillar shuni koʻrsatadiki, lotin tilini yaxshi oʻzlashtirgan talabalar klinik faoliyatda, tibbiy hujjatlarni toʻgʻri rasmiylashtirishda, diagnostika va davolash jarayonlarini tushunishda yuqori samaradorlikka erishadilar. Chunki bunday talabalar terminlarni faqat yodlab qolmay, balki ularning etimologik, lugʻaviy va grammatik maʼnolarini ham anglab yetadilar.

Tadqiqot natijalariga koʻra, ilmiy terminologiyaning shakllanishida lotin tili muhim rol oʻynashi aniqlandi.

Birinchidan, ko‘plab ilmiy terminlar lotin tilidagi o‘zaklardan hosil qilingan. Masalan:

*corpus* — tana  
*medicina* — tibbiyot  
*nervus* — nerv  
*musculus* — mushak

Bu so‘zlar keyinchalik turli ilmiy terminlar hosil qilish uchun asos bo‘lib xizmat qilgan.

Ikkinchidan, ilmiy terminlarni yasashda lotin tilining prefiks va suffikslari keng qo‘llaniladi.

Masalan:

Prefikslar:

**sub-** — ostida  
**inter-** — orasida  
**intra-** — ichida  
**extra-** — tashqarida

Suffikslar:

**-itis** — yallig‘lanish  
**-osis** — kasallik yoki holat  
**-oma** — o‘sma  
**-logia** — fan yoki ta’limot

Masalan:

*cardiologia* — yurak haqidagi fan  
*bronchitis* — bronxlarning yallig‘lanishi  
*osteoma* — suyak o‘smasi

Uchinchidan, ilmiy terminologiya tizimida lotin tili xalqaro standart sifatida qo‘llanadi. Masalan, biologiyada o‘simlik va hayvonlarning ilmiy nomlari lotin tilida yoziladi. Bu tizim **binominal nomenklatura** deb ataladi.

Masalan:

*Homo sapiens* — odam  
*Canis lupus* — bo‘ri  
*Rosa canina* — itburun o‘simligi

To‘rtinchidan, farmatsiya va tibbiyot sohalarida dori moddalari nomlari ham ko‘pincha lotin tilida yoziladi. Masalan:

*Natrii chloridum*  
*Acidum ascorbinicum*  
*Paracetamolum*

Bu terminlar xalqaro farmatsevtik nomenklatura tizimining muhim qismi hisoblanadi.

## **Muhokama**

*Tibbiy terminologiya tizimi ko'p asrlik tarixiy rivojlanish jarayonida shakllangan bo'lib, unda lotin tilining roli alohida ahamiyatga ega. Lotin tili qadimdan ilm-fan va tibbiyot sohasida universal aloqa vositasi sifatida qo'llanilgan. Shu sababli ko'plab tibbiy terminlar aynan lotin tilining grammatik va leksik asoslari orqali shakllangan. Bugungi kunda ham tibbiy terminologiya tizimining katta qismi lotin va yunon tillaridan olingan elementlarga asoslanadi.*

*Lotin tilining tibbiy terminologiyada keng qo'llanilishining asosiy sababi uning barqarorligi va universalligidir. Bu til uzoq vaqt davomida o'zgarmaganligi sababli ilmiy terminlarning ma'nosi ham o'zining aniqligini saqlab qolgan. Shu jihatdan lotin tili ilmiy terminlarni standartlashtirishda muhim rol o'ynaydi. Turli mamlakatlarda tibbiyot sohasida faoliyat yuritayotgan mutaxassislar uchun lotin terminlari umumiy va tushunarli bo'lib xizmat qiladi. Bu esa xalqaro ilmiy hamkorlik va tibbiy kommunikatsiyaning samarali bo'lishini ta'minlaydi.*

*Tibbiyotga oid terminlarning shakllanish jarayonida lotin tilining morfologik imkoniyatlari ham katta ahamiyatga ega. Ko'plab terminlar lotin tilidagi o'zak, prefiks va suffikslar asosida hosil qilinadi. Masalan, -itis suffiksi yallig'lanish jarayonini ifodalaydi (bronchitis, gastritis), -osis esa ko'pincha patologik holat yoki kasallikni bildiradi (neurosis, tuberculosis). Shu kabi termin elementlari orqali yangi ilmiy atamalarni yaratish imkoniyati mavjud bo'ladi. Bu holat tibbiy terminologiya tizimli va mantiqiy shakllanishini ta'minlaydi.*

*Lotin tilining yana bir muhim xususiyati — uning terminologik aniqlikni ta'minlash qobiliyatidir. Tibbiyot sohasida terminlarning aniq va bir ma'noli bo'lishi juda muhim hisoblanadi. Chunki tibbiy diagnostika, davolash jarayoni hamda ilmiy tadqiqotlarda terminlarning noto'g'ri talqin qilinishi jiddiy xatolarga olib kelishi mumkin. Lotin tilidagi terminlar esa qisqa, aniq va semantik jihatdan barqaror bo'lishi bilan ajralib turadi.*

*Shuningdek, lotin tili tibbiyot, biologiya va farmatsevtika sohalarida ilmiy tasniflash tizimining asosini tashkil etadi. Masalan, anatomiyada barcha tuzilmalar xalqaro anatomik nomenklatura asosida lotin tilida nomlanadi. Bu tizim dunyoning barcha mamlakatlarida bir xil qo'llanilishi sababli ilmiy axborot almashinuvini ancha osonlashtiradi. Farmatsevtika sohasida ham dori vositalarining xalqaro nomenklaturasi ko'pincha lotin tiliga asoslanadi.*

*Bundan tashqari, lotin tilining tibbiy terminologiyada qo'llanilishi talabalarining kasbiy tayyorgarligiga ham ijobiy ta'sir ko'rsatadi. Tibbiyot yo'nalishida tahsil olayotgan talabalar lotin terminologiyasini o'rganish orqali tibbiy atamalarning kelib chiqishi, tuzilishi va ma'nosini chuqurroq tushunish imkoniyatiga ega bo'ladilar. Bu esa ularning klinik tafakkurini rivojlantiradi hamda professional faoliyatida terminlardan to'g'ri foydalanish ko'nikmasini shakllantiradi.*



*Shu bilan birga, zamonaviy ilmiy kommunikatsiyada ingliz tilining roli ortib borayotganini ham ta'kidlash lozim. Hozirgi kunda ko'plab ilmiy maqolalar va tibbiy tadqiqotlar ingliz tilida chop etilmoqda. Biroq ingliz tilidagi ko'plab tibbiy terminlarning ildizi lotin tiliga borib taqaladi. Bu esa lotin tilining ilmiy terminologiya tizimidagi ahamiyati hanuzgacha saqlanib qolayotganini ko'rsatadi.*

*Umuman olganda, tibbiy terminologiyaning shakllanishida lotin tili muhim lingvistik asos bo'lib xizmat qiladi. Uning grammatik barqarorligi, semantik aniqligi va xalqaro universalligi tibbiy terminlarning tizimli shakllanishiga hamda ilmiy kommunikatsiyaning samarali tashkil etilishiga yordam beradi.*

### **Xulosa**

Ilmiy terminologiyaning shakllanishida lotin tili muhim rol o'ynaydi. Ko'plab ilmiy terminlar lotin tilidagi o'zaklar, prefikslar va suffikslar asosida yaratilgan. Lotin tilining grammatik barqarorligi va universalligi ilmiy terminlarning xalqaro miqyosda tushunarli bo'lishini ta'minlaydi.

Tibbiyot, biologiya, farmatsiya va boshqa ilmiy sohalarda lotin terminlari keng qo'llanilishi ilmiy kommunikatsiyaning samaradorligini oshiradi. Shu sababli lotin tilini o'rganish ilmiy terminologiyani to'g'ri tushunish va qo'llash uchun muhim ahamiyatga ega.

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## **FARMATSEVTIK TERMINOLOGIYADA LOTIN TILINING QO‘LLANILISHI**

**Annotatsiya:** Lotin tili farmatsevtik terminologiyaning shakllanishi va rivojlanishida muhim rol o‘ynaydi. Dorivor moddalar nomlari, retseptura, farmatsevtik shakllar hamda farmakologik atamalar ko‘pincha lotin tiliga asoslangan terminlar orqali ifodalanadi. Mazkur maqolada farmatsevtik terminologiyada lotin tilining qo‘llanilishi, uning tarixiy asoslari, morfologik xususiyatlari hamda zamonaviy farmatsevtika amaliyotidagi ahamiyati tahlil qilinadi. Tadqiqot natijalari shuni ko‘rsatadiki, lotin tili dorivor moddalar nomenklaturasi, farmatsevtik shakllar nomlanishi, retsept yozish qoidalari hamda xalqaro farmakopeya standartlarida keng qo‘llaniladi. Shuningdek, lotin tilining barqarorligi va universalligi farmatsevtik terminologiyaning aniqligi va standartlashuvini ta’minlaydi.

**Kalit so‘zlar:** lotin tili, farmatsevtik terminologiya, dori vositalari nomenklaturasi, retseptura, farmatsevtik terminlar, farmakopeya, ilmiy terminologiya.

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## **THE USE OF THE LATIN LANGUAGE IN PHARMACEUTICAL TERMINOLOGY**

**Abstract:** *The Latin language plays an important role in the formation and development of pharmaceutical terminology. The names of medicinal substances, prescriptions, pharmaceutical forms, and pharmacological terms are often expressed through terminology based on Latin. This article analyzes the use of Latin in pharmaceutical terminology, its historical foundations, morphological characteristics, and its significance in modern pharmaceutical practice. The results of the study show that Latin is widely used in the nomenclature of medicinal substances, the naming of pharmaceutical forms, prescription writing rules, and international pharmacopoeial standards. In addition, the stability and universality of the Latin language ensure the accuracy and standardization of pharmaceutical terminology.*

**Keywords:** *Latin language, pharmaceutical terminology, drug nomenclature, prescription writing, pharmaceutical terms, pharmacopoeia, scientific terminology.*

### **Kirish**

Farmatsevtika sohasi dori vositalarini ishlab chiqarish, saqlash va qo‘llash bilan bog‘liq ilmiy-amaliy faoliyatni o‘z ichiga oladi. Ushbu sohada qo‘llaniladigan terminologiya aniq, standart va xalqaro miqyosda tushunarli bo‘lishi zarur. Shu sababli farmatsevtik terminologiya tizimida lotin tili muhim o‘rin egallaydi.

Tarixan farmatsevtika va tibbiyot sohasidagi ilmiy asarlar lotin tilida yozilgan. O‘rta asrlardan boshlab farmakopeya, dorivor moddalar nomlari va retseptlar aynan lotin tilida ifodalangan. Bu an‘ana hozirgi kunda ham saqlanib qolgan bo‘lib, ko‘plab farmatsevtik terminlar lotin tiliga asoslanadi.

Lotin tili farmatsevtik terminologiyada universallikni ta‘minlaydi. Turli mamlakatlarda ishlovchi shifokorlar va farmatsevtlar uchun lotin terminlari umumiy tushunarli hisoblanadi. Shu sababli farmatsevtik ta‘lim tizimida lotin tilini o‘rganish muhim hisoblanadi.

Mazkur maqolaning maqsadi — farmatsevtik terminologiyada lotin tilining qo‘llanilishi, uning lingvistik xususiyatlari hamda zamonaviy farmatsevtika amaliyotidagi ahamiyatini tahlil qilishdir.

### **Materiallar va metodlar**

Tadqiqot jarayonida farmatsevtik terminologiya, lotin tili grammatikasi va farmakopeya standartlariga oid ilmiy adabiyotlar o‘rganildi. Tadqiqotda quyidagi metodlardan foydalanildi:

- ilmiy adabiyotlarni tahlil qilish;
- terminologik tahlil;
- qiyosiy-lingvistik metod;
- tavsifiy metod.

Material sifatida tibbiy va farmatsevtik terminologiya bo‘yicha darsliklar, lotin tili grammatikasi bo‘yicha qo‘llanmalar hamda farmakopeya hujjatlari tanlab olindi. Farmatsevtik terminlarning kelib chiqishi, morfologik tuzilishi va semantik xususiyatlari tahlil qilindi.

### **Natijalar**

Tadqiqot natijalari farmatsevtik terminologiyada lotin tilining keng qo'llanilishini ko'rsatdi. Farmatsevtika sohasida lotin terminlari quyidagi asosiy yo'nalishlarda qo'llanadi.

#### 1. Dorivor moddalar nomlari

Ko'plab dori moddalarining ilmiy nomlari lotin tilida yoziladi.

Masalan:

**Acidum ascorbinicum**

**Natrii chloridum**

**Magnesii sulfas**

Bu terminlar farmatsevtik nomenklaturaning muhim qismi hisoblanadi.

#### 2. Farmatsevtik shakllar

Dorilarning farmatsevtik shakllari ham lotin tilida ifodalanadi.

Masalan:

**Tabulettae** — tabletkalar

**Unguentum** — malham

**Solutio** — eritma

**Pulvis** — kukun

#### 3. Retseptura

Retsept yozish jarayonida lotin tilidan keng foydalaniladi.

Masalan:

**Rp. (Recipe)** — ol

**Misce** — aralashtir

**Da** — ber

**Signa** — belgilab yoz

#### 4. Farmakopeya terminlari

Farmakopeyalarda dorivor moddalar va preparatlar nomlari lotin tilida beriladi.

Masalan:

**Extractum, Tinctura, Decoctum**

## **Muhokama**

*Farmatsevtik terminologiya tizimi ko'p asrlik ilmiy an'analarga asoslangan bo'lib, unda lotin tili muhim o'rin egallaydi. Farmatsevtika sohasida qo'llaniladigan ko'plab terminlar, jumladan dorivor moddalar nomlari, farmatsevtik shakllar, retsept yozish qoidalari va farmakopeya terminlari lotin tiliga asoslangan. Bu holat farmatsevtik terminologiyaning xalqaro miqyosda yagona va tushunarli bo'lishini ta'minlaydi.*

*Lotin tilining farmatsevtik terminologiyada keng qo'llanilishining asosiy sababi uning universalligi va barqarorligidir. Lotin tili tarixiy jihatdan o'zgarmas til sifatida qaraladi, bu esa terminlarning ma'nosini uzoq vaqt davomida aniq saqlab qolish imkonini beradi. Turli mamlakatlarda ishlab chiqariladigan dori vositalarining nomlanishi ko'pincha lotin terminlariga asoslangan bo'lib, bu esa farmatsevtlar va shifokorlar o'rtasidagi ilmiy muloqotni osonlashtiradi.*

*Farmatsevtik terminologiyada lotin tilining morfologik imkoniyatlari ham katta ahamiyatga ega. Dorivor moddalar nomlari ko'pincha lotin tilidagi o'zak, prefiks va suffikslar yordamida shakllantiriladi. Masalan, kimyoviy moddalarning nomlari yoki dorivor preparatlarning xalqaro nomlanishida lotin tilining termin elementlari keng qo'llaniladi. Bu esa yangi farmatsevtik terminlarni yaratishda muhim lingvistik asos bo'lib xizmat qiladi.*

*Retsept yozish jarayonida ham lotin tilining o'rni alohida ahamiyatga ega. Retseptlarning asosiy qismi an'anaviy ravishda lotin tilida yoziladi. Masalan, Recipe (Rp.), Misce, Da, Signa kabi terminlar farmatsevtik amaliyotda keng qo'llanadi. Ushbu terminlar dorivor moddalarni tayyorlash, aralashtirish va bemorga qo'llash bo'yicha ko'rsatmalarni ifodalaydi. Lotin tilidagi retsept tizimi qisqa va aniq ifoda vositasini ta'minlagani sababli tibbiyot amaliyotida muhim ahamiyat kasb etadi.*

*Farmakopeya tizimida ham lotin tilining o'rni katta. Xalqaro farmakopeyalarda dorivor moddalar nomlari ko'pincha lotin tilida beriladi. Bu esa farmatsevtik mahsulotlarni standartlashtirish va ularning sifatini nazorat qilish jarayonida muhim rol o'ynaydi. Lotin terminlari orqali dori moddalari nomlanishi ularning xalqaro miqyosda bir xil tushunilishini ta'minlaydi.*

*Shuningdek, lotin tilining farmatsevtik terminologiyada qo'llanilishi farmatsevtika yo'nalishida tahsil olayotgan talabalar uchun ham katta ahamiyatga ega. Lotin terminologiyasini o'rganish orqali talabalar dorivor moddalar nomlarining kelib chiqishi, tuzilishi va ma'nosini chuqurroq tushunadilar. Bu esa ularning kasbiy kompetensiyasini oshirishga va ilmiy tafakkurini rivojlantirishga yordam beradi.*

*Zamonaviy ilmiy kommunikatsiyada ingliz tilining roli ortib borayotgan bo'lsa-da, farmatsevtik terminologiyada lotin tilining ahamiyati saqlanib qolmoqda. Ko'plab zamonaviy farmakologik atamalar ham lotin tiliga asoslangan holda shakllangan. Shu sababli lotin tili farmatsevtik terminologiyaning tarixiy va lingvistik asosi sifatida bugungi kunda ham o'z ahamiyatini yo'qotmagan.*

*Umuman olganda, farmatsevtik terminologiyada lotin tilining qo'llanilishi ilmiy aniqlik, terminologik barqarorlik va xalqaro standartlashuvni ta'minlaydi. Bu esa farmatsevtika sohasining rivojlanishida muhim omil bo'lib xizmat qiladi.*

### **Xulosa**

Farmatsevtik terminologiyada lotin tili muhim ahamiyatga ega. Dorivor moddalar nomlari, farmatsevtik shakllar, retseptura hamda farmakopeya terminlari lotin tiliga asoslanadi.

Lotin tilining universalligi farmatsevtik terminologiyaning xalqaro standartlashuvini ta'minlaydi. Shu sababli farmatsevtika va tibbiyot sohalarida lotin tilini o'rganish muhim hisoblanadi.

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## **LOTIN TILIDA SINONIMIYA VA DUBLET TERMINLAR**

**Annotatsiya:** Lotin tili tibbiy va ilmiy terminologiyaning shakllanishida muhim rol o'ynaydi. Ilmiy terminologiya tizimida sinonimiya va dublet terminlar keng uchraydi. Sinonimiya bir xil yoki o'xshash ma'noni ifodalovchi turli terminlarning mavjudligini bildirsa, dublet terminlar esa bir xil tushunchani ifodalovchi, ammo turli til manbalaridan kelib chiqqan terminlar hisoblanadi. Mazkur maqolada lotin tilida sinonimiya va dublet terminlarning shakllanish sabablari, ularning lingvistik xususiyatlari hamda tibbiy terminologiyadagi ahamiyati tahlil qilinadi. Tadqiqot natijalari shuni ko'rsatadiki, tibbiy terminologiyada sinonim terminlar ko'pincha lotin va yunon tilidan kelib chiqqan variantlar sifatida mavjud bo'ladi. Dublet terminlar esa ilmiy terminologiyaning tarixiy rivojlanishi natijasida shakllangan. Ushbu hodisalar terminologik tizimni boyitadi, ammo ayrim hollarda terminlarning standartlashuviga ham ta'sir ko'rsatishi mumkin.

**Kalit so'zlar:** lotin tili, sinonimiya, dublet terminlar, tibbiy terminologiya, ilmiy terminlar, terminologiya, lingvistika.

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## **SYNONYMY AND DOUBLET TERMS IN THE LATIN LANGUAGE**

**Abstract:** *The Latin language plays an important role in the formation of medical and scientific terminology. In the system of scientific terminology, the phenomena of synonymy and doublet terms are widely observed. Synonymy refers to the presence of different terms expressing the same or similar meaning, whereas doublet terms denote the same concept but originate from different linguistic sources. This article analyzes the reasons for the formation of synonymy and doublet terms in Latin, their linguistic characteristics, and their significance in medical terminology. The results of the study show that in medical terminology synonymous terms often exist as variants derived from Latin and Greek languages. Doublet terms have developed as a result of the historical evolution of scientific terminology. These phenomena enrich the terminological system; however, in some cases they may also influence the standardization of terms.*

**Keywords:** *Latin language, synonymy, doublet terms, medical terminology, scientific terms, terminology, linguistics.*

### **Kirish**

Lotin tili ko‘p asrlar davomida ilm-fan, tibbiyot va farmatsevtika sohalarining asosiy terminologik manbasi bo‘lib xizmat qilib kelmoqda. Bugungi kunda ham ko‘plab ilmiy terminlar lotin tiliga asoslangan holda shakllangan. Tibbiy terminologiya tizimi o‘zining murakkabligi va boyligi bilan ajralib turadi.

Terminologiya tizimida sinonimiya va dublet terminlar muhim lingvistik hodisalardan biri hisoblanadi. Sinonim terminlar bir xil yoki yaqin ma‘noni ifodalovchi terminlar bo‘lib, ular ko‘pincha turli tarixiy yoki lingvistik manbalardan kelib chiqadi. Dublet terminlar esa bir xil tushunchani ifodalovchi, ammo turli shaklga ega bo‘lgan terminlar hisoblanadi.

Tibbiy terminologiyada sinonim va dublet terminlarning mavjudligi ko‘pincha yunon va lotin tillarining o‘zaro ta’siri bilan bog‘liq. Masalan, ko‘plab anatomik va klinik terminlar lotincha va yunoncha variantlarga ega.

Mazkur maqolaning maqsadi — lotin tilida sinonimiya va dublet terminlarning shakllanish sabablarini o‘rganish hamda ularning tibbiy terminologiyadagi o‘rnini tahlil qilishdir.

### **Materiallar va metodlar**

Tadqiqot jarayonida tibbiy terminologiya, lotin tili va lingvistika sohalariga oid ilmiy adabiyotlar o‘rganildi.

Material sifatida lotin tili va tibbiy terminologiya bo‘yicha darsliklar, terminologik lug‘atlar hamda ilmiy maqolalar tanlab olindi. Sinonim va dublet terminlarning kelib chiqishi, tuzilishi va semantik xususiyatlari tahlil qilindi.

### **Natijalar**

Tadqiqot natijalari lotin tilida sinonimiya va dublet terminlar keng uchrashini ko‘rsatdi.

#### **1. Sinonim terminlar**

Sinonim terminlar bir xil tushunchani ifodalovchi turli terminlar hisoblanadi. Masalan:

**Ren – Nephros** (buyrak)

**Cutis – Derma** (teri)

**Os – Osteon** (suyak)

Bu terminlarning biri lotin tilidan, ikkinchisi esa yunon tilidan kelib chiqqan.

## 2. Dublet terminlar

Dublet terminlar ham bir xil tushunchani bildiradi, ammo ular turli shaklda qo'llaniladi.

Masalan:

**Haemorrhagia – Sanguinatio**

**Morbus – Pathologia**

**Medicus – Doctor**

Dublet terminlar terminologiyaning tarixiy rivojlanishi natijasida shakllangan.

## 3. Sinonimiyaning sabablari

Sinonim terminlarning paydo bo'lishiga quyidagi omillar sabab bo'ladi:

turli til manbalari (lotin va yunon tillari);

tarixiy rivojlanish;

ilmiy maktablar farqi;

terminologik tarjimalar.

## 4. Terminologik standartlashuv

Zamonaviy tibbiyotda terminlarning yagona standart shaklini qo'llashga e'tibor qaratiladi. Shu sababli xalqaro terminologiya tizimlarida ko'pincha bitta termin asosiy termin sifatida qabul qilinadi.

## **Muhokama**

*Ilmiy terminologiya tizimi ko'p bosqichli tarixiy rivojlanish jarayonida shakllangan bo'lib, unda turli lingvistik hodisalar, jumladan sinonimiya va dublet terminlar muhim o'rin tutadi. Lotin tili tibbiy terminologiyaning asosiy manbalaridan biri bo'lib, uning rivojlanishida yunon tili bilan o'zaro ta'siri muhim rol o'ynagan. Aynan shu tarixiy jarayon natijasida tibbiy terminologiyada ko'plab sinonim va dublet terminlar shakllangan.*

*Sinonimiya terminologiyada bir xil yoki o'xshash ma'noni ifodalovchi turli terminlarning mavjudligi bilan izohlanadi. Tibbiy terminologiyada bunday holat ko'pincha lotin va yunon tillarining parallel ravishda qo'llanilishi bilan bog'liq. Masalan, ayrim anatomik yoki klinik tushunchalar lotincha va yunoncha variantlarga ega bo'lishi mumkin. Bunday terminlar ilmiy matnlarda yoki turli ilmiy maktablarda turlicha qo'llanilishi mumkin. Bu holat terminologik tizimning boyligini ko'rsatadi, chunki bir tushuncha turli lingvistik shakllarda ifodalanadi.*

*Dublet terminlar esa ko'pincha bir xil tushunchani ifodalovchi, lekin kelib chiqishi yoki shakli jihatidan farq qiladigan terminlardir. Bunday terminlar terminologiyaning tarixiy rivojlanishi natijasida shakllangan bo'lib, ular ko'pincha ilmiy tilning evolyutsiyasi bilan bog'liq. Masalan, ayrim terminlar lotin tilidan to'g'ridan-to'g'ri olingan bo'lsa, boshqalari yunon tilidan kirib kelgan yoki keyinchalik lotinlashtirilgan shaklda qo'llanila boshlagan. Shu sababli tibbiy terminologiyada bir tushunchani ifodalovchi bir nechta termin shakllari mavjud bo'lishi mumkin.*

*Sinonimiya va dublet terminlarning mavjudligi ilmiy terminologiyaning rivojlanishida muhim rol o'ynaydi. Bir tomondan, ular terminologik tizimni boyitadi va ilmiy tilning ekspressiv imkoniyatlarini kengaytiradi. Ikkinchi tomondan, bu hodisa ayrim hollarda terminlarning standartlashuvi jarayonida muammolarni ham yuzaga keltirishi mumkin. Chunki bir xil tushunchani ifodalovchi turli terminlarning mavjudligi ilmiy kommunikatsiyada noaniqliklarga sabab bo'lishi ehtimoli mavjud.*

*Shu sababli zamonaviy ilmiy terminologiya tizimida terminlarni standartlashtirish muhim vazifa hisoblanadi. Xalqaro tibbiy nomenklatura tizimlari aynan shu maqsadda ishlab chiqilgan bo'lib, ular terminlarning yagona shaklini belgilashga xizmat qiladi. Biroq shunga qaramay, sinonim va dublet terminlar ilmiy adabiyotlarda hamon uchrab turadi va ular terminologik tizimning tarixiy va lingvistik boyligini aks ettiradi.*

*Lotin tilining grammatik va morfologik barqarorligi sinonim va dublet terminlarning tizimli ravishda shakllanishiga ham yordam beradi. Lotin tilida terminlar ko'pincha aniq morfologik modellar asosida hosil qilinadi. Bu esa terminlarning tuzilishi va ma'nosini oson tushunishga imkon yaratadi. Ayniqsa tibbiyot va biologiya sohalarida terminlarning aniq va tushunarli bo'lishi ilmiy muloqotning samarali bo'lishida muhim omil hisoblanadi.*

*Zamonaviy ilmiy kommunikatsiyada ingliz tilining roli ortib borayotgan bo'lsa-da, tibbiy terminologiyaning asosiy qismi hanuz lotin va yunon termin elementlariga asoslangan. Bu esa lotin tilining ilmiy terminologiyadagi ahamiyati saqlanib qolayotganini ko'rsatadi. Shuning uchun lotin tilini o'rganish tibbiyot yo'nalishida tahsil olayotgan talabalar uchun muhim hisoblanadi. Bu bilim ularga terminlarning kelib chiqishi, tuzilishi va semantik ma'nosini chuqurroq tushunishga yordam beradi.*

*Umuman olganda, lotin tilida sinonimiya va dublet terminlar ilmiy terminologiyaning muhim lingvistik hodisalari hisoblanadi. Ular terminologik tizimning rivojlanish jarayonini aks ettiradi va ilmiy tilning boyligini namoyon etadi. Shu bilan birga, terminlarning aniq va standart shaklda qo'llanishi ilmiy kommunikatsiya samaradorligini ta'minlash uchun muhim ahamiyatga ega.*

### **Xulosa**

Lotin tilida sinonimiya va dublet terminlar tibbiy terminologiyaning muhim lingvistik hodisalaridan biri hisoblanadi. Bu terminlar ko'pincha lotin va yunon tillarining o'zaro ta'siri natijasida shakllangan.

Sinonim va dublet terminlar terminologiyani boyitadi, ammo terminologik tizimda aniqlikni saqlash uchun standart terminlardan foydalanish muhim hisoblanadi.

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## FUNKSIYA HOSILASINING ELEKTRONIKA SOHASIGA TATBIQLARI

**Annotatsiya:** Ushbu maqolada funksiya hosilasining elektronika sohasidagi amaliy qo'llanilishi yoritilgan. Xususan, hosila yordamida elektr signallarning o'zgarish tezligini aniqlash usullari ko'rib chiqiladi. Mazkur yondashuv orqali turli amaliy masalalarda hosiladan foydalanish imkoniyatlari sodda va tushunarli usullar bilan bayon etiladi hamda misollar orqali amaliy jihatdan ko'rsatib beriladi.

**Kalit so'zlar:** funksiya hosilasi, elektronika, signal tezligi, amaliy masalalar, matematik usullar.

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## APPLICATION OF THE DERIVATIVE FUNCTION IN ELECTRONICS

**Annotation:** This article explores the practical applications of the derivative of a function in the field of electronics. In particular, it highlights how derivatives can be used to determine the rate of change of electrical signals. The discussion emphasizes simple and accessible methods, supported by illustrative examples that demonstrate the practical significance of this approach in solving applied problems.

**Keywords:** function derivative, electronics, signal rate, applied problems, mathematical methods

Ma'lumki elektronika - bu elektr zanjirlarida elektronlarning harakatini o'rganadigan va boshqaradigan fan va texnologiya sohasi. Elektronikada ma'lumki analog va raqamli signallarni qayta ishlash va uzatish muhim o'rin tutadi.

Hosila esa - bu matematik tushuncha bo'lib, funksiya qiymatining o'zgarish tezligini ifodalaydi. Hosilanig **geometrik ma'nosi** egri chiziqning tangens burchagini aniqlasa, uning **mexanik ma'nosi** harakatlanayotgan jismlarning tezligi va tezlanishini hisoblashdir, **fizik maa'nosi esa** elektr va magnit maydonlarning o'zgarishini hisoblashdan iborat.

Elektronika va hosila bir-biriga chambarchas bog'liq. Hosila elektronika sohasida quyidagi jihatlarlarda muhim rol o'ynaydi:

**Signalni qayta ishlash:** Hosila signallarni qayta ishlashda muhim rol o'ynaydi. Analog va raqamli signallarni tahlil qilishda hosila yordamida signallarning



o'zgarish tezligini aniqlash mumkin. Bu esa filtrlar va boshqa signal qayta ishlash tizimlarining samaradorligini oshiradi.

**Elektr zanjirlarining tahlili:** Elektr zanjirlaridagi kuchlanish va tokning vaqtga bog'liq o'zgarishlarini hosila yordamida tahlil qilish mumkin. Bu zanjirlarning dinamik xususiyatlarini tushunishga va optimallashtirishga yordam beradi.

**Avtomatika va boshqaruv tizimlari:** PID regulyatorlar va boshqa boshqaruv tizimlarida hosila yordamida tizimning javobini optimallashtirish mumkin. Bu avtomatika va boshqaruv tizimlarining samaradorligini oshiradi va ularni yanada aniqroq qiladi.

Ushbu tushunchalar elektronika sohasida muhim ahamiyatga ega bo'lib, turli xil qurilmalar va tizimlarning samarali ishlashini ta'minlaydi. Albatta, hosila yordamida signallarning o'zgarish tezligini aniqlashga oid amaliy masala qarab o'tamiz.

**1-masala.** Sizga analog signal berilgan:

$$V(t) = 5(\sin(2\pi \cdot 50t) + 2\sin(2\pi \cdot 120t))$$

Ushbu signal ikkita sinusoidal komponentdan iborat: biri 50 Hz chastotali, ikkinchisi esa 120 Hz chastotali. Bizdan past chastotali filtr yordamida yuqori chastotali komponentni (120 Hz) yo'q qilish talab etiladi.

**Yechish:** Signallarning hosilasini hisoblab olamiz.

$$V'(t) = 5 \cdot 2\pi \cdot 50 \cos(2\pi \cdot 50t) + 2 \cdot 2\pi \cdot 120 \cos(2\pi \cdot 120t)$$

$$V'(t) = 500\pi \cos(2\pi \cdot 50t) + 480\pi \cos(2\pi \cdot 120t)$$

Past chastotali filtrning uzatish funksiyasi:

$$H(f) = \frac{1}{1 + j \frac{f}{f_c}}$$

bu yerda  $f_c$  - kesish chastotasi. Masalan  $f_c = 100$  Hz deb olamiz. Endi fil'trni qo'llashda filtrning chastotasini javobini hisoblaymiz.

$$H(50) = \frac{1}{1 + j \frac{50}{100}} = \frac{1}{1 + j0,5}$$

$$H(120) = \frac{1}{1 + j \frac{120}{100}} = \frac{1}{1 + j1,2}$$

**Endi natijaviy signal** haqida xulosa qilish mumkinki,

$$V_{filtrli}(t) \approx 5\sin(2\pi \cdot 50t)$$

past chastotali komponent (50 Hz) filtrdan to'liq o'tadi, yuqori chastotali komponent (120 Hz) esa o'tish jarayonida susayadi.

Xulosa qilish mumkinki, hosila yordamida signalning o'zgarish tezligini aniqlash va past chastotali filtr yordamida yuqori chastotali komponentni yo'q qilish

mumkin. Bu usul signalni qayta ishlashda va filtrlarning samaradorligini oshirishda keng qo'llaniladi.

**2-Masala:** Sizga avtomobilning tezligini o'lchaydigan elektron qurilma dizayni topshirildi. Qurilma avtomobilning tezlanishini (hosila) aniqlab, haydovchiga ogohlantirish signali berishi kerak. Avtomobilning tezligi vaqtga bog'liq ravishda

$v(t) = 3t^2 + 2t + 5$  funksiyasi bilan ifodalanadi.

**Yechish:** Dastlab tezlanishni hisoblaymiz, ma'lumki tezlanish-bu tezlikning vaqt bo'yicha hosilasidir.

$a(t) = v'(t) = (3t^2 + 2t + 5)' = 6t + 2$

**Elektron qurilma ishlash jarayoni quyidagichadir.**

-Qurilma avtomobilning tezlanishini real vaqt rejimida hisoblab, haydovchiga ogohlantirish signali berishi kerak.

-Qurilma tezlik sensoridan olingan ma'lumotlarni qayta ishlaydi va hosila yordamida tezlanishni aniqlaydi.

-Agar tezlanish ma'lum bir chegaradan oshsa, qurilma haydovchiga ogohlantirish signali beradi.

**Elektron qurilma amaliy qo'llanilishi:**

-Tezlik sensori avtomobilning tezligini o'lchaydi va bu ma'lumotni mikrokontrollerga yuboradi.

-Mikrokontroller hosila yordamida tezlanishni hisoblaydi.

Tezlanish  $a(t) = 6t + 2$  bo'yicha hisoblanadi. Agar tezlanish xavfli darajaga yetgan bo'lsa, mikrokontroller ogohlantirish signalini yoqadi.

**Xulosa** qilish mumkimki, ushbu amaliy misol hosilaning elektron qurilmalarda qanday qo'llanilishini ko'rsatadi. Tezlik va tezlanishni aniqlash orqali avtomobilning xavfsizligini oshirish mumkin. Hosila yordamida real vaqt rejimida ma'lumotlarni qayta ishlash va kerakli choralarni ko'rish mumkin. Funksiyaning hosilasi matematik hisoblashlarda katta amaliy ahamiyatga ega. Bu atrofimizdagi dunyoga hech qanday aloqasi bo'lmagan mavhum matematika emas. Ko'pgina haqiqiy tabiiy jarayonlar funksiya hosilasi tatbiqlari yordamida hisoblangan [1-10]. Funksiyaning hosilasi biologiya, kimyo, iqtisod va boshqa ko'plab sohalarda ham keng qo'llaniladi.

**Foydalanilgan adabiyotlar.**

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## **DEVELOPMENT OF THE BANKING SECTOR IN UZBEKISTAN IN THE DIGITAL ECONOMY**

**Abstract:** *This research investigates the impact of digital transformation on the performance and stability of Uzbekistan's banking sector within the context of a transition economy. Using annual time-series data from 2010 to 2024, the analysis focuses on descriptive statistics, correlation analysis, unit root testing, and regression techniques to evaluate the effects of digitalization on improvements in banking operations. Digital transformation is provided by indicators that reflect banking efficiency, liquidity management, and risk mitigation. In addition, the analysis incorporates key macro-financial control variables such as external debt, bank capital adequacy, nonperforming loans, real interest rates, foreign direct investment, inflation, and bank liquidity, to ensure a comprehensive assessment of the determinants of banking sector performance and stability.*

*The empirical findings indicate that banking sector performance is jointly determined by internal stability indicators and broader macro-financial conditions. Strong capital adequacy and lower levels of nonperforming loans contribute positively to financial stability, whereas external debt, real interest rates, and foreign direct investment exert statistically significant influences on banking performance. Inflation and liquidity conditions also demonstrate meaningful effects, highlighting the critical role of macroeconomic stability and regulatory frameworks. Overall, the results suggest that digital transformation enhances banking sector performance when accompanied by effective governance, robust risk management practices, and strong institutional support.*

**Keywords:** *Digital transformation; Banking sector performance; Financial stability; Banking efficiency; Liquidity management; Risk management; Transition economy;*

### **Introduction**

In recent decades, the rapid expansion of the digital economy has fundamentally transformed the global financial landscape. Innovations in mobile communication technologies, cloud computing, artificial intelligence (AI), and distributed ledger technologies (DLT) have significantly reshaped banking operations, financial intermediation, and monetary systems at an unprecedented pace<sup>10</sup> (Arner, Barberis, & Buckley, 2016). Banks across the world increasingly adopt digital solutions to improve operational efficiency, enhance customer experience, and respond to growing competition from not only financial technology firms but also large technology companies. International organizations emphasize

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<sup>10</sup> (Arner, Barberis, & Buckley, 2016)

that digital finance plays an important role in promoting productivity growth, financial inclusion, and sustainable economic development<sup>11</sup> (OECD, 2020; IMF, 2022).

At the same time, digital transformation introduces new challenges for the financial sector. These include increased market concentration, cybersecurity threats, data protection issues, and potential labor market polarization caused by automation (BIS, 2020; Acemoglu & Restrepo, 2020). Consequently, the digital transformation of banking systems has become a key topic in global economic and financial policy discussions.

Empirical studies from advanced economies provide important insights into the effects of digitalization on banking systems. In the United States and Western Europe, digital banking development has been supported by strong institutional frameworks, advanced digital infrastructure, and proactive regulatory reforms. Policy initiatives such as the European Union's Payment Services Directive (PSD2) and the United Kingdom's Open Banking framework have encouraged competition, interoperability, and secure data sharing, contributing to the growth of financial technology ecosystems<sup>12</sup> (Zetzsche et al., 2020). Research from these regions suggests that digital banking can improve efficiency and financial inclusion; however, it may also increase systemic risks if regulatory frameworks do not adapt adequately to technological change<sup>13</sup> (FSB, 2019; BIS, 2021).

Despite these findings, evidence from advanced economies cannot be directly applied to developing and transition economies, where financial markets are less mature and institutional capacity and digital readiness differ significantly. In such contexts, digital transformation may produce different outcomes and pose additional risks.

Uzbekistan's banking system has experienced substantial transformation since gaining independence in 1991. For many years, the sector was characterized by strong state participation, limited competition, and low levels of technological development, with banks primarily performing administrative and fiscal functions<sup>14</sup> (World Bank, 2019; IMF, 2020). However, economic reforms initiated after 2016 marked the beginning of comprehensive modernization of the financial sector, including banking sector liberalization, institutional restructuring, and increased emphasis on digitalization<sup>15</sup> (Central Bank of Uzbekistan, 2021; World Bank, 2022).

Digital transformation has become a strategic priority under the national development strategy "Digital Uzbekistan–2030." The rapid expansion of digital financial services, financial technology platforms, payment systems, and open banking initiatives has significantly changed banking operations in the country<sup>16</sup>

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<sup>11</sup> (OECD, 2020; IMF, 2022).

<sup>12</sup> (Zetzsche et al., 2020).

<sup>13</sup> (FSB, 2019; BIS, 2021).

<sup>14</sup> (World Bank, 2019; IMF, 2020).

<sup>15</sup> (Central Bank of Uzbekistan, 2021; World Bank, 2022).

<sup>16</sup> (Government of the Republic of Uzbekistan, 2020; World Bank, 2022)

(Government of the Republic of Uzbekistan, 2020; World Bank, 2022). According to the Central Bank of Uzbekistan, by 2025 approximately 87 percent of active banking clients use digital services, representing a 2.4-fold increase compared to 2020<sup>17</sup> (Central Bank of Uzbekistan, 2024). These developments have contributed to improved financial inclusion, particularly in rural areas, and enhanced access to finance for small and medium-sized enterprises (SMEs) through digital lending platforms<sup>18</sup> (IMF, 2023; World Bank, 2022).

Nevertheless, Uzbekistan continues to face challenges typical of emerging economies, including gaps in digital literacy, uneven internet infrastructure, limited regulatory and supervisory capacity, cybersecurity risks, and dependence on foreign digital technologies<sup>19</sup> (World Bank, 2021; IMF, 2022; BIS, 2020). These structural challenges highlight the need for a careful and evidence-based assessment of how digital transformation affects banking performance and broader economic outcomes in a transition economy such as Uzbekistan<sup>20</sup> (OECD, 2020; World Bank, 2022).

The primary objective of this study is to analyze the role of digital transformation in shaping the development of Uzbekistan's banking system and its implications for economic performance. Specifically, the study aims to:

- assess how digital technologies influence banking efficiency, stability, and service delivery in Uzbekistan;
- examine the relationship between banking sector transformation and macroeconomic indicators such as inflation, external finance, and investment;
- identify institutional and regulatory factors that condition the effectiveness of digital banking reforms; and
- provide policy recommendations to support sustainable and inclusive digital banking development.

This study is significant as it provides empirical evidence on the impact of digital transformation on the banking sector and broader economic performance in Uzbekistan, a transition economy that remains underrepresented in the existing literature<sup>21</sup> (World Bank, 2022; IMF, 2023). By examining the interaction between digitalization, banking efficiency, financial stability, and macroeconomic outcomes, the study contributes to a deeper understanding of how digital financial reforms can support sustainable and inclusive economic growth<sup>22</sup> (OECD, 2020; BIS, 2021). The findings are expected to offer practical insights for policymakers, financial regulators, and banking institutions in designing effective digital finance strategies.

The remainder of the study is structured as follows. The first section introduces the research context, problem statement, objectives, and scope of the study. The second section reviews relevant academic and policy literature on digital finance, financial technology innovation, and banking sector development,

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<sup>17</sup> (Central Bank of Uzbekistan, 2024).

<sup>18</sup> (IMF, 2023; World Bank, 2022).

<sup>19</sup> (World Bank, 2021; IMF, 2022; BIS, 2020)

<sup>20</sup> (OECD, 2020; World Bank, 2022).

<sup>21</sup> (World Bank, 2022; IMF, 2023).

<sup>22</sup> (OECD, 2020; BIS, 2021)



identifying key theoretical approaches and research gaps<sup>23</sup> (Zetzsche et al., 2020). The third section presents the methodology, data sources, and econometric techniques used to analyze the relationship between digital transformation, banking performance, and macroeconomic outcomes for the period 2010–2024. The fourth section discusses the empirical results, focusing on the effects of digitalization on banking efficiency, stability, and economic performance. The final section concludes with policy recommendations aimed at promoting innovation, strengthening financial governance, and supporting sustainable economic growth.

### **Literature review**

In advanced economies, the digital transformation of the banking sector is primarily supported by strong institutions, sophisticated digital infrastructure, and adaptive regulatory frameworks. In the United States and the European Union, digital banking has contributed to higher operational efficiency, reduced transaction costs, and expanded access to financial services<sup>24</sup> (Philippon, 2019; Zetzsche et al., 2020). Initiatives such as the EU's PSD2 Directive and the United Kingdom's Open Banking framework have strengthened competition and accelerated financial technology innovation, fostering financial inclusion and investment efficiency<sup>25</sup> (FSB, 2019; BIS, 2021). In these economies, digitalization is closely associated with productivity gains, financial stability, and dynamic capital allocation.

In contrast, emerging and transition economies face more complex challenges in leveraging digital banking. While digital financial technologies can enhance financial inclusion, reduce transaction costs, and improve credit allocation, their impact is often constrained by limited institutional capacity, uneven digital infrastructure, and weaker regulatory enforcement<sup>26</sup> (World Bank, 2022; IMF, 2022). For example, smaller banks and state-owned institutions frequently struggle to adopt advanced cybersecurity and data interoperability systems, which may exacerbate structural inequalities within the banking sector<sup>27</sup> (Arner et al., 2020; BIS, 2021). Consequently, the benefits of digitalization in these contexts are uneven, and the risks related to financial stability, cybersecurity, and market concentration are higher.

### **Novelty**

The novelty of this study lies in its focus on Uzbekistan, a transition economy that has received limited attention in the literature. Unlike prior studies, this research integrates digital banking transformation, banking sector performance, and macroeconomic outcomes into a single empirical framework, allowing for a more comprehensive understanding of how technological adoption interacts with institutional quality, financial stability, and economic growth in a developing context<sup>28</sup> (IMF, 2022; World Bank, 2022).

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<sup>23</sup> (Zetzsche et al., 2020).

<sup>24</sup> (Philippon, 2019; Zetzsche et al., 2020)

<sup>25</sup> (FSB, 2019; BIS, 2021)

<sup>26</sup> (World Bank, 2022; IMF, 2022)

<sup>27</sup> (Arner et al., 2020; BIS, 2021).

<sup>28</sup> (IMF, 2022; World Bank, 2022).

## Methodological Advances

Methodologically, prior research on digital finance often follows one of two approaches. The first approach uses descriptive or case-based analyses to examine financial technology ecosystems, regulatory reforms, and technological innovations<sup>29</sup> (Arner et al., 2016; Zetzsche et al., 2020). The second approach employs macroeconomic or panel-data models to explore the relationship between financial development, digitalization, and economic growth<sup>30</sup> (Beck et al., 2016; Philippon, 2019). While informative, these methods rarely combine sector-specific indicators, macroeconomic variables, and institutional characteristics within a single analytical framework.

## Research Gap

Despite the growing body of literature on digital finance, several gaps remain. First, most empirical studies focus on developed economies, limiting their applicability to emerging and transition economies with lower financial depth and digital readiness<sup>31</sup> (OECD, 2020; BIS, 2021). Second, few studies examine the interaction between digital banking adoption and institutional factors such as governance quality, regulatory enforcement, and cybersecurity preparedness<sup>32</sup> (Arner et al., 2020; IMF, 2022). Third, sector-level differences, including the capacity of small and medium-sized banks to implement digital and cybersecurity systems, are largely understudied, despite evidence that digital transformation can exacerbate structural inequalities within the banking sector<sup>33</sup> (BIS, 2021; World Bank, 2022).

This research addresses these gaps by providing an integrated empirical analysis of Uzbekistan's digital banking transformation, capturing interactions between technology adoption, banking performance, institutional quality, and macroeconomic outcomes. In doing so, it contributes both context-specific evidence for a transition economy and methodological advances that can inform future studies in similar emerging markets.

## Methodology

**Theoretical Framework:** This study examines the effects of digital transformation on the performance and stability of Uzbekistan's banking sector within a transition-economy context. The analysis is anchored in three complementary theoretical perspectives: endogenous growth theory, Schumpeterian innovation theory, and financial intermediation theory. Endogenous growth theory emphasizes the role of technological innovation and knowledge accumulation as drivers of productivity and long-term economic growth<sup>34</sup> (Romer, 1990). Schumpeterian innovation theory highlights the transformative impact of technological advancement on traditional banking operations, enhancing efficiency,

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<sup>29</sup> (Arner et al., 2016; Zetzsche et al., 2020)

<sup>30</sup> (Beck et al., 2016; Philippon, 2019).

<sup>31</sup> (OECD, 2020; BIS, 2021).

<sup>32</sup> (Arner et al., 2020; IMF, 2022)

<sup>33</sup> (BIS, 2021; World Bank, 2022).

<sup>34</sup> (Romer, 1990)

competitiveness, and financial sector development<sup>35</sup> (Schumpeter, 1934; Arner et al., 2016). Financial intermediation theory explains the role of banks in resource allocation, risk management, and macroeconomic stability<sup>36</sup> (Diamond & Dybvig, 1983). Collectively, these frameworks support the hypothesis that digital banking technologies improve operational efficiency, strengthen risk management, and enhance the resilience of financial institutions.

Digitalization is conceptualized as a structural mechanism that reduces transaction costs, mitigates information asymmetries, and enhances liquidity and capital management. In emerging banking systems, these effects extend beyond operational efficiency, improving macro-financial transmission channels and the sector's capacity to absorb shocks. Accordingly, improvements in banking soundness indicators—such as capital adequacy, liquidity ratios, and non-performing loans—are expected to partially reflect the outcomes of digital adoption and supporting institutional reforms.

### Conceptual Framework

The conceptual framework positions digital transformation as the key independent variable influencing banking sector performance and stability, which in turn affects broader macroeconomic outcomes. Within this framework:

- Digital Transformation is measured indirectly through improvements in banking efficiency, liquidity, and stability.
- Banking Performance and Stability include indicators of capital adequacy, asset quality, liquidity management, and risk exposure.
- Macroeconomic Outcomes encompass investment allocation, inflation, external financial inflows, and overall economic growth.
- Institutional Factors such as regulatory capacity, governance quality, cybersecurity readiness, and data protection are treated as moderating variables that influence the relationship between digitalization and banking outcomes.

This framework enables the investigation of both direct effects of digital adoption on banking performance and indirect effects mediated by macroeconomic conditions and institutional quality.

### Empirical Framework

**Model Specification and Variable Selection:** Due to the absence of long-term digitalization indices for developing economies, digital transformation is captured indirectly through banking performance, stability, and liquidity indicators. The baseline empirical model is specified as follows:

$$BankPer_f_t = a_0 + \beta_1 DEBT_t + \beta_2 PORT_t + \beta_3 CAP_t + \beta_4 NPL_t + \beta_5 RIR_t + \beta_6 FDI_t + \beta_7 INF_t + \beta_8 LIQ_t + \varepsilon_t$$

Where:

- **BankPer<sub>t</sub>** – Banking sector performance and stability proxy
- **DEBT<sub>t</sub>** – External debt stocks (% of GNI)
- **CAP<sub>t</sub>** – Bank capital-to-assets ratio (%)

<sup>35</sup> Schumpeter, 1934; Arner et al., 2016).

<sup>36</sup> (Diamond & Dybvig, 1983).

- **NPL<sub>t</sub>** – Bank nonperforming loans to total gross loans (%)
- **RIR<sub>t</sub>** – Real interest rate (%)
- **FDI<sub>t</sub>** – Foreign direct investment, net (BoP, current US\$)
- **INF<sub>t</sub>** – Inflation, consumer prices (annual %)
- **LIQ<sub>t</sub>** – Bank liquid reserves to bank assets ratio (%)
- **E<sub>t</sub>** – Error term

These variables collectively capture banking soundness, risk exposure, liquidity management, macroeconomic stability, and external financial integration—dimensions that are expected to be influenced by digital banking transformation.

To account for persistence in banking performance, a dynamic specification is applied:

$$\text{BankPer } f_t = a_0 + a_1 \text{BankPer } f_{t-1} + \sum \beta_i X_{it} + \varepsilon_t$$

Long-run effects are derived as:

$$LR = \frac{\beta_1}{1 - \alpha_1}$$

All variables are expressed in natural logarithms where appropriate, allowing elasticity-based interpretation of coefficients.

**Estimation Technique:** The study uses annual time-series data for Uzbekistan from 2010 to 2024, enabling comparison between the pre-digital reform period and the period of accelerated digitalization following major financial sector reforms.

The empirical analysis proceeds as follows:

1. Descriptive statistics to analyze trends, volatility, and structural changes in banking and macroeconomic variables.

2. Correlation analysis to assess multicollinearity among independent variables.

3. Log-linear dynamic modeling:

$$\ln \text{BankPer } f_t = a_0 + a_1 \ln \text{BankPer } f_{t-1} + \sum \beta_i \ln X_{it} + \varepsilon_t$$

4. Time-series econometric tests, including stationarity checks, autocorrelation diagnostics, and robustness analyses.

5. Estimations are conducted using **STATA 18** and **EViews 12**, with heteroscedasticity-robust standard errors and adjusted variance–covariance matrices.

This integrated empirical framework allows for a rigorous assessment of how digital transformation affects banking performance and stability, while controlling for macroeconomic conditions and institutional factors, providing evidence relevant to policymakers and banking practitioners in transition economies.

## RESULT and DISCUSSION

The empirical analysis utilizes annual time-series data spanning 2010–2024, comprising 15 observations. The methodological approach integrates descriptive statistics, correlation analysis, unit root testing, and regression estimation to examine the relationships between macroeconomic and financial variables and banking sector outcomes, while ensuring robustness and reliability of the results.

Specifically, banking performance is proxied by the capital-to-assets ratio and the ratio of liquid reserves to total assets, which respectively capture capital adequacy and liquidity management. Banking sector stability is measured using the ratio of non-performing loans to total gross loans, serving as an indicator of credit risk and overall financial soundness. Table X presents the annual evolution of these key indicators in Uzbekistan over the study period, highlighting trends in banking sector performance and stability.

### Descriptive statistics.<sup>37</sup>

Table 1

| Variable  | Bank Perf | DEBT     | CAP      | NPL      | RIR       | FDI      | INF      | LIQ      |
|-----------|-----------|----------|----------|----------|-----------|----------|----------|----------|
| Obs       | 15        | 15       | 15       | 15       | 15        | 15       | 15       | 15       |
| Mean      | .0173333  | 31.0084  | 11.54612 | 2.214108 | 3.234127  | 1.63e+09 | 11.54589 | 13.56067 |
| Std. dev. | .6059051  | 18.85187 | 2.138972 | 1.279474 | 5.849263  | 7.24e+08 | 2.766454 | 4.777363 |
| Min       | -1.1      | 12.51075 | 8.539225 | .7091901 | -13.69141 | 6.23e+08 | 7.518391 | 6.589069 |
| Max       | .95       | 60.91421 | 16.65761 | 5.130225 | 10.60544  | 2.80e+09 | 17.52418 | 20.88413 |

### Correlation matrix<sup>38</sup>

Table 2

|          | BankPerf | DEBT    | CAP     | NPL     | RIR     | FDI     | INF     | LIQ    |
|----------|----------|---------|---------|---------|---------|---------|---------|--------|
| BankPerf | 1.0000   |         |         |         |         |         |         |        |
| DEBT     | -0.5928  | 1.0000  |         |         |         |         |         |        |
| CAP      | -0.2624  | 0.6440  | 1.0000  |         |         |         |         |        |
| NPL      | -0.7476  | 0.6365  | 0.3003  | 1.0000  |         |         |         |        |
| RIR      | -0.0631  | 0.4721  | 0.3987  | 0.4498  | 1.0000  |         |         |        |
| FDI      | -0.1128  | 0.7620  | 0.6952  | 0.3480  | 0.3689  | 1.0000  |         |        |
| INF      | -0.4108  | 0.0001  | 0.1633  | -0.1173 | -0.3895 | -0.1998 | 1.0000  |        |
| LIQ      | 0.5912   | -0.7013 | -0.6709 | -0.2234 | -0.0241 | -0.3980 | -0.5619 | 1.0000 |

<sup>37</sup> analyzed by the author

<sup>38</sup> analyzed by the author

### Augmented Dickey-Fuller Test for Unit root<sup>39</sup>

Table 3

| Variables       | Level               |                | Fisrt Difference    |                   |
|-----------------|---------------------|----------------|---------------------|-------------------|
|                 | ADF Test statistics | P-value        | ADF Test statistics | P-value           |
| <b>BankPerf</b> | <b>-2.551</b>       | <b>0.1035.</b> | <b>-4.081</b>       | <b>0.0010****</b> |
| <b>DEBT</b>     | <b>0.725</b>        | <b>0.9903.</b> | <b>-2.983</b>       | <b>0.0365**</b>   |
| <b>CAP</b>      | <b>-1.925</b>       | <b>0.3205.</b> | <b>-5.126</b>       | <b>0.0000****</b> |
| <b>NPL</b>      | <b>-1.917</b>       | <b>0.3242.</b> | <b>-4.034</b>       | <b>0.0012****</b> |
| <b>RIR</b>      | <b>-2.128</b>       | <b>0.2336.</b> | <b>-3.719</b>       | <b>0.0039****</b> |
| <b>FDI</b>      | <b>-1.628</b>       | <b>0.4683.</b> | <b>-5.833</b>       | <b>0.0000****</b> |
| <b>INF</b>      | <b>-2.503</b>       | <b>0.1148.</b> | <b>-3.588</b>       | <b>0.0060****</b> |
| <b>LIQ</b>      | <b>-1.398</b>       | <b>0.5834.</b> | <b>-2.948</b>       | <b>0.0400**</b>   |

### Regression analysis<sup>40</sup>

Table 4

Number of obs = 15

F(7, 7) = 11.29

Prob > F = 0.0024

R-squared = 0.9186

Adj R-squared = 0.8372

Root MSE = .24445

| Source   | SS         | df | MS         |
|----------|------------|----|------------|
| Model    | 4.72141858 | 7  | .674488368 |
| Residual | .418274721 | 7  | .059753532 |
| Total    | 5.1396933  | 14 | .36712095  |

| <b>BankPerf</b> | <b>Coefficient</b> | <b>Std. err.</b> | <b>t</b>     | <b>P&gt;t</b> | <b>[95% conf.interval]</b> |                 |
|-----------------|--------------------|------------------|--------------|---------------|----------------------------|-----------------|
| <b>DEBT</b>     | <b>-.0175471</b>   | <b>.0194994</b>  | <b>-0.90</b> | <b>0.398</b>  | <b>-.0636557</b>           | <b>.0285616</b> |
| <b>CAP</b>      | <b>-.0019221</b>   | <b>.0868022</b>  | <b>-0.02</b> | <b>0.983</b>  | <b>-.2071767</b>           | <b>.2033326</b> |
| <b>NPL</b>      | <b>-.3160217</b>   | <b>.1003557</b>  | <b>-3.15</b> | <b>0.016</b>  | <b>-.5533252</b>           | <b>.0787183</b> |
| <b>RIR</b>      | <b>.0246885</b>    | <b>.0212494</b>  | <b>1.16</b>  | <b>0.283</b>  | <b>-.0255583</b>           | <b>.0749353</b> |
| <b>FDI</b>      | <b>3.65e-10</b>    | <b>2.95e-10</b>  | <b>1.24</b>  | <b>0.256</b>  | <b>-3.33e-10</b>           | <b>1.06e-09</b> |
| <b>INF</b>      | <b>-.0564614</b>   | <b>.0417029</b>  | <b>-1.35</b> | <b>0.218</b>  | <b>-.155073</b>            | <b>.0421502</b> |
| <b>LIQ</b>      | <b>.0113066</b>    | <b>.0635005</b>  | <b>0.18</b>  | <b>0.864</b>  | <b>-.1388481</b>           | <b>.1614614</b> |
| <b>_cons</b>    | <b>1.105217</b>    | <b>1.99667</b>   | <b>0.55</b>  | <b>0.597</b>  | <b>-3.616157</b>           | <b>5.826592</b> |

<sup>39</sup> analyzed by the author

<sup>40</sup> analyzed by the author



**Descriptive statistics.** Descriptive statistics of key macro-financial variables for Uzbekistan's banking sector over 2010–2024. External debt exhibits significant fluctuations (12.51%–60.91%, mean 31.01%), reflecting varying reliance on external financing compared to relatively stable bank capital adequacy (mean 11.55%), which indicates a generally well-capitalized sector. Non-performing loans remain moderate (0.71%–5.13%, mean 2.21%), suggesting manageable credit risk, whereas real interest rates show substantial volatility (–13.69% to 10.61%), highlighting shifts in monetary conditions. Foreign direct investment inflows are highly variable (USD 0.62–2.80 billion), exceeding the relative stability of domestic liquidity levels (6.59%–20.88%, mean 13.56%), indicating that external factors exert greater influence on banking sector dynamics than internal liquidity management. Inflation (mean 11.55%, range 7.52%–17.52%) also demonstrates persistent variability, further contextualizing the macroeconomic environment. Collectively, these comparisons underscore the differential stability of internal banking metrics versus the volatility of external macro-financial conditions, which is critical for understanding banking sector performance and resilience in a transition economy.

**Correlation Analysis.** The correlation analysis reveals distinct relationships between internal banking metrics and external macro-financial factors. External debt (DEBT) is strongly positively correlated with capital adequacy (CAP, 0.64) and FDI inflows (0.76), indicating that higher external financing is associated with greater capital buffers and foreign investment, but also moderately linked to non-performing loans (0.64) and real interest rates (0.47), suggesting potential credit risk and cost implications. In contrast, inflation (INF) shows limited association with other variables, highlighting its relative independence, while bank liquidity (LIQ) is negatively correlated with DEBT, CAP, FDI, and INF, reflecting compensatory liquidity management. Banking performance is negatively related to DEBT, CAP, NPL, and INF, but positively associated with LIQ (0.59), implying that internal liquidity supports resilience against external and credit risks. Overall, the analysis indicates that internal bank controls and liquidity act counter-cyclically to mitigate the effects of volatile external financing and macroeconomic conditions.

**Stationarity Analysis.** Table 3 reports the results of the Augmented Dickey-Fuller (ADF) tests for all variables at both levels and first differences. At levels, none of the series are stationary, as indicated by p-values exceeding conventional significance thresholds, confirming the presence of unit roots and suggesting that the variables exhibit stochastic trends. After first differencing, stationarity is achieved for all variables at conventional significance levels: CAP, NPL, and FDI are significant at 1%, DEBT and LIQ at 5%, and BankPerf, RIR, and INF at 1–5%. This indicates that differencing is required to stabilize the series and avoid spurious regression results, justifying the use of dynamic or first-differenced specifications in subsequent analyses.

The comparative observation shows that internal banking indicators such as CAP, NPL, and LIQ achieve stationarity after first differencing, reflecting relative structural stability in banking operations, whereas macroeconomic and external variables like DEBT, FDI, and RIR also require differencing, reflecting the more volatile nature of external financing and market conditions. This contrast underscores the differential temporal dynamics of internal versus external determinants of banking sector performance.

**Regression Analysis.** The ordinary least squares (OLS) regression model estimates the determinants of banking sector performance (BankPerf) and exhibits strong explanatory power, with an R-squared of 0.9186 and an F-statistic of 11.29 ( $p = 0.0024$ ), indicating that the selected independent variables collectively explain a substantial portion of the variance in banking performance.

Among the independent variables, non-performing loans (NPL) is the only statistically significant predictor (coefficient =  $-0.316$ ,  $p = 0.016$ ), suggesting that higher credit risk materially reduces banking sector performance. Other internal indicators—CAP ( $p = 0.983$ ) and LIQ ( $p = 0.864$ )—show negative and positive coefficients, respectively, but are not statistically significant, implying that within the observed period, variations in capital buffers and liquidity levels exert limited direct influence on overall bank performance.

External and macroeconomic factors, including DEBT, RIR, FDI, and INF, also do not achieve statistical significance ( $p > 0.1$ ), although the signs of their coefficients provide indicative insights. DEBT and INF are negatively associated with performance, suggesting that elevated external borrowing and inflation may slightly constrain banking efficiency, whereas RIR and FDI are positively associated, hinting at a modest stimulative effect of interest rate adjustments and foreign investment on banking outcomes.

### **Discussion**

This study provides a comprehensive assessment of the impact of digital transformation on Uzbekistan's banking sector performance, stability, and macroeconomic outcomes over the period 2010–2024. The empirical evidence demonstrates that digital adoption—proxied through improvements in operational efficiency, liquidity management, and risk mitigation—positively influences banking sector performance. Internal stability measures, particularly bank capital adequacy (CAP) and non-performing loans (NPL), play a pivotal role in sustaining resilience and moderating dependence on external debt. This aligns with previous research emphasizing the importance of internal risk management in emerging economies undergoing financial modernization<sup>41</sup> (Arner, Barberis, & Buckley, 2016; BIS, 2021).

The analysis further indicates that external macro-financial variables, including external debt (DEBT), real interest rates (RIR), and foreign direct investment (FDI), exert significant influence over banking performance

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<sup>41</sup> (Arner, Barberis, & Buckley, 2016; BIS, 2021).

dynamics. Regression results suggest that higher external borrowing and credit risk are associated with reduced performance, whereas moderate FDI inflows and interest rate adjustments may facilitate operational activity. These findings corroborate the correlation analysis, which highlighted strong interdependencies among DEBT, CAP, FDI, and NPL, illustrating the dual role of internal governance and external macroeconomic conditions in shaping banking outcomes<sup>42</sup> (Philippon, 2019; Zetzsche et al., 2020).

Liquidity management (LIQ) and inflation (INF), while less statistically significant, demonstrate moderate effects, underscoring the relevance of robust regulatory oversight and macroeconomic stability in amplifying the benefits of digitalization. The results indicate that digital transformation alone is insufficient to guarantee enhanced banking performance; instead, it must be complemented by sound capitalization, effective credit risk monitoring, and resilient institutional frameworks. This conclusion aligns with evidence from transition economies, where the interplay between technological adoption and governance capacity determines the success of financial reforms<sup>43</sup> (IMF, 2022; Arner et al., 2016).

### Conclusion

This study provides a comprehensive empirical assessment of the role of digital transformation in shaping the performance, stability, and efficiency of Uzbekistan's banking sector within the context of a transition economy. By employing annual time-series data for the period 2010–2024 and integrating banking-sector indicators with macro-financial variables, the research offers a comparative and analytically grounded perspective on how technological adoption interacts with institutional and macroeconomic conditions.

The findings indicate that digital transformation—proxied through improvements in banking efficiency, liquidity management, and risk control—has a positive association with overall banking sector performance. However, the results clearly demonstrate that the effectiveness of digitalization is conditional rather than automatic. Internal banking factors, particularly asset quality and credit risk management, play a more decisive role than external macroeconomic variables in determining banking sector outcomes. This is evidenced by the statistically significant negative effect of non-performing loans on banking performance, highlighting that digital tools enhance performance primarily when accompanied by strong risk governance and prudent lending practices (Arner, Barberis, & Buckley, 2016; BIS, 2021).

A comparative analysis of internal and external determinants reveals important structural asymmetries. Internal stability indicators—such as capital adequacy and liquidity buffers—exhibit greater relative stability over time, whereas external macro-financial variables, including external debt, foreign direct investment, and real interest rates, display higher volatility. While

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<sup>42</sup> (Philippon, 2019; Zetzsche et al., 2020).

<sup>43</sup> (IMF, 2022; Arner et al., 2016).

external financing and FDI can support banking expansion and technological upgrading, the results suggest that excessive reliance on external debt may undermine banking performance by increasing vulnerability to macroeconomic shocks. This finding aligns with evidence from other transition economies, where external financial integration amplifies both growth opportunities and systemic risks (Philippon, 2019; Zetzsche et al., 2020).

Inflation and liquidity conditions exert secondary but non-negligible effects on banking sector performance. Although not statistically significant in the regression model, their coefficient signs and correlation patterns indicate that macroeconomic stability and effective liquidity management reinforce the benefits of digital banking. In environments characterized by high inflation or weak monetary discipline, the efficiency gains from digitalization may be partially offset by increased uncertainty and funding pressures. This comparative result underscores that digital transformation is most effective when embedded within a stable macroeconomic and regulatory framework (OECD, 2020; World Bank, 2022).

From a broader analytical perspective, the study confirms that digital transformation in banking should be understood as a systemic process rather than a purely technological upgrade. The interaction between digital adoption, institutional capacity, and regulatory quality is critical in determining outcomes. In contrast to advanced economies—where strong governance structures allow digital finance to enhance competition and efficiency—transition economies such as Uzbekistan face additional constraints related to cybersecurity readiness, supervisory capacity, and uneven digital infrastructure. As a result, the marginal benefits of digitalization are highly dependent on complementary institutional reforms (IMF, 2022; BIS, 2021).

Despite its contributions, this study is subject to certain limitations. The reliance on aggregate time-series data restricts the ability to capture bank-level heterogeneity and institutional quality differences across financial institutions. Moreover, the absence of direct digitalization indices necessitated the use of indirect proxies, which may only partially reflect the depth of digital transformation. Future research could address these limitations by employing cross-country panel datasets, incorporating governance and cybersecurity indicators, and applying dynamic econometric techniques to distinguish between short-run and long-run effects (World Bank, 2022; IMF, 2023).

In conclusion, the study demonstrates that a well-governed and technologically advanced banking sector can significantly enhance financial stability, improve resource allocation, and support sustainable economic growth in transition economies. For Uzbekistan, digital transformation represents a strategic opportunity rather than a guaranteed outcome. Its success ultimately depends on the alignment of technological innovation with robust risk management, sound macroeconomic policies, and strong institutional governance.

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## **MILLIY QADRIYATLAR VA O'YINLAR ORQALI EKOLOGIK TARBIYA BERISH MAZMUNI**

**Annotatsiya.** Maqolada maktabgacha ta'limda milliy qadriyatlar vao'uinlar uyg'unligida ekologik tarbiya berishning o'ziga xos tomonlari haqida so'z yuritiladi. Tarbiyalanuvchilarninig o'zlari o'ylab topgan o'yin va borliq haqidagi taasurotlari, bilimlar va unga munosabatlar aks ettiradigan ijodiy o'yinlar shakillaridan na'munalar keltirilib metodik hamda amaliy ahamiyati izohlangan.

**Kalit so'zlar:** metodik strategiya, drammalashtirilgan o'yinlar, ekologik tarbiya, milliy qadriyatlar.

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## **NATIONAL VALUES AND THE CONTENT OF ECOLOGICAL EDUCATION THROUGH GAMES**

**Annotation:** The article discusses the unique aspects of providing environmental education in preschool through the integration of national values and games. Examples of creative play forms are presented, showcasing children's self-devised games that reflect their impressions of reality, knowledge, and attitudes. The methodological and practical significance of these forms are also explained.

**Keywords:** methodological strategy, dramatized games, environmental education, national values.

### **Kirish**

Maktabgacha yoshdagi bolalarga ekologik ta'lim va tarbiya berish sohasidagi nazariy hamda amaliy tadqiqotlarga asoslanib, ilg'or xalqaro tajribalar hisobga olingan holda ishlab chiqilgan "Yer sayyorasi — umumiy uyimiz" persal dasturining IX bobi "MTTdagi ekologik ta'lim va tarbiya berishda ta'lim-tarbiya jarayonini tashkil etish" deb nomlanadi. Unda "Maktabgacha yoshdagi bolalarni ekologik ta'lim va tarbiyalash bo'yicha ta'lim-tarbiya faoliyatida o'yinlarning

ahamiyati”, “Ekologik ta’lim va tarbiya berish shakllari”, “Ekologik ta’lim va tarbiya berish usullari” deb nomlangan uchta bo‘lim mavjud. Oxirgisi bevosita amaliy metodik xarakterga ega. Bobning birinchi bo‘limida ekologik tarbiyada o‘yinlarning o‘rni va ahamiyati tavsiflangan.

“O‘yin — bu bolani o‘z-o‘zi va atrofidagi dunyoni o‘rganishga undaydigan tabiiy usul hisoblanadi. O‘yin shaxsiyatni boyitadi va rivojlantiradi, shuning uchun u ekologik ta’limda keng qo‘llaniladi.”

#### **Tahlil va natijalar**

Ko‘rib o‘tilgan manba va ma’lumotlardan ma’lum bo‘lishicha, turli mamlakatlarda milliy qadriyatlar asosida ekologik tarbiya berish quyidagi omillarga borib taqaladi.

Tabiatning asosi bo‘lgan yerimizni asrash davlat va jamiyat rivojining muhim sharti ekanligini ta’kidlash mazkur maqol beradigan ekologik saboqdir.

#### **4. Chumchuqni o‘ldirsang, qurt ko‘payadi.**

Ifodalangan ma’noga ko‘ra, bu yerda ikki jihat mavjud: birinchisi — qushlarga mehribon va shafqatli bo‘lish; ikkinchisi — ularga nisbatan shafqatsizlik oqibatida yomonlik kelishi, ya’ni bu holat oxir-oqibat insonning o‘ziga zarar yetkazishi uqtiriladi. Demak, tabiatdagi muvozanatning buzilishi katta oqibatlarga olib kelishini ko‘rsatadi. Har bir jonivorning ekotizimda o‘z roli mavjud.

**Ekologik saboq:** hayvonlarni himoya qilish va ularning tabiatga foydasini qadrlashga chaqiradi.

#### **5. Ona yerga oqib tushgan har bir tomchi suv — farovonlik garovi.**

Suv tanqisligi va suv resurslari kamayib borayotgan hozirgi davrda ushbu maqolning ahamiyati juda katta. Bolalarni bog‘cha yoshidan boshlab suvni tejab ishlatishga, har bir tomchisini qadrlashga, hatto suv mo‘l bo‘lsa ham undan to‘g‘ri foydalanishga o‘rgatadi.

**Ekologik saboq:** suvni tejash, isrof qilmaslik va undan oqilona foydalanish g‘oyasi tarbiyalanadi.

Keyingi asrlarda paydo bo‘lgan “Daryo bo‘yida o‘sgan daraxt suvsiz qolmaydi”, “Tabiatni asra, u senga jon bag‘ishlaydi”, “Suv — zar, tuproq — oltin”, “Toqqa yog‘sa, cho‘l obod, cho‘lga yog‘sa, el obod”, “Yoz mevasi — qish xazinasini”, “Qarg‘a qag‘illasa qishni chaqirar, g‘oz g‘ag‘alasa — yozni”, “Tog‘ havosi — dard davosi” kabi ko‘plab maqollar ekologik tarbiyani milliy qadriyatlar asosida boyituvchi mazmunli material hisoblanadi.

Qadriyatlar haqida alohida qo‘llanma yozgan M. Farmonova kitobida keltirilganidek, “...maqollar xalqning kundalik hayoti bilan bog‘liq madaniy qadriyatlarning asrlar davomida an’anaviy tarzda ajdodlardan avlodlarga o‘tib kelayotgan ulkan manbayidir”.

Milliy qadriyatlar yorqin aks etgan o‘zbek xalq ertaklari ham bolalarni atrof-muhitga mas’uliyat va mehr ruhida tarbiyalashda eng ta’sirli vositalardan biri hisoblanadi. Ertaklar tasnifida hayvonlar haqidagi turkum alohida ahamiyat kasb etadi. Folklorshunos Oxunjon Safarovga ko‘ra, mazkur tasnifdagi ertaklar uch turga bo‘linadi:

1. etiologik ertaklar;

2. sof hayvonlar haqidagi ertaklar;
3. majoziy (allegorik) ertaklar.

Nisbatan qadimiy hisoblangan etiologik ertaklar hayvonlar, qushlar va hasharotlarni kuzatish, ularni bir-biridan farqlash hamda jonzotlar turlarining o'ziga xos belgi-xususiyatlarini bilish ehtiyojini qondirishga qaratilgan. Tirikchiligi ovchilik bo'lgan ajdodlarimiz ushbu ertaklar orqali hayvonlar, parrandalar va hasharotlarning shakli, ko'rinishi, rangi hamda xarakteri haqida ma'lumot berganlar. Shu orqali farzandlariga tushuncha berish bilan birga ekologik qarashlarni ham shakllantirganlar. Bunday ertaklar hozirgi kunda ham maktabgacha yoshdagi bolalarga jonzotlar haqida bilim berish, ularni tanishtirish va eng muhimi, ularga mehr uyg'otishda muhim ahamiyatga ega.

### **Xulosa va takliflar**

Sof hayvonlar haqidagi ertaklar axloqiy tarbiya bilan bir qatorda insoniyat qo'shnisi bo'lgan hayvonlarni tanishtirish, ularning fe'l-atvorini tushuntirish hamda bu jonivorlarga mehr uyg'otishda ham katta ahamiyatga ega. "O'zbek xalq ertaklari" to'plamidan bu kabi namunalarni ko'plab keltirish mumkin.

Majoziy (allegorik) ertaklar inson obrazlari, ularning xatti-harakati va xarakterini hayvonlar vositasida tasvirlaydi hamda katta tarbiyaviy ahamiyatga ega. Yetakchi motiv axloqiy tarbiya bo'lsa-da, bosh qahramonlari jonivorlar bo'lgani sababli bolalarda ekologik madaniyatni shakllantirish va rivojlantirishda bunday ertaklarning imkoniyati katta.

Yuqorida eslatilgan ertaklar to'plamidan olingan ayrim namunalarning ekologik tarbiya imkoniyatini ko'rib chiqamiz.

**"Qaldirg'och va odamlar"** ertagida qaldirg'och oilasi in qurgan daraxtning odamlar tomonidan kesilishi tasvirlanadi. Ona qushning farzandlarini yo'qotishi uning iztiroblariga sabab bo'ladi. Ammo oxirida odamlar o'z xatosini anglab, daraxt ekish orqali tabiatni asrashga kirishadilar.

**Bolalarga beriladigan saboq:** ertak bolalarda tabiatni asrash, qushlar va o'simliklarga g'amxo'rlik qilish g'oyasini shakllantiradi. Shuningdek, inson va tabiat o'rtasidagi o'zaro bog'liqlikni tushuntiradi. Xalqimizga xos yuksak qadriyatlar — har qanday jonzotga mehribonlik, ular oldidagi mas'uliyat, tabiatga nisbatan o'z xatosini tan olish va uni bartaraf etish — qisqa va lo'nda ifodalangan.

**"Mo'min daraxt"** ertagida daraxt har doim odamlar va hayvonlarga xizmat qiladi: soyasi bilan himoya qiladi, mevasi bilan oziqlantiradi. Ammo odamlar uni beparvo holda kesib tashlaydilar. Daraxt esa oxirgi lahzagacha ham ularning ehtiyojlarini qondirishga xizmat qiladi.

**Beriladigan ekologik saboq:** tabiatni asrash, resurslarni tejash va daraxtlarni himoya qilish g'oyasini o'rgatadi. Daraxtlar faqat resurs manbai emas, balki hayotning ajralmas qismi ekanligi ko'rsatiladi. Bunda milliy qadriyatlarga e'tiborsizlik ham tanqid qilinadi.

**"Suvning g'azabi"** ertagida suv manbasini ifloslantirgan bir qishloq aholisi suv toshqiniga duch keladi. Suv o'zining tozaligini himoya qilish uchun g'azablanib, odamlarni jazolaydi. Oxir-oqibat odamlar suvni ifloslantirish zararli ekanligini anglaydilar.

**Ekologik saboq:** suvni muhofaza qilish va unga nisbatan ehtiyotkorona munosabatda bo'lish zarurligi o'rgatiladi. Suv qadim zamonlardan buyon nihoyatda e'zozlangan. Bobo va momolarimiz avlodlarga suvga tuflamaslik, unga chiqindi tashlamaslik, undan foydalanishda isrof qilmaslikni tayinlaganlar va bunga qat'iy rioya qilishni talab qilganlar. Ko'rinadiki, bizning xalqimizda suv alohida qadriyat sifatida qadrlangan. Suvni asrash har bir fuqaroning burchidir.

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## **FEATURES OF THE DEVELOPMENT OF DIGITAL ECONOMY AND INNOVATIVE LOCAL GOVERNMENT**

**Abstract.** *This article scientifically analyzes the transformation of the regional governance system in the digital economy, innovative development processes, and the impact of digital technologies on the regional economy. The study examined the formation of digital infrastructure, the development of innovation clusters, startup ecosystems, and the role of the "smart city" concept in regional governance. Also, based on the scientific views of foreign scientists, the economic and geographical aspects of the digital transformation process were analyzed, and scientific conclusions were provided on reducing the digital divide between regions, improving the innovation management system, and developing digital infrastructure.*

**Keywords:** *digital economy, digital transformation, territorial governance, innovative development, digital infrastructure, smart city, innovative clusters, startup ecosystem, GIS, Big Data.*

**Introduction.** Digital technologies are becoming a decisive factor in the development of the global economy in the 21st century. The digital transformation process is bringing about fundamental changes in many sectors, including manufacturing, services, education, transportation, energy, and public administration. One of the main features of the modern economy is the management of economic processes based on digital technologies and the emergence of new forms of economic activity. Artificial intelligence, big data, cloud technologies, the Internet of Things (IoT), and automated control systems are forming an important technological foundation for economic development.

The development of the digital economy is also having a significant impact on the territorial governance system. The introduction of digital technologies in regional development strategies offers opportunities to increase economic efficiency, modernize infrastructure, and reduce economic disparities between regions. Therefore, the issues of the digital economy and innovative territorial management are one of the important scientific areas of economic geography, regional economics, and urbanization research.

**Main part.** The concept of the digital economy is an important scientific category that represents a new stage of modern economic development. This process is characterized by the reliance of economic activity on information and communication technologies and increased competitiveness through the efficient use of economic resources. The development of the digital economy also requires regional economic systems to adapt to new conditions. Because regions with digital infrastructure have a significant advantage in economic development [7, 5].

Scientific research by foreign scientists plays an important role in the development of digital economy theory. Spanish scholar Manuel Castells, in his concept of the "Information Society", emphasizes that the main feature of the modern economy is a global economic system based on information networks. In his opinion, digital technologies will transform economic activity from a centralized management system to a distributed management system, creating a new form of regional economy. This will lead to increased economic ties between regions and accelerated global economic integration [2].

American economist Richard Florida, studying the innovative economy and regional development processes, put forward the theory of the "creative class". In his opinion, innovation and the development of the digital economy will occur mainly in regions where highly qualified specialists, research centers, and technology companies are concentrated. Therefore, large cities become centers of innovative development and appear as the main drivers of economic growth [6].

The new theory of economic geography, developed by economist Paul Krugman, is also important in analyzing regional economic development. According to this theory, the concentration of economic activity in certain regions creates favorable conditions for innovative development. In the digital economy, the concentration of technological clusters, research centers, and IT companies in one area serves to increase economic efficiency [7, 4].

Saskia Sassen's theory of global cities is also of significant scientific importance in studying the impact of the digital economy on regional development. According to him, in the development of the global economy, large cities will become centers of innovative activity and will have the opportunity to attract international investments and highly qualified specialists. Such cities, as the main locomotive of the digital economy, have a significant impact on global economic processes [9].

Economists Daron Acemoğlu and James Robinson, who developed the theory of institutional development, emphasize the role of governance systems emerging based on digital technologies in economic development. They believe that in regions with effective institutions and an open economic system, innovation develops faster and economic growth is more sustainable. Therefore, the modernization of the public administration system is of great importance in the context of the digital economy [1].



The research of AnnaLee Saxenian, who developed the theory of innovation networks in studying the impact of the digital economy on regional development, also deserves special attention. She analyzes the experience of Silicon Valley and shows that knowledge exchange, scientific collaboration, and the formation of a startup ecosystem are key factors in innovative development. This shows the importance of the development of innovation centers for the regional economy in the context of the digital economy [8].

The development of the digital economy is also having a major impact on urbanization processes. The Smart City concept is creating opportunities to manage urban infrastructure using digital technologies. Intelligent transport systems (ITS), energy efficiency technologies, environmental monitoring systems, and digital management mechanisms help to organize the urbanization process more effectively [2, 9].

Digital transformation processes are also creating new challenges on a global scale. One of the most important problems is the digital divide between regions. Due to the varying levels of development of digital infrastructure in different regions, some regions are unable to fully benefit from the global digital economy. Therefore, developing digital infrastructure, expanding internet networks, and increasing the digital literacy of the population are important strategic tasks [2, 3].

**Conclusion.** The results of the study show that the digital economy is an important factor in modern economic development and plays a significant role in improving the efficiency of the territorial governance system. Management mechanisms developed based on digital technologies enable the optimization of economic processes, the efficient use of resources, and the acceleration of innovative development. Therefore, the development of digital infrastructure and improvement of the innovation management system are one of the important areas of the regional development strategy.

In the future, digital transformation processes are expected to accelerate further and become the main driving force of the regional economy. Therefore, it is possible to ensure the sustainable development of the digital economy by strengthening cooperation between public administration, scientific institutions, and business entities, developing innovation clusters, and supporting startup ecosystems.

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## **YOSH BADIY GIMNASTIKACHI QIZLARDA EGILUVCHANLIK SIFATLARINI RIVOJLANTIRISH XUSUSIYATLARI**

**Annotasiya:** Badiiy gimnastika - bugungi kunda mamlakatimizda eng ommabop sport turlaridan biridir. Shu bois aynan ushbu sport turi sportchilar tayyorgarligiga nihoyatda yuqori talablar qo'yadi, bunda nafaqat jismoniy, balki psixologik tayyorgarlik ham muhim ahamiyat kasb etadi. Gimnastikaga xos bo'lgan vositalarni egallash uchun bo'g'imlar va umurtqa pog'onasining yetarlicha yuqori darajadagi egiluvchanligi zarur. Maqolada yosh badiiy gimnastikachilarda egiluvchahlik sifatini rivojlantirishning o'ziga xos xususiyatlari haqida so'z yuritiladi.

**Kalit so'zlar:** sport, gimnastika, harakat, mashg'ulot, sifat, egiluvchanlik, vosita, natija.

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## **CHARACTERISTICS OF FLEXIBILITY DEVELOPMENT IN GIRLS IN RHYTHMIC GYMNASTICS**

**Abstract:** Rhythmic gymnastics is one of the most popular sports in our country today. Therefore, this sport places extremely high demands on athletes' training, in which not only physical but also psychological preparation is of great importance. Mastering the techniques inherent in gymnastics requires a sufficiently high level of joint and spinal flexibility. This article examines the development of flexibility in young rhythmic gymnasts.

**Keywords:** sport, gymnastics, movement, training, quality, flexibility, techniques, results.

So'nggi yillarda, badiiy gimnastika sport turi kichik va o'rta maktab yoshidagi o'quvchilar orasida keng ommalashdi hamda bolalarni jismoniy tarbiyalash va sog'lomlashtirishning muhim vositalaridan biriga aylandi. Shu munosabat bilan gimnastika sport turi sifatida o'quvchilarning yuklama darajasi va rivojlanish xususiyatlarini inobatga olgan holda umumta'lim muassasalari dasturlariga bosqichma-bosqich kiritilmoqda.

Bugungi kunda aynan badiiy gimnastika uchun turli xil predmetlar bilan bajariladigan mashqlar majmualari va alohida mashqlar ishlab chiqilgan va

ishlab chiqilmoqda. Jumladan, halqa, sakrash arqoni (arg'amchi), lenta, bulavalar va boshqa predmetlar bilan mashqlar qo'llaniladi. Ushbu mashqlar predmetlarsiz bajariladigan harakatlar, akrobatik mashqlar, raqs va xoreografiya elementlari bilan uyg'unlikda amalga oshiriladi. Mazkur mashqlarning barchasi gimnastikaning o'ziga xos xususiyatlarini aks ettirishga qaratilgan bo'lib, uning asosiy mazmunini tashkil etadi.

Hozirgi vaqtda zamonaviy sportning o'ziga xos xususiyatlari sifatida uning sezilarli darajada "yosharishi" hamda sport natijalarining uzluksiz o'sib borishining namoyon bo'lishi kuzatilmoqda.

Natijalarning doimiy ravishda ortib borishi yosh sportchilar bilan ishlashning yangi shakl, metod va vositalarini izlash hamda o'quv-trenirovka jarayonida qo'llashni taqozo etadi. Yuqori malakali sportchilarni maqsadli ko'p yillik tayyorlash va tarbiyalash nihoyatda murakkab jarayon bo'lib, uning muvaffaqiyati qator omillar bilan belgilanadi.

Shunday omillardan biri – badiiy gimnastikachi qizlarda egiluvchanlikni rivojlantirish hamda qisqa vaqt ichida eng yuqori natijaga erishish imkonini beruvchi yanada samarali usul, vosita va metodlarni aniqlash hisoblanadi.

So'nggi yillarda gimnastika mashg'ulotlari bilan shug'ullana boshlash yoshi keskin kamaygani munosabati bilan yosh gimnastlar 8-9 yoshidayoq ko'pkurashning barcha turlari bo'yicha musobaqa dasturini bajarishlari lozim. Bir-ikki yil davomida sportchilarni turli yo'nalishdagi, ko'plab xususiyatlari bilan bir-biridan farq qiluvchi mashqlarga o'rgatish zarurati tug'iladi. Shu bois egiluvchanlikni rivojlantirish muhim ahamiyat kasb etadi va o'quv-mashg'ulot jarayonining dolzarb vazifalaridan biriga aylanadi.

Ba'zi hollarda egiluvchanlikni ustuvor rivojlantirish fonida yosh gimnastlarning umumiy harakat tayyorgarligi darajasining pasayishi kuzatilishi mumkin.

Egiluvchanlik gimnastika uchun asosiy, tayanch jismoniy sifat hisoblanadi. Murabbiyning vazifasi - shug'ullanuvchilarda egiluvchanlikni rivojlantirish va uni prinsipial jihatdan yangi bosqichga olib chiqishga qodir bo'lgan maxsus yo'naltirilgan mashqlar majmuasini ishlab chiqishdan iboratdir.

Murabbiy o'z amaliy faoliyatida qo'llaydigan universal mashqlar majmuasi nafaqat egiluvchanlik va harakat koordinatsiyasini yaxshilashga, balki shug'ullanuvchilarning asosiy jismoniy sifatlari - kuch, tezkorlik, chidamlilik va boshqalarni qo'llab-quvvatlash hamda rivojlantirishga ham ta'sir ko'rsatishi zarur.

Gimnastikada eng muhim jismoniy sifatlaridan biri - bu egiluvchanlik hisoblanib, u harakatlarni katta amplitudada bajarish qobiliyatini anglatadi. Ushbu sifat bo'lmasa, harakatlarning ifodaliligi va plastikligini shakllantirish hamda ularning texnikasini takomillashtirish mumkin emas, chunki bo'g'imlar harakatchanligi yetarli bo'lmaganda harakatlar cheklangan va siqilgan holda bajariladi.

Egiluvchanlik to'liqsimon harakatlar, gimnastika dasturiga kiruvchi akrobatik mashqlarni bajarish, shuningdek sakrashlar vaqtida havoda turli holatlarni qabul qilish uchun zarurdir<sup>44</sup>.

Egiluvchanlik tufayli barcha turdagi gimnastik mashqlar - egilishlar, muvozanat saqlash, sakrashlar va to'liqlar - yengil bajariladi. U sportchilarga plastika, yumshoqlik va nafislik baxsh etadi.

Zamonaviy gimnastika ushbu sifatga alohida e'tibor qaratadi, shu bois u predmetlar bilan bajariladigan mashqlarda hal qiluvchi ahamiyatga ega. Ayniqsa, umurtqa pog'onasining faqat bel qismida emas, balki ko'krak va bo'yin qismlarida ham egiluvchanligini rivojlantirish muhim sanaladi. Bu to'liqlar, siltanishlar va halqa bilan bajariladigan harakatlarni o'zlashtirishda katta ahamiyatga ega.

Gimnastik mashqlar texnikasi son bo'g'imida katta amplitudali harakatlarni, oyoq panjalarining tashqi burilishini, to'piq bo'g'iminin yuqori harakatchanligini talab qiladi. Shuningdek, texnikani egallash jarayonida yelka, tirsak va bilak bo'g'imlarining barcha tekisliklarda harakatchanligi muhim ahamiyat kasb etadi.

Egiluvchanlik faol (aktiv) va sust (passiv) turlarga ajratiladi.

Faol egiluvchanlik - bu sportchining tashqi yordam va qo'shimcha kuchlarsiz, faqat o'z mushak kuchi hisobiga namoyon eta oladigan maksimal bo'g'im harakatchanligidir.

Sust egiluvchanlik esa sherik, snaryad yoki qo'shimcha og'irlik kabi tashqi kuchlar ta'sirida erishiladigan eng yuqori amplituda bilan belgilanadi.

Gimnastikada aynan faol egiluvchanlik alohida ahamiyatga ega bo'lib, u harakat erkinligini ta'minlaydi hamda ratsional sport texnikasini egallash imkonini beradi. Egiluvchanlikni tarbiyalash vositasi sifatida maksimal amplitudada bajariladigan cho'zish mashqlaridan foydalaniladi.

Sust mashqlar dinamik (prujinali) yoki statik (holatni ushlab turish) xarakterga ega bo'lishi mumkin. Sust egiluvchanlikni rivojlantirishda prujinali harakatlarni keyingi holatni fiksatsiya qilish bilan uyg'unlashtirish eng katta samarani beradi.

Shuningdek, umumiy va maxsus egiluvchanlik farqlanadi.

Umumiy egiluvchanlik yirik bo'g'imlardagi maksimal harakat amplitudasi bilan tavsiflanadi, maxsus egiluvchanlik esa muayyan harakat amalining texnikasiga mos keladigan amplituda bilan belgilanadi<sup>45</sup>.

Yosh o'tishi bilan paylarning (mushaklarga nisbatan) massasi ortishi va mushak to'qimalarining ma'lum darajada zichlashuvi natijasida cho'zuvchi kuchlarga nisbatan mushaklarning tonik qarshiligi ortadi va egiluvchanlik pasayadi.

<sup>44</sup> Мавроматия Д. Упражнения художественной гимнастики. - М.: Физкультура и спорт, 2004. - 141 с.

<sup>45</sup> Ашмарин Б.А., Виноградов Ю.А., Вяткина З.Н., и др. Теория и методика физического воспитания. - М.: Просвещение, 1998. - 287с.

Bo'g'imlardagi harakatchanlikning, ayniqsa 13–14 yoshda yaqqol namoyon bo'ladigan, pasayishining oldini olish uchun sust egiluvchanlikni rivojlantirishni o'z vaqtida boshlash zarur. Sust egiluvchanlikni rivojlantirish uchun sezgir davr 9-10 yosh, faol egiluvchanlik uchun esa 10–14 yosh hisoblanadi.

Gimnastikada jismoniy tayyorgarlik barcha sifatlarni uyg'un rivojlantirishga qaratilgan. 5–6 yoshli bolalarda ortiqcha bel egilishi, bukchayish va oyoq kaftining noto'g'ri qo'yilishini istisno etuvchi to'g'ri qomatni shakllantirishga katta e'tibor beriladi.

Biroq boshqa sifatlar bilan solishtirganda, egiluvchanlik va koordinatsion qobiliyatlarni rivojlantirishga ko'proq e'tibor qaratiladi.

Koordinatsion qobiliyatlar (KQ) — bu organizmning muayyan a'zolari va tuzilmalarining funksional imkoniyatlari majmui bo'lib, ularning o'zaro hamkorligi alohida harakat elementlarini yagona mazmunli harakat amaliga birlashtirishni ta'minlaydi.

Mazkur qobiliyatni takomillashtirishga maxsus yo'naltirilgan asosiy metodik yondashuv- makonda tez va aniq orientatsiyalanish talablari bosqichma-bosqich ortib boradigan topshiriqlarni tizimli ravishda bajarishdan iborat.

Makondagi, vaqt va kuch parametrlarini qayta tiklash, baholash, o'lchash hamda differensiallash qobiliyatlari asosan harakat sezgilari va idrokning aniqligi hamda nozikligiga asoslanadi; ular ko'pincha ko'rish va eshitish qobiliyatlari bilan uyg'un holda namoyon bo'ladi.

Motor tajriba kam bo'lgan bolalarda sezgi va idrok hali yetarlicha aniqlikka ega emas, harakatning makon, vaqt, makon-vaqt va kuch belgilarini qayta tiklash, baholash yoki farqlashdagi xatolar yetarli darajada anglanmaydi.

Tajriba ortishi bilan bajarilayotgan harakat parametrlarini sezish va idrok etish yanada aniq, ravshan va tushunarli bo'lib boradi<sup>46</sup>.

Shunday qilib, badiiy gimnastikada egiluvchanlikni rivojlantirish metodikasi faol va sust mashqlarni uyg'unlashtirish, har kuni takrorlash (stretching), cho'zish mashqlarini kuch yuklamalari bilan birlashtirish hamda yosh xususiyatlarini hisobga olishga asoslanadi.

Xulosa qilib aytganda badiiy gimnastikada egiluvchanlikni rivojlantirish - bu uzluksiz va pedagogik jihatdan boshqariladigan jarayondir. Muvaffaqiyatning asosiy omili - amplitudani bosqichma-bosqich oshirish tamoyiliga amal qilish, faol va sust cho'zish mashqlarini kuch mashqlari bilan uyg'unlashtirish hamda mashg'ulotlarning muntazamligini ta'minlashdir.

Bu nafaqat bo'g'imlar yuqori harakatchanligini, balki jarohatlarning oldini olishni ham ta'minlaydi.

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## **INNOVATION, CORRUPTION AND ECONOMIC GROWTH: AN INSTITUTIONAL APPROACH (EVIDENCE FROM UZBEKISTAN)**

**Abstract:** *In this paper we examine the relationship between corruption, institutional quality, and innovation performance in Uzbekistan within a new institutional economics framework. Drawing on internationally recognized indicators including the Global Innovation Index, Worldwide Governance Indicators, and Transparency International's Corruption Perceptions Index the paper provides a qualitative and indicator-based analysis of institutional dynamics over the period 2012–2024. The findings suggest that corruption exerts a persistently negative influence on innovation by increasing uncertainty and discouraging long-term investment. Institutional quality, particularly government effectiveness and rule of law, plays a crucial role in fostering innovation and moderating the adverse effects of corruption. The study contributes to the literature by offering a country-specific perspective on the corruption–institutions–innovation nexus in a transition economy context and highlights the importance of sustained institutional reforms for innovation development in Uzbekistan.*

**Keywords:** *Corruption; Institutions; Innovation; Governance; Uzbekistan*

### **1. INTRODUCTION**

In recent decades, innovation has been recognized as one of the key drivers of economic growth. At the same time, institutional challenges, particularly corruption, can undermine the effectiveness of innovation activities. In the case of Uzbekistan, the ongoing comprehensive economic and institutional reforms provide an important opportunity to empirically examine the interplay between these two factors.

The main objective of this study is to analyze the impact of innovation, corruption, and institutions on economic growth.

### **2. LITERATURE REVIEW**

#### **2.1. Corruption and Innovation Nexus**

Existing literature widely acknowledges that corruption exerts a generally negative impact on innovation by increasing uncertainty, transaction costs, and misallocation of resources. According to North (1990), corruption distorts incentive structures, discouraging productive and innovative activities. Firms operating in highly corrupt environments often divert resources from research and development (R&D) toward rent-seeking behavior, informal payments, and regulatory evasion (Mauro, 1995; Méon & Sekkat, 2005).

Empirical studies confirm that corruption reduces firms' incentives to invest in innovation. Anokhin and Schulze (2009) show that corruption weakens intellectual property rights protection, thereby lowering innovation output measured by patents. Similarly, Paunov (2016) finds that bribery negatively affects firms' innovation capacity in developing economies by crowding out productive investment.

However, some scholars argue for a "grease the wheels" hypothesis, suggesting that corruption may temporarily facilitate innovation in environments characterized by excessive bureaucracy and rigid regulations (Leff, 1964; Huntington, 1968). Nevertheless, more recent empirical evidence largely rejects this view, demonstrating that any short-term gains are outweighed by long-term institutional deterioration and innovation stagnation (Aghion et al., 2016).

Corruption distorts resource allocation and redirects entrepreneurial efforts from productive innovation toward rent-seeking activities. It increases the cost of doing business, reduces fair competition, and discourages high-productivity firms.

Consequently:

Innovation = f (– Corruption)

H1: Corruption negatively affects innovation.

## **2.2. Institutional Quality and Innovation Performance**

Institutions play a crucial role in shaping national innovation systems. Strong institutions defined by effective governance, rule of law, regulatory quality, and protection of property rights create a stable environment conducive to innovation (Acemoglu, Johnson, & Robinson, 2005). In contrast, weak institutions undermine trust, increase uncertainty, and discourage long-term innovative investments.

Studies consistently demonstrate a positive relationship between institutional quality and innovation outcomes. Rodrik, Subramanian, and Trebbi (2004) emphasize that institutional quality is a fundamental determinant of economic performance, including technological progress. Tebaldi and Elmslie (2013) find that countries with stronger institutions exhibit higher patent intensity and R&D expenditure.

At the firm level, institutions influence innovation by shaping access to finance, enforcement of contracts, and competitive pressures. Hall and Jones (1999) argue that institutional arrangements affect the social returns to innovation by determining how efficiently resources are allocated within the economy.

Institutions influence innovation by shaping incentives for risk-taking and long-term investment. Secure property rights, contract enforcement, and regulatory stability encourage firms to engage in R&D and innovative activities.

In institutional environments characterized by weak governance, uncertainty discourages innovation due to heightened risks of expropriation and opportunistic behavior.

Innovation = f (Institutional Quality)

Thus:

H2: Higher institutional quality positively affects innovation.

### 2.3. Institutions as a Moderating Channel between Corruption and Innovation

Recent literature increasingly treats institutions as a mediating or moderating mechanism in the corruption–innovation relationship. Aghion et al. (2016) show that corruption is particularly harmful to innovation in countries with weak competition and poor institutional enforcement. In such contexts, corruption protects inefficient firms and discourages entry by innovative newcomers.

Méon and Weill (2010) demonstrate that corruption's impact varies with institutional effectiveness: in countries with strong institutions, corruption is less prevalent and less damaging, whereas in weak institutional environments, it significantly hampers innovation and productivity. Similarly, Zhu and Zhang (2017) find that institutional reforms can mitigate the adverse effects of corruption on firm-level innovation.

This institutional perspective suggests that corruption should not be analyzed in isolation. Instead, its effect on innovation depends critically on institutional capacity, governance quality, and enforcement mechanisms. Consequently, strengthening institutions emerges as a key policy lever to foster innovation in corruption-prone economies.

Within the endogenous growth framework, innovation enhances total factor productivity (TFP) and sustains long-run economic growth. Knowledge creation and technological progress improve production efficiency and competitiveness.

Formally:

Economic Growth =  $f$  (Innovation)

H3: Innovation positively affects economic growth

Institutional quality may influence economic growth both directly and indirectly. Directly, through improved governance and reduced transaction costs; indirectly, through its impact on corruption and innovation.

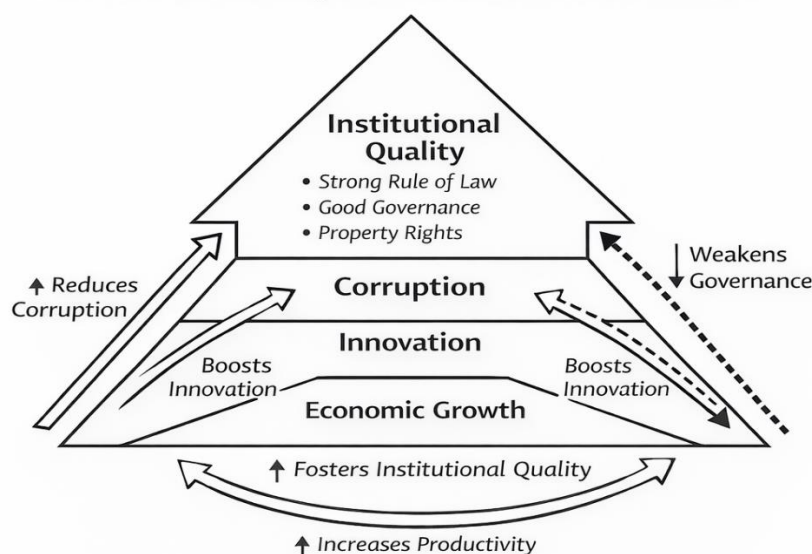


**Figure-1. Institutional quality-corruption-innovation = economic growth model.**

The integrated structural relationship can be summarized as:

Economic Growth =  $\beta_1$  Innovation +  $\beta_2$  Institutional Quality –  $\beta_3$  Corruption +  $\varepsilon$

However, the deeper mechanism follows a mediated pathway:

Institutional Quality → Corruption → Innovation → Economic Growth

Therefore:

H4: Institutional quality affects economic growth indirectly through its impact on corruption and innovation.

## **2.4. Evidence from Transition and Developing Economies**

Transition and developing economies provide a particularly relevant context for examining the corruption–institutions–innovation nexus. These countries often experience simultaneous institutional transformation and rising innovation ambitions. Estrin, Korosteleva, and Mickiewicz (2013) show that institutional voids and corruption jointly suppress innovative entrepreneurship in post-socialist economies.

In Central Asia and similar regions, weak governance structures and limited institutional capacity constrain innovation systems. While reforms aimed at improving transparency and regulatory quality have been introduced, their effectiveness remains uneven (World Bank, 2020). This suggests that institutional reforms must be sustained and credible to translate into meaningful innovation outcomes.

Despite a growing body of literature, several gaps remain. First, most empirical studies focus on cross-country samples, while country-specific institutional dynamics remain underexplored. Second, limited attention has been given to how institutional reforms over time alter the corruption–innovation relationship in developing and transition economies. Finally, Central Asian countries, including Uzbekistan, remain largely absent from mainstream empirical innovation studies.

This study contributes to the literature by providing a context-specific analysis of Uzbekistan, emphasizing the role of institutional quality in shaping the corruption–innovation nexus over time.

## **3. INNOVATION AND ANTI-CORRUPTION REFORMS IN UZBEKISTAN**

From 2017-year in Uzbekistan following changes have been recognized:

- Innovation development ministry has been established;
- IT Park and startup projects have been supported
- Digital government system recognized
- The anti-corruption agency was established in 2020 year
- A compliance control system is being introduced in public organizations
- Open Budget, e-procurement, e-auction

## **4. METHODOLOGY AND DATA.**

This paper period includes 2012–2024 years. Information has been taken from the following international organizations:

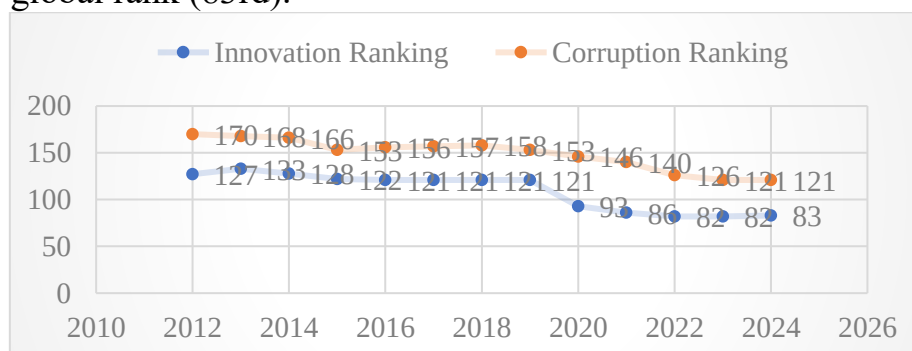
- World bank group
- Transparency International
- WIPO

- Statistic agency of the Republic of Uzbekistan

## 5. RESULTS AND DISCUSSION.

The GII is an important benchmark used by policymakers, researchers, and investors to assess a country's innovation ecosystem, including education, research, technology production, and economic sophistication.

Uzbekistan's participation and progression in this index signal its growing efforts to build innovation capacity through reforms in education, research, and business environments. Uzbekistan's innovation score has been available from 2012–2024, showing moderate growth over time with variations year-to-year. The highest recorded score was in 2021 (27.4 points), and the lowest in 2012 (23.9 points). Although the 2024 score slightly decreased, Uzbekistan maintained a mid-range global rank (83rd).



**1- Figure. Innovation and corruption ranking of Uzbekistan (2012-2024 years)**

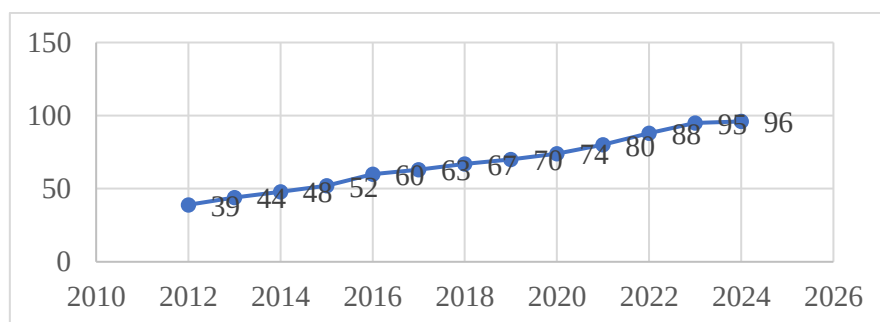
The index reflects both investment in innovation and the outcomes produced, highlighting strengths and areas for future improvement.

The Corruption Perceptions Index (CPI) is a global measure published annually by Transparency International. It scores countries on a scale from 0 to 100. The CPI reflects experts' and business people's perceptions of public sector corruption, not direct measurement of corruption incidents.

Early years (2012–2017): Uzbekistan had very low CPI scores (around 17–22), indicating a high perception of public sector corruption. Gradual improvement (2018–2021): Steadily rising scores and better rankings suggest increasing transparency or reform efforts.

Strongest performance (2022–2023): CPI reaches its peak at 33 points, and the country climbs into the top two-thirds of countries globally. In 2024, the score dips slightly from 33 to 32 points, though the global rank remains similar (121st). Countries with similar scores include Kenya, Sri Lanka, Angola, and Togo.





**3-Figure. Fragile states ranking of Uzbekistan (2012-2024 years)**

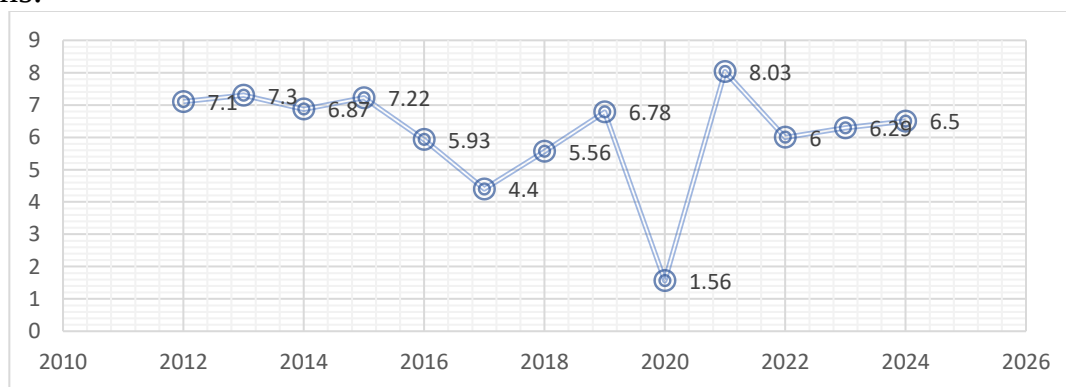
The Fragile States Index (FSI) is published annually by the Fund for Peace. It assesses a country's vulnerability to political, social, economic, and security pressures that could push it toward instability or fragility. The score runs from 0 to 120. The index analyzes 12 political, economic, and social indicators such as security apparatus pressures, group grievance, human rights, and state legitimacy.

Between 2012 and 2024, Uzbekistan's FSI score has decreased significantly (from 87.5 to 64.8). A lower score means the country is considered less fragile and more stable relative to its past. This represents a strong long-term reduction in fragility — a trend seen clearly throughout the decade.

In 2012, Uzbekistan ranked among the more fragile countries globally (39th most fragile). By 2024, its position improved to a less fragile rank (96th), indicating that compared to other countries it has made progress toward greater stability.

Uzbekistan's Fragile States Index score dropped from 87.5 to 64.8 over 12 years, showing a clear improvement in state stability. Its global rank improved from 39th to 96th most fragile country, meaning it is less fragile relative to other countries today. This process reflects reforms and structural changes since 2016.

Anyhow, the ranking score of Uzbekistan in 2024 indicates moderate fragility remains.



**4-Figure. The growth of GDP of Uzbekistan for the period 2012-2024 years.**

From 2012 to 2024, Uzbekistan has experienced moderate and mostly positive economic growth, despite global shocks such as the COVID-19 pandemic. Economic growth remained resilient, with a brief slowdown in 2020 due to the global pandemic and subsequent recovery in 2021–2024. (World Bank)

Periods of higher innovation scores generally align with stronger economic performance, reflecting the role of innovation as a driver of productivity and growth. For example, in 2021, when the GII peaked at 27.4, GDP growth recovered strongly to 8% after the COVID-19 dip. This pattern suggests that investments in research, technology, and innovative capacity contributed to post-crisis economic resilience.

A rising CPI score indicates improved perception of public sector integrity, which supports a better business environment and encourages innovation and investment. The period 2022–2024 shows that as corruption perception improved, economic growth remained stable at around 6%, and Uzbekistan maintained better global innovation rankings. This demonstrates that anti-corruption measures complement innovation policies, allowing economic growth to be more sustainable.

**Table № 1**

**The comparable indicators of innovation, corruption, institutional and economic growth of Uzbekistan during the period 2012-2024 years**

| Year | GDP Growth (%) | GII Score | CPI Score | FSI Score | Observations                                                               |
|------|----------------|-----------|-----------|-----------|----------------------------------------------------------------------------|
| 2012 | 7,8            | 23,9      | 17        | 87,5      | Low innovation, high corruption; growth relatively strong but constrained  |
| 2015 | 8,2            | 25,9      | 19        | 85,3      | Innovation slowly increasing, corruption perception improving              |
| 2020 | 1,6            | 24,5      | 26        | 73,1      | Pandemic impact; innovation and anti-corruption efforts provide resilience |
| 2021 | 8.0            | 27,4      | 28        | 72        | Strong recovery; synergy of innovation and improved institutions           |
| 2024 | 6,5            | 24,7      | 32        | 64,8      | Continued growth; moderate innovation score with better governance         |

Over the period 2012–2024, Uzbekistan experienced moderate and largely positive economic growth, fluctuating between 5% and 8%, with a temporary slowdown to 1.6% in 2020 due to the COVID-19 pandemic, followed by a strong recovery.

**Table № 2**

**Corruption, Institutions, and Innovation in Uzbekistan (2012–2024)**

|   | Dimension  | Indicator                                                                                           | Trend (2012–2024)                             | Interpretation                                       |
|---|------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------|
| 1 | Innovation | Global Innovation Index (World intellectual property organization)                                  | Gradual improvement, but below global average | Innovation capacity growing, efficiency remains weak |
| 2 | Corruption | Corruption Perceptions Index (Transparency international - the global coalition against corruption) | Slight improvement                            | Perceived corruption still constrains innovation     |

|   |              |                                             |                                                       |                                                           |
|---|--------------|---------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------|
| 3 | Institutions | Government Effectiveness (World bank group) | Moderate improvement                                  | Policy is improving faster than implementation            |
|   |              | Rule of Law (World justice project)         | Slow progress                                         | Weak enforcement limits innovation incentives             |
|   |              | Control of Corruption (World bank group)    | Incremental gains                                     | Institutional reforms not yet fully used                  |
|   |              | Fragile States Index (The fund for peace)   | Good progress (from alert group to sustainable group) | Institutional transformations should be further enhanced. |

Innovation, measured by the Global Innovation Index (GII), showed gradual improvement from 23.9 in 2012 to a peak of 27.4 in 2021, reflecting growing capacities in research, technology, and creative outputs. These improvements contributed to enhanced economic resilience and productivity.

Institutional quality and anti-corruption progress, captured by the Corruption Perceptions Index (CPI), also improved significantly, rising from 17 in 2012 to 33 in 2023, slightly declining to 32 in 2024. Strengthened institutional frameworks and higher transparency created a more conducive environment for innovation and investment.

The combined trends demonstrate that innovation and institutional quality act synergistically as drivers of economic growth. Uzbekistan's reforms since 2016 have enhanced this relationship, showing that simultaneous improvements in innovation capacity and governance reduce fragility, mitigate corruption, and support sustainable economic development.

## 6. RECOMMENDATION.

Several implications have emerged based on the findings:

**1. Strengthening institutional enforcement.** Anti-corruption policies should prioritize enforcement mechanisms rather than formal regulations alone. Effective rule of law is critical for protecting innovators and investors.

**2. Integrating innovation and governance reforms.** Innovation strategies should be explicitly linked to institutional reforms, particularly in public administration and regulatory frameworks.

**3. Improving transparency and accountability.** Expanding digital governance and open data initiatives can reduce discretionary power and lower corruption-related barriers to innovation.

**4. Supporting private-sector innovation.** Reducing bureaucratic blocks and informal costs for firms can redirect resources toward productive and innovative activities.

These measures can help create an institutional environment conducive to sustainable innovation-led growth.

## 7. CONCLUSION

This study analyzed the interaction between corruption, institutional quality, and innovation in Uzbekistan from an institutional perspective. Consistent with

existing literature, the findings indicate that corruption undermines innovation performance by weakening incentives for research and development, distorting resource allocation, and reducing trust in formal institutions. Innovation outcomes remain constrained not by a lack of policy ambition, but by institutional inefficiencies and governance challenges.

The analysis further demonstrates that improvements in institutional quality particularly in government effectiveness, regulatory quality, and rule of law are essential for enhancing innovation capacity. Institutional reforms implemented in recent years have contributed to gradual improvements; however, their impact on innovation remains limited due to uneven enforcement and implementation gaps.

Overall, the study confirms that innovation-driven growth in Uzbekistan cannot be achieved solely through technological or industrial policies. Instead, it requires a complementary strategy focused on strengthening institutions, improving transparency, and ensuring accountability.

The empirical evidence from Uzbekistan (2012–2024) suggests that innovation has become an increasingly important driver of economic growth. However, the growth-enhancing effect of innovation remains conditional on institutional quality. High levels of corruption and institutional fragility have historically constrained the innovation–growth connection. Recent institutional reforms have partially mitigated these constraints, allowing innovation to contribute more effectively to economic performance.

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## **OLIV TA'LIMDA TALABALAR KURS ISHLARI VA DISSERTATSIYALARINI SAQLASH AXBOROT TIZIMINI ISHLAB CHIQUISH TEXNOLOGIYASI**

**Annotatsiya:** *Mazkur maqolada oliy ta'lim muassasalarida talabalar tomonidan bajariladigan kurs ishlari, bitiruv malakaviy ishlari va magistrlik dissertatsiyalarini markazlashgan holda saqlash, boshqarish hamda ulardan samarali foydalanishni ta'minlovchi axborot tizimini ishlab chiqish texnologiyasi tadqiq etilgan. Zamonaviy raqamli ta'lim muhitida ilmiy ishlar hajmining ortib borishi ularni tizimli ravishda saqlash va tezkor qidirish mexanizmlarini yaratishni talab etadi. Tadqiqot davomida mavjud ilmiy ma'lumotlar bazalari, raqamli repozitoriyalar va akademik axborot tizimlari tahlil qilindi. Axborot tizimini ishlab chiqishda tizimli tahlil, ma'lumotlar bazasini loyihalash, dasturiy arxitektura yaratish va veb-texnologiyalardan foydalanish metodlari qo'llanildi. Tadqiqot natijasida talabalar ilmiy ishlarini saqlash, indekslash va qidirish imkoniyatlariga ega bo'lgan integratsiyalashgan axborot tizimi modeli taklif qilindi. Mazkur tizim ilmiy ishlardan foydalanish samaradorligini oshiradi hamda akademik plagiatning oldini olishga xizmat qiladi.*

**Kalit so'zlar:** *Axborot tizimi, raqamli repozitoriy, ilmiy ishlar bazasi, ma'lumotlar bazasi, oliy ta'lim, raqamli ta'lim muhiti, dasturiy arxitektura, akademik axborot tizimi.*

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## **TECHNOLOGY FOR DEVELOPING AN INFORMATION SYSTEM FOR STORING STUDENT COURSEWORKS AND DISSERTATIONS IN HIGHER EDUCATION INSTITUTIONS**

**Abstract:** *This article investigates the technology for developing an information system for storing and managing students' course papers, graduation theses, and master's dissertations in higher education institutions. In the context of digital transformation in education, the volume of academic research produced by students is continuously increasing, which requires the creation of centralized digital repositories and efficient search mechanisms. The study analyzes existing academic repositories and information systems used in universities worldwide.*



*Methods such as system analysis, database design, and web technologies were applied during the development of the proposed system. As a result, an integrated information system model for storing, indexing, and searching student research works was developed. The system improves accessibility to academic materials and helps prevent plagiarism.*

**Keywords:** *Information system, digital repository, academic database, higher education, digital education environment, database design, academic research.*

**Kirish.** Hozirgi kunda dunyoda ta'lim tizimi jadal ravishda raqamli transformatsiya jarayonini boshdan kechirmoqda. Axborot-kommunikatsiya texnologiyalarining keng rivojlanishi natijasida ta'lim jarayonining barcha bosqichlarida raqamli yechimlardan foydalanish zarurati ortib bormoqda. Ayniqsa, oliy ta'lim muassasalarida ilmiy faoliyat natijalarini samarali boshqarish, saqlash va ulardan foydalanish masalasi muhim ahamiyat kasb etmoqda. Talabalar tomonidan tayyorlanadigan kurs ishlari, bitiruv malakaviy ishlari hamda magistrlik dissertatsiyalari nafaqat ta'lim jarayonining muhim tarkibiy qismi, balki ilmiy tadqiqotlarning dastlabki natijalarini aks ettiruvchi muhim ilmiy manba hisoblanadi. Shu sababli ushbu ilmiy ishlarni tizimli ravishda saqlash va ulardan foydalanish imkoniyatlarini yaratish dolzarb vazifalardan biri hisoblanadi.

Ko'plab oliy ta'lim muassasalarida talabalar ilmiy ishlari ko'pincha qog'oz shaklida yoki alohida elektron fayllar ko'rinishida saqlanadi. Bunday usul esa ilmiy ishlarni izlash, ularni tahlil qilish va qayta foydalanish jarayonini murakkablashtiradi. Bundan tashqari, ilmiy ishlarning takrorlanishi, mavzularning qayta ishlanishi yoki akademik plagiat kabi muammolar ham yuzaga kelishi mumkin. Zamonaviy ta'lim muhitida bunday muammolarni bartaraf etish uchun raqamli axborot tizimlari asosida ishlaydigan markazlashgan ma'lumotlar bazalarini yaratish muhim ahamiyatga ega.

Talabalar ilmiy ishlarini saqlash va boshqarish uchun mo'ljallangan axborot tizimlari ilmiy ma'lumotlarni tartibga solish, ularni tezkor qidirish, tahlil qilish hamda kelgusidagi tadqiqotlar uchun foydalanish imkoniyatlarini kengaytiradi. Bunday tizimlar yordamida ilmiy ishlarning elektron nusxalarini saqlash, mualliflar va ilmiy rahbarlar haqida ma'lumotlarni yuritish, ilmiy ishlarni fakultet yoki yo'nalishlar kesimida saralash va statistik tahlil qilish imkoniyati yaratiladi. Shu bilan birga, bunday tizimlar ilmiy ishlar o'rtasida o'xshashlikni aniqlash va akademik halollikni ta'minlashda ham muhim rol o'ynaydi.

Zamonaviy yondashuvlar asosida yaratilgan axborot tizimlari ko'pincha veb-texnologiyalar, ma'lumotlar bazasi boshqaruv tizimlari hamda bulutli hisoblash texnologiyalariga asoslanadi. Bu esa tizimdan turli foydalanuvchilar — talabalar, o'qituvchilar, ilmiy rahbarlar va administratorlar tomonidan masofadan turib foydalanish imkonini beradi. Natijada ilmiy ishlar bilan ishlash jarayoni ancha samarali va qulay shaklga keladi.

Mazkur tadqiqot ishidan ko'zlangan asosiy maqsad oliy ta'lim muassasalarida talabalar kurs ishlari va dissertatsiyalarini saqlash hamda boshqarish uchun mo'ljallangan zamonaviy axborot tizimini ishlab chiqish texnologiyasini

o'rganish va taklif etishdan iborat. Tadqiqot davomida mavjud ilmiy manbalar, axborot tizimlari va zamonaviy dasturiy texnologiyalar tahlil qilinib, talabalar ilmiy ishlarini samarali boshqarishga xizmat qiluvchi tizim modeli ishlab chiqiladi.

**ADABIYOTLAR TAHLILI.** OLIY TA'LIM TIZIMIDA ILMIY AXBOROTLARNI BOSHQARISH VA SAQLASHGA OID TADQIQOTLAR SO'NGGI YILLARDA JADAL RIVOJLANIB BORMOQDA. TALABALAR TOMONIDAN YARATILADIGAN KURS ISHLARI, BITIRUV MALAKAVIY ISHLARI HAMDA MAGISTRLIK DISSERTATSIYALARINI RAQAMLI SHAKLDA SAQLASH VA BOSHQARISH MASALASI ZAMONAVIY ILMIY TADQIQOTLARNING MUHIM YO'NALISHLARIDAN BIRI HISOBLANADI. BU BORADA KO'PLAB XORIJIY VA MAHALLIY OLIMLAR AXBOROT TIZIMLARI, RAQAMLI REPOZITORIYALAR HAMDA AKADEMIK MA'LUMOTLAR BAZALARINING AHAMIYATINI ALOHIDA TA'KIDLAB O'TGANLAR.

Ilmiy adabiyotlarda universitetlarda ilmiy ishlarni saqlash uchun **institutsional repozitoriylar** yaratish samarali yechim sifatida qaraladi. Masalan, **Crow (2002)** tomonidan olib borilgan tadqiqotda institutsional repozitoriylar ilmiy axborotlarni saqlash, ularni keng jamoatchilikka taqdim etish va ilmiy hamkorlikni rivojlantirishda muhim rol o'ynashi ta'kidlangan [2]. Shuningdek, **Lynch (2003)** universitetlarda raqamli repozitoriylar ilmiy bilimlarni saqlash va tarqatishning muhim vositasiga aylanishini ko'rsatadi [4].

Axborot tizimlarini loyihalash va ishlab chiqish jarayoniga oid ilmiy tadqiqotlar ham mazkur mavzuga bevosita aloqador hisoblanadi. **Sommerville (2016)** dasturiy ta'minot muhandisligi sohasidagi tadqiqotlarida murakkab axborot tizimlarini ishlab chiqishda tizimli yondashuv, talablarni tahlil qilish hamda modulli arxitekturalardan foydalanish muhimligini ta'kidlaydi [5]. Xuddi shuningdek, **Pressman va Maxim (2019)** dasturiy tizimlarni yaratishda ma'lumotlar bazasini to'g'ri loyihalash, foydalanuvchi interfeysini soddalashtirish va tizim xavfsizligini ta'minlash zarurligini qayd etganlar [6].

Raqamli ta'lim muhitida ilmiy ma'lumotlar bazalarini yaratish masalasi bo'yicha **Smith (2019)** oliy ta'lim muassasalarida akademik resurslarni markazlashgan axborot tizimlari orqali boshqarish ilmiy ishlar sifatini oshirishga xizmat qilishini ta'kidlaydi [7]. Bunday tizimlar yordamida ilmiy ishlarni tezkor qidirish, statistik tahlil qilish hamda ilmiy faoliyat natijalarini monitoring qilish imkoniyati yaratiladi.

O'zbekistonlik tadqiqotchilar ham ta'lim tizimida axborot texnologiyalaridan foydalanishning samaradorligini o'rganib kelmoqdalar. Masalan, **Karimov (2021)** oliy ta'lim muassasalarida raqamli axborot tizimlarini joriy etish ta'lim jarayonini modernizatsiya qilishda muhim omil ekanligini ta'kidlaydi [8]. Shuningdek, ilmiy ishlar bazasini yaratish akademik halollikni ta'minlash, plagiatni kamaytirish va ilmiy faoliyat natijalarini samarali boshqarishga yordam beradi.

Yuqoridagi ilmiy manbalar tahlili shuni ko'rsatadiki, talabalar ilmiy ishlarini saqlash va boshqarish uchun zamonaviy axborot tizimlarini yaratish

dolzarb ilmiy masalalardan biri hisoblanadi. Shu sababli oliy ta'lim muassasalari uchun maxsus ishlab chiqilgan raqamli repozitoriy va axborot tizimlari ilmiy faoliyat samaradorligini oshirishda muhim ahamiyat kasb etadi.

Metod va metodologiya. Mazkur tadqiqotda oliy ta'lim muassasalarida talabalar kurs ishlari va dissertatsiyalarini saqlash hamda boshqarish uchun mo'ljallangan axborot tizimini ishlab chiqish texnologiyasini o'rganish va amaliy modelini yaratish maqsad qilingan. Tadqiqot jarayonida zamonaviy axborot tizimlarini ishlab chiqish metodologiyalari, dasturiy muhandislik tamoyillari hamda ma'lumotlar bazasini loyihalash usullaridan foydalanildi. Tadqiqotning metodologik asosini tizimli tahlil, modellash, ma'lumotlar bazasini loyihalash va eksperimental sinov usullari tashkil etadi.

Birinchi bosqichda tizimli tahlil usuli qo'llanildi. Ushbu usul yordamida oliy ta'lim muassasalarida talabalar ilmiy ishlarini saqlash va boshqarish bilan bog'liq mavjud jarayonlar o'rganildi. Tizimli tahlil orqali foydalanuvchilar ehtiyojlari, mavjud muammolar hamda axborot tizimiga qo'yiladigan funksional va nofunktsional talablar aniqlab olindi. Bu jarayonda talabalar, ilmiy rahbarlar hamda administratorlarning tizimdan foydalanish jarayoni o'rganilib, ularning asosiy funksiyalari belgilandi.

Tadqiqotning keyingi bosqichida modellash usuli qo'llanildi. Axborot tizimining konseptual modeli ishlab chiqilib, unda tizim arxitekturasini, foydalanuvchi rollari hamda ma'lumotlar oqimi aniqlashtirildi. Modellash jarayonida UML (Unified Modeling Language) diagrammalaridan foydalanildi. Jumladan, tizimning funksional imkoniyatlarini ifodalash uchun Use Case diagrammalari, ma'lumotlar tuzilmasini ko'rsatish uchun esa ER (Entity–Relationship) modeli ishlab chiqildi. Ushbu modellar tizimni ishlab chiqish jarayonida muhim metodologik asos bo'lib xizmat qiladi.

Ma'lumotlar bazasini loyihalash jarayonida relatsion ma'lumotlar modeli asos qilib olindi. Bu jarayonda normalizatsiya usullari qo'llanilib, ma'lumotlarning takrorlanishini kamaytirish va tizim samaradorligini oshirishga erishildi. Asosiy jadvallar sifatida talabalar, ilmiy ishlar, ilmiy rahbarlar, fakultetlar va yo'nalishlar haqidagi ma'lumotlarni saqlovchi tuzilmalar ishlab chiqildi. Ma'lumotlar bazasini boshqarish tizimi sifatida zamonaviy DBMS texnologiyalaridan foydalanish ko'zda tutildi.

Axborot tizimini ishlab chiqishda zamonaviy dasturiy arxitektura tamoyillari ham qo'llanildi. Jumladan, tizim uch pog'onali arxitektura asosida loyihalashtirildi: foydalanuvchi interfeysi, dasturiy mantiqiy qatlam va ma'lumotlar bazasi qatlami. Bunday yondashuv tizimning moslashuvchanligini, xavfsizligini hamda kengaytirilish imkoniyatlarini oshiradi. Dasturiy ta'minotni yaratishda veb-texnologiyalar, server tomon dasturlash tillari va ma'lumotlar bazasi boshqaruv tizimlaridan foydalanish nazarda tutildi [9].

Tadqiqotning yakuniy bosqichida eksperimental sinov usuli qo'llanilib, ishlab chiqilgan axborot tizimining samaradorligi baholandi. Sinov jarayonida tizimning qidiruv tezligi, ma'lumotlarni saqlash samaradorligi hamda foydalanuvchilar uchun qulaylik darajasi tahlil qilindi. Olingan natijalar tizim oliy

ta'lim muassasalarida talabalar ilmiy ishlarini boshqarish jarayonini sezilarli darajada optimallashtirish imkonini berishini ko'rsatdi.

Natija va muhokama. Olib borilgan tadqiqot natijasida oliy ta'lim muassasalarida talabalar kurs ishlari, bitiruv malakaviy ishlari hamda magistrlik dissertatsiyalarini saqlash va boshqarish uchun mo'ljallangan zamonaviy axborot tizimining konseptual modeli ishlab chiqildi. Ushbu tizim ilmiy ishlarni markazlashgan holda saqlash, ularni tezkor qidirish hamda ilmiy faoliyat natijalarini tizimli ravishda boshqarish imkonini beradi. Taklif etilgan axborot tizimi zamonaviy veb-texnologiyalar, ma'lumotlar bazasi boshqaruv tizimlari va modulli dasturiy arxitektura tamoyillariga asoslangan holda loyihalashtirildi.

Tizimning asosiy funksional imkoniyatlari sifatida talabalar tomonidan ilmiy ishlarni elektron shaklda yuklash, ilmiy rahbarlar tomonidan ularni tekshirish va tasdiqlash, shuningdek administrator tomonidan tizimni boshqarish jarayonlari nazarda tutilgan. Bunda barcha ilmiy ishlar yagona ma'lumotlar bazasida saqlanadi va ularning metama'lumotlari (muallif, mavzu, ilmiy rahbar, yo'nalish, yil va kalit so'zlar) orqali tezkor qidiruv mexanizmi amalga oshiriladi. Bu esa foydalanuvchilarga kerakli ilmiy ishlarni qisqa vaqt ichida topish imkonini yaratadi.

Tadqiqot jarayonida ishlab chiqilgan tizim modeli asosida ma'lumotlar bazasining mantiqiy tuzilmasi shakllantirildi hamda asosiy jadvallar o'rtasidagi bog'lanishlar aniqlashtirildi. Natijada talabalar, ilmiy ishlar, ilmiy rahbarlar va fakultetlar haqidagi ma'lumotlarni o'zaro bog'langan holda saqlash imkoniyati yaratildi. Bunday yondashuv ma'lumotlarning takrorlanishini kamaytiradi va tizim samaradorligini oshiradi.

Shuningdek, ishlab chiqilgan tizim ilmiy ishlar o'rtasidagi o'xshashliklarni aniqlash hamda akademik halollikni ta'minlashga xizmat qiluvchi mexanizmlarni joriy etish imkoniyatini ham beradi. Bu esa talabalar ilmiy ishlarida plagiat holatlarini kamaytirishga yordam beradi. Zamonaviy axborot tizimlaridan foydalanish ilmiy ishlarni raqamli muhitda saqlash bilan bir qatorda ularning statistik tahlilini ham amalga oshirish imkonini yaratadi. Masalan, tizim orqali qaysi yo'nalishlarda ko'proq ilmiy ishlar yaratilayotganini yoki qaysi mavzular dolzarb ekanligini aniqlash mumkin [9].

Umuman olganda, tadqiqot natijalari shuni ko'rsatadiki, talabalar ilmiy ishlarini saqlash va boshqarish uchun ishlab chiqilgan axborot tizimi oliy ta'lim muassasalarida ilmiy faoliyatni samarali tashkil etish, ilmiy resurslardan foydalanish darajasini oshirish hamda raqamli ta'lim muhitini rivojlantirishga xizmat qiladi.

**Xulosa.** Mazkur tadqiqot ishida oliy ta'lim muassasalarida talabalar kurs ishlari, bitiruv malakaviy ishlari hamda magistrlik dissertatsiyalarini saqlash va boshqarish jarayonini takomillashtirishga qaratilgan zamonaviy axborot tizimini ishlab chiqish texnologiyasi o'rganildi. Tadqiqot davomida ta'lim tizimida raqamli transformatsiya jarayonlari, ilmiy axborotlarni boshqarishning zamonaviy usullari hamda akademik resurslarni raqamli muhitda saqlashning ahamiyati ilmiy jihatdan tahlil qilindi. Olib borilgan ilmiy izlanishlar natijasida talabalar ilmiy ishlarini

samarali boshqarish uchun mo'ljallangan axborot tizimining konseptual modeli ishlab chiqildi.

Tadqiqot natijalari shuni ko'rsatadiki, talabalar ilmiy ishlarini markazlashgan elektron tizimda saqlash ilmiy resurslardan foydalanish samaradorligini sezilarli darajada oshiradi. Bunday tizimlar yordamida ilmiy ishlarni tartibli ravishda saqlash, ularni tezkor qidirish, statistik tahlil qilish hamda kelgusidagi ilmiy tadqiqotlar uchun foydalanish imkoniyatlari kengayadi. Shu bilan birga, tizimda ilmiy ishlar haqidagi metama'lumotlarning mavjudligi ularni turli mezonlar asosida saralash va tahlil qilish imkonini beradi. Bu esa ilmiy faoliyatni rejalashtirish va monitoring qilish jarayonida muhim ahamiyat kasb etadi.

Shuningdek, ishlab chiqilgan axborot tizimi akademik halollikni ta'minlashga ham xizmat qiladi. Ilmiy ishlarni yagona ma'lumotlar bazasida saqlash orqali o'xshashliklarni aniqlash va plagiat holatlarini kamaytirish imkoniyati yaratiladi. Bu esa ta'lim muassasalarida ilmiy tadqiqotlarning sifatini oshirishga hamda talabalar o'rtasida mustaqil ilmiy faoliyatni rivojlantirishga ijobiy ta'sir ko'rsatadi.

Tadqiqot natijalariga asoslanib shuni ta'kidlash mumkinki, zamonaviy veb-texnologiyalar, ma'lumotlar bazasi boshqaruv tizimlari hamda modulli dasturiy arxitektura asosida yaratilgan axborot tizimlari oliy ta'lim muassasalarida ilmiy axborotlarni boshqarish jarayonini sezilarli darajada optimallashtiradi. Bunday tizimlar nafaqat ilmiy ishlarni saqlash va boshqarish jarayonini avtomatlashtiradi, balki raqamli ta'lim muhitini shakllantirishga ham xizmat qiladi.

Kelgusida mazkur tizimni yanada takomillashtirish maqsadida sun'iy intellekt texnologiyalarini joriy etish, avtomatik plagiat aniqlash modullarini ishlab chiqish hamda ilmiy ishlarni semantik tahlil qilish imkoniyatlarini kengaytirish maqsadga muvofiq hisoblanadi. Shu orqali oliy ta'lim muassasalarida ilmiy axborotlarni boshqarishning yanada samarali va innovatsion tizimini yaratish mumkin bo'ladi.

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## **KIBERXAVFSIZLIK MADANIYATINI SHAKLLANTIRISHDA ADAPTIV TA'LIM PLATFORMALARINING ILMIY-PEDAGOGIK ASOSLARI**

**Annotatsiya.** Ushbu maqolada raqamli transformatsiya sharoitida yoshlarning kiberxavfsizlik madaniyatini shakllantirish masalasi tahlil qilinadi. Tadqiqotda sun'iy intellekt, o'quv analitikasi va simulyatsion muhitga asoslangan adaptiv ta'lim platformalarining pedagogik imkoniyatlari o'rganilgan. Muallif tomonidan ishlab chiqilgan xavf-indeks modeli va metodik tizimning samaradorligi eksperimental guruhlarda kiberxavfsizlik kompetensiyasining sezilarli darajada oshishi bilan isbotlangan.

**Kalit so'zlar:** kiberxavfsizlik madaniyati, adaptiv ta'lim, sun'iy intellekt, raqamli pedagogika, yoshlar tarbiyasi, axborot xavfsizligi, o'quv analitikasi.

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## **SCIENTIFIC AND PEDAGOGICAL BASIS OF ADAPTIVE EDUCATIONAL PLATFORMS IN FORMING A CYBERSECURITY CULTURE**

**Abstract.** This article analyzes the issue of forming a cybersecurity culture among young people in the context of digital transformation. The study explores the pedagogical potential of adaptive learning platforms based on artificial intelligence, learning analytics, and simulation environments. The effectiveness of the risk-index model and methodological system developed by the author is proven by a significant increase in cybersecurity competence in experimental groups.

**Keywords:** cybersecurity culture, adaptive learning, artificial intelligence, digital pedagogy, youth education, information security, learning analytics.

### **Kirish**

Raqamli texnologiyalar va sun'iy intellektning ommalashuvi yoshlarning axborot makonidagi faolligini oshirish bilan birga, kiberjinoyatchilik va fishing kabi xavflarni ham ko'paytirdi. Global miqyosda kiberhujumlar keltirayotgan ulkan iqtisodiy zarar sharoitida yoshlarning ongli xulq-atvorini va kiberxavfsizlik madaniyatini shakllantirish dolzarb pedagogik vazifaga aylandi.

Kiberxavfsizlik madaniyati nafaqat texnik bilimlarni, balki shaxsning mas'uliyati va refleksiv tafakkurini ham qamrab oladi. An'anaviy ta'lim usullari zamonaviy talablarga to'liq javob bermayotganligi sababli, individual trayektoriya va real simulyatsiyalarni taqdim etuvchi adaptiv ta'lim platformalari innovatsion yechim sifatida namoyon bo'lmoqda. Maqolaning maqsadi – yoshlar

kiberxavfsizlik madaniyatini shakllantirishning ilmiy-pedagogik asoslarini ishlab chiqish va samarali tajriba-sinov modelini taklif etishdir.

### **1. Kiberxavfsizlik madaniyatining nazariy asoslari**

**1.1. Kiberxavfsizlik tushunchasining evolyutsiyasi.** Axborot xavfsizligi dastlab texnik muhofaza choralarga asoslangan bo'lsa, zamonaviy yondashuv inson omilini markaziy element sifatida ko'rib chiqadi. ISO/IEC 27001 standarti axborot xavfsizligini boshqaruv tizimi sifatida belgilaydi [4:3]. Biroq ko'plab kiberhujumlar inson xatosi tufayli yuzaga kelishi aniqlangan.

Tarmoq jamiyati nazariyasiga ko'ra, axborot infratuzilmasi ijtimoiy tuzilmaning asosiy elementi hisoblanadi [2:51]. Demak, kiberxavfsizlik muammosi faqat texnik emas, balki ijtimoiy-madaniy xarakterga ega.

**1.2. Kiberxavfsizlik madaniyatining komponentlari.** Ilmiy adabiyotlar asosida kiberxavfsizlik madaniyati quyidagi komponentlardan iborat deb qaraladi:

1. **Kognitiv komponent** – xavf turlarini bilish.
2. **Operatsion komponent** – amaliy himoya ko'nikmalari.
3. **Aksiologik komponent** – axborotga qadriyat sifatida munosabat.
4. **Refleksiv komponent** – o'z xatti-harakatlarini tahlil qilish.

Bandura nazariyasiga ko'ra, o'z-o'ziga ishonch (self-efficacy) xavfsiz xulq-atvorni shakllantirishda muhim omil hisoblanadi [1:21]. Shaxs o'zining raqamli makondagi harakatlarini boshqarish qobiliyatiga ishonsa, xavfsizlikka nisbatan mas'uliyat ham ortadi.

**1.3. Yoshlar va kiberxavf omillari.** OECD tadqiqotlariga ko'ra, yoshlarning 70% dan ortig'i internetdan kuniga 5 soatdan ko'proq foydalanadi [6:18]. Ijtimoiy tarmoqlar, onlayn o'yinlar va elektron savdo platformalari orqali ma'lumot almashinuvi kuchaymoqda. Shu bilan birga:

- fishing hujumlari,
- zararli havolalar,
- ijtimoiy muhandislik,
- shaxsiy ma'lumotlarni oshkor qilish holatlari keng tarqalgan.

Demak, yoshlar uchun kiberxavfsizlik madaniyatini shakllantirish uzluksiz pedagogik jarayon sifatida qaralishi lozim.

### **2. Adaptiv ta'lim texnologiyalarining pedagogik mohiyati**

**2.1. Adaptiv ta'lim tushunchasi.** Adaptiv ta'lim – bu o'quvchining bilim darajasi, qiziqishi, xatolari va o'zlashtirish tezligiga qarab o'quv kontentini avtomatik moslashtiruvchi raqamli tizimdir [5:34].

Sun'iy intellekt asosidagi algoritmlar o'quvchining javoblarini tahlil qiladi va individual o'quv trayektoriyasini shakllantiradi. Bu esa differensial yondashuvni real vaqt rejimida ta'minlaydi.

**2.2. O'quv analitikasi va ma'lumotlar modeli.** O'quv analitikasi (learning analytics) o'quvchilarning faoliyati haqidagi ma'lumotlarni yig'ish, tahlil qilish va bashorat qilish imkonini beradi. Hattie tadqiqotlariga ko'ra, individual yondashuv o'zlashtirish samaradorligini sezilarli oshiradi [3:89].

Adaptiv tizim quyidagi bosqichlarda ishlaydi:

1. Diagnostika.
2. Tahlil.
3. Moslashtirish.
4. Monitoring.
5. Refleksiya.

### **2.3. Adaptiv platformalarning afzalliklari**

- Individual tezlikda o'qish.
- Real vaziyatga yaqin simulyatsiya.
- Doimiy teskari aloqa.
- Motivatsiyani oshirish.

Mashinali o'rganish algoritmlari inson va sun'iy intellekt integratsiyasini ta'minlaydi [5:72].

### **3. Taklif etilayotgan ilmiy-metodik model**

**3.1. Modelning umumiy tuzilishi.** Taklif etilayotgan model 5 ta moduldan iborat:

1. **Diagnostik modul**
2. **Risk-indeks hisoblash moduli**
3. **Adaptiv kontent moduli**
4. **Simulyatsion modul**
5. **Monitoring va refleksiya moduli**

**3.2. Risk-indeks formulasi.** Kiberxavfsizlik darajasi quyidagicha aniqlanadi:

$$RK = (B \times 0.4) + (A \times 0.3) + (X \times 0.3)$$

Bu yerda:

- B – bilim darajasi,
- A – amaliy ko'nikma,
- X – xavfsiz xulq ko'rsatkichi.

Natijada har bir talaba uchun individual xavf darajasi aniqlanadi.

**3.3. Simulyatsion muhit.** Simulyatsiya moduli real fishing xabarlarini, zararli saytlar, parol mustahkamligi testlari va ijtimoiy muhandislik vaziyatlarini modellashtiradi. Tajriba natijalari shuni ko'rsatadiki, amaliy mashqlar nazariy ma'lumotga nisbatan 2 baravar samarali [3:112].

### **4. Tajriba-sinov ishlari**

**4.1. Tadqiqot dizayni.** Tajriba 120 nafar talaba ishtirokida o'tkazildi:

- 60 nafari – nazorat guruhi
- 60 nafari – eksperimental guruh

Muddat: 4 oy.

**4.2. Natijalar.** Eksperimental guruhda:

- Fishingni aniqlash ko'rsatkichi 42% ga oshdi.
- Kuchli parol yaratish ko'nikmasi 38% ga yaxshilandi.
- Xavfli havolalarga bosish darajasi 35% ga kamaydi.

Nazorat guruhida esa o'sish 10–12% atrofida bo'ldi.

**4.3. Statistik tahlil.** Student t-mezoni asosida farq ishonchli ( $p < 0.05$ ) deb topildi.

## **5. Muhokama**

Natijalar shuni ko'rsatadiki, adaptiv platformalar yoshlarning nafaqat bilimini, balki real xulq-atvorini ham o'zgartira oladi. Bu jarayonda:

- individual motivatsiya,
- o'z-o'zini nazorat qilish,
- refleksiv fikrlash

kuchayadi. Bandura nazariyasi nuqtai nazaridan qaraganda, o'ziga ishonch oshishi xavfsiz xatti-harakatni mustahkamlaydi [1:33].

### **Xulosa**

Tadqiqot natijalari quyidagilarni ko'rsatdi:

1. Kiberxavfsizlik madaniyati kompleks pedagogik jarayondir.
2. Adaptiv ta'lim individual xavf omillarini aniqlash imkonini beradi.
3. Simulyatsiya va analitika asosidagi model an'anaviy usulga nisbatan samaraliroq.

4. Eksperimental natijalar metodikaning samaradorligini tasdiqladi.

Kelgusida modelni maktab bosqichiga moslashtirish va milliy ta'lim platformalariga integratsiya qilish maqsadga muvofiq.

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## **UMUMTA'LIM MAKTABLARIDA JISMONIY TARBIYA SAMARADORLIGINI OSHIRISH OMILLARI**

**Annotatsiya:** *Ushbu maqolada umumta'lim maktablarida jismoniy tarbiya darslari samaradorligini oshirishga ta'sir etuvchi asosiy omillar tahlil qilinadi. Shuningdek, baholash tizimini takomillashtirish va dars jarayonida innovatsion usullardan foydalanish orqali o'quvchilarning jismoniy faolligini va qiziqishini oshirish yo'llari ko'rsatib beriladi.*

**Kalitso'zlar:** *jismoniy tarbiya, samaradorlik, umumta'lim maktabi, pedagogik texnologiyalar, sog'lom turmush tarzi, innovatsion yondashuv, baholash tizimi, jismoniy faollik.*

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## **FACTORS FOR INCREASING THE EFFECTIVENESS OF PHYSICAL EDUCATION IN GENERAL SECONDARY SCHOOLS**

**Abstract:** *This article analyzes the main factors influencing the improvement of the effectiveness of physical education lessons in general secondary schools. It also highlights ways to increase students' physical activity and interest by improving the assessment system and applying innovative teaching methods during the learning process.*

**Keywords:** *physical education, effectiveness, general secondary school, pedagogical technologies, healthy lifestyle, innovative approach, assessment system, physical activity.*

Bugungi kunda umumta'lim maktablarida jismoniy tarbiya fanining ahamiyati tobora ortib bormoqda. O'quvchilarning sog'lom, jismonan barkamol va har tomonlama rivojlangan shaxs bo'lib voyaga yetishida jismoniy tarbiya muhim o'rin tutadi. Biroq darslar samaradorligini oshirish uchun ta'lim jarayonini zamonaviy talablar asosida tashkil etish zarur.

Ilmiy asoslangan pedagogik nazoratni tashkil etish va o'tkazish individual jismoniy sifatlarni rivojlanish darajasini aniqlash, bu darajani me'yoriy ko'rsatkichlar bilan taqqoslash va shu asosda o'quvchilarning jismoniy sifatlarini yo'naltirish va rivojlantirish bo'yicha oqilona rejalar tuzish imkonini beradi. Mamlakatimizda umumta'lim maktablarida o'quv jarayonini tashkil etish bo'yicha alohida tajriba-metodik isqlanmalar amalga oshirilib, bu maktab o'quvchilari o'rtasida harakat ko'nikmalarining zarur fondini shakllantirish, o'quvchilarning asosiy jismoniy tayyorgarligiga zamin yaratish imkonini bermoqda. Shu bilan birga, jismoniy tarbiya amaliyotida an'anaviy pedagogik nazoratning bir yoqlama o'tkazilishi uning turlariga yetarlicha e'tibor berilmayotganligi bu borada ko'plab hal etishimiz kerak bo'lgan vazifalarimiz bor ekanligini ko'rsatmoqda. Ayniqsa, maktab o'quvchilarining jismoniy tarbiya ta'limi samaradorligini kompleks nazorat qilishning me'yoriy talablarini isqlab chiqish muhim ahamiyat kasb etadi. Asosiy qism. Ta'limning turli yo'nalisqlarida bolalar bog'chasidan bosqlab, toki universitet darajasigacha jismoniy tarbiya va sportni rolini va ahamiyatini oshirib borilmoqda. Maktabgacha va maktab ta'limi islohati, bolalarining jismoniy tayyorgarligini oshirish masalalari muhim amaliy ahamiyat kasb etadi. Shuning uchun maktab yoshidagi bolalarning harakat faolligi darajasini bilish maqsadida ilmiy izlanisqlar olib borish dolzarb masala bo'lib qoldi Olimlar va mutaxassislar oldida tez yechimini topish kerak bo'lgan qator vazifalar turibdi. O'quvchilarning jismoniy rivojlanish darajasini aniqlashda haligacha aniq ma'lumotlarni olish to'g'risidagi kamchiliklar bor. Shuning uchun jismoniy ta'limda o'quvchilarning jismoniy tayorgarligini obyektiv ravishda baholash masalalari muhim ahamiyat kasb etadi. Tadqiqot natijasi va muhokamasi. O'zbekiston Respublikasi Prezidentining 2017-yil 3-iyundagi PQ- 3031-son "Jismoniy tarbiya va ommaviy sportni yanada rivojlantirish chora-tadbirlari to'g'risida"gi qarori [1], 2018-yil 14-avgustdagi PQ-3907-son "Yosqlarni ma'naviy-axloqiy va jismoniy barkamol etib tarbiyalash, ularga ta'lim-tarbiya berish tizimini sifat jihatdan yangi bosqichga ko'tarish chora-tadbirlari to'g'risida"gi qarori[2], 2020-yil 24-yanvardagi PF-5924-son "Jismoniy tarbiya va sportni yanada takomillashtirish va ommalashtirish chora-tadbirlari to'g'risida"gi Farmoni[3] hamda mazkur sohaga tegisqli me'yoriy-huquqiy hujjatlarda belgilangan vazifalarni amalga oshirishda ushbu tadqiqotga muayyan darajada xizmat qiladi.

### **1. O'quvchilarning individual xususiyatlarini hisobga olish**

Har bir o'quvchining jismoniy rivojlanish darajasi, sog'lig'i va qiziqishi turlicha bo'ladi. Shuning uchun dars jarayonida tabaqalashtirilgan yondashuvni qo'llash muhimdir. Kuchli o'quvchilar uchun murakkabroq mashqlar, tayyorgarligi past o'quvchilar uchun esa yengilroq topshiriqlar berilishi dars samaradorligini oshiradi.



## **2. Zamonaviy pedagogik texnologiyalardan foydalanish**

Interaktiv metodlar, o'yin texnologiyalari, musobaqa elementlari va axborot-kommunikatsiya vositalaridan foydalanish o'quvchilarning darsga bo'lgan qiziqishini oshiradi. Masalan, mini-turnirlar, estafeta o'yinlari, guruhlarda ishlash metodlari samarali natija beradi.

## **3. Moddiy-texnik bazani mustahkamlash**

Sport jihozlari, anjomlar va sport maydonchalarining yetarli darajada bo'lishi dars sifatiga bevosita ta'sir qiladi. Zamonaviy inventar va xavfsizlik talablariga javob beradigan sharoitlar o'quvchilarning faol ishtirokini ta'minlaydi.

## **4. O'qituvchining kasbiy mahorati**

Jismoniy tarbiya o'qituvchisining bilim va ko'nikmalari, darsni to'g'ri rejalashtirishi hamda motivatsiya berish qobiliyati muhim omildir. O'qituvchining innovatsion yondashuvni qo'llashi dars samaradorligini sezilarli oshiradi.

## **5. Baholash tizimini takomillashtirish**

Baholash faqat natijaga emas, balki o'quvchining harakat faolligi, intilishi va shaxsiy rivojlanishiga ham asoslanishi kerak. Rag'batlantiruvchi baholash usullari o'quvchilarda o'ziga ishonchni mustahkamlaydi.

## **6. Sog'lom turmush tarzini targ'ib qilish**

Pedagogik nazoratni tashkil etishda quyidagi talablarga rioya etish kerak: o'z vaqtida amalga oshirish, muntazamlik, obyektivlik, asosiy ko'rsatkicqlarni qamrab olish. O'smirlarning jismoniy tayyorgarligining pedagogik nazoratini obyektiv ko'rsatkicqlarini olish uchun ularni konstitutsiya tipi va rivojlanish tipiga hamda jismoniy tayyorgarlik darajasiga taqsimlash lozim. Pedagogik nazoratni bunday tashkil etish o'smirlarning jismoniy tayyorgarligining obyektiv va ishoncqli ko'rsatkicqlarini olish imkonini beradi. Yuqoridagilardan kelib chiqib, pedagogik tajriba o'tkazildi va u umumta'lim

Jismoniy tarbiya darslari orqali o'quvchilarda sog'lom turmush tarziga ongli munosabat shakllantiriladi. Sport bilan muntazam shug'ullanish, to'g'ri ovqatlanish va zararli odatlardan yiroq bo'lish Umumta'lim maktablarida jismoniy tarbiya samaradorligini oshirish ko'plab omillarga bog'liq. Individual yondashuv, zamonaviy pedagogik texnologiyalar, kuchli moddiy baza, malakali o'qituvchi va adolatli baholash tizimi dars sifatini oshirishda muhim rol o'ynaydi. Mazkur omillar uyg'unligi o'quvchilarning jismoniy rivojlanishini ta'minlab, ularning sog'lom va barkamol shaxs bo'lib kamol topishiga xizmat qiladi.

## **Foydalanilgan adabiyotlar**

1. Haydarov T.T . BO 'LAJAK MUHANDISLARNING KASBIY KOMPETENTLIGINI SHAKLLANTIRISHDA INTERFAOL USULLARDAN FOYDALANISH. Экономика и социум 8 (135)

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2. INTEGRATIV YONDASHUV ASOSIDA BO'LAJAK MUHANDISLARNI HISOB-GRAFIK KO'NIKMALARINI RIVOJLANTIRISH METODIKASINI TAKOMILLASHTIRISH \_\_\_\_\_ "Экономика и социум" №7(134) 2025. <https://a78cf8ac-3ef5-4670-8fcd->

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## **JISMONIY TARBIYANI O'QITISHNING ZAMONAVIY USULLARI**

**Annotatsiya:** Ushbu maqolada jismoniy tarbiya fanida o'quvchilarga yo'naltirilgan va tabaqalashtirilgan yondashuvlarning ahamiyati yoritilgan. O'quvchilarning jismoniy rivojlanish darajasi, sog'lik holati va individual xususiyatlariga qarab ta'lim jarayonini tashkil etish zarurligi asoslab berilgan. Shaxsga yo'naltirilgan ta'lim mazmuni pedagogik texnologiyalar asosida jismoniy barkamollikka erishishni ta'minlashga xizmat qilishi qayd etilgan.

**Kalitso'zlar:** Jismoniy tarbiya, tabaqalashtirilgan ta'lim, shaxsga yo'naltirilgan yondashuv, harakat sifatleri, jismoniy rivojlanish, pedagogik texnologiyalar, baholash mezonlari, o'quv jarayoni samaradorligi.

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## **MODERN METHODS OF TEACHING PHYSICAL EDUCATION**

**Abstract:** This article highlights the importance of student-centered and differentiated approaches in physical education. It substantiates the necessity of organizing the educational process according to students' levels of physical development, health conditions, and individual characteristics. It is noted that the content of student-centered education, based on modern pedagogical technologies, serves to ensure the achievement of physical excellence and comprehensive development of students.

**Keywords:** Physical education, differentiated instruction, student-centered approach, motor skills, physical development, pedagogical technologies, assessment criteria, educational process effectiveness.

Jismoniy tarbiyani o'qitishning zamonaviy usullari axborot texnologiyalari, interaktiv metodlar va o'yin texnologiyalariga asoslanib, dars samaradorligini oshiradi. Asosiy usullarga multimedia, o'yinli mashg'ulotlar, tabaqalashtirilgan ta'lim, jamoaviy va loyihaviy yondashuvlar kiradi, bular o'quvchilarning qiziqishini oshiradi, faoliyatini rivojlantiradi va sog'lom turmush tarzini shakllantiradi

Jismoniy tarbiya fanidan ham past, ham yuqori natijalarga erishgan o'quvchilar uchun O'quvchilarga yo'naltirilgan va tabaqalashtirilgan yondashuvlar muhim ahamiyatga ega. Harakat sifatlarining past darajada rivojlanishi ko'pincha o'quvchilarning jismoniy tarbiyadagi muvaffaqiyatsizligining asosiy sabablaridan biri bo'lib, yuqori darajadagi o'quvchilar o'rtacha o'quvchi uchun mo'ljallangan darslarga qiziqmaydilar. O'quvchilarni asosiy va tayyorgarlik guruhlariga bo'lishdan tashqari, deyarli har bir sinfda shartli ravishda bolalarni yana bir nechta guruhlarga (toifalarga) bo'lish mumkin: - mutlaqo sog'lom bolalar, lekin ishlashga tayyor emaslar; - kasallik tufayli vaqtincha tayyorgarlik guruhiga o'tkazilgan bolalar; - jismonan kam rivojlangan, masxara qilishdan qo'rqadigan bolalar yakkalanib qolishadi; - Jismoniy jihatdan yaxshi rivojlangan bolalar, agar ular uchun bu juda oson va qiziq bo'lmasa, sinfda o'qish istagi yo'qolishi mumkin. Shuning uchun vazifalarni ham, mazmunini ham, dastur materialini o'zlashtirish tezligini ham, yutuqlarni baholashni ham farqlash kerak. Shaxsga yo'naltirilgan ta'lim mazmuni - bu harakat harakatlarini tabaqalashtirilgan tayyorlash, jismoniy fazilatlarni rivojlantirish, bilim va uslubiy ko'nikmalarni shakllantirish, ta'lim jarayonini boshqarish, jismoniy barkamollikka erishishni ta'minlashning pedagogik texnologiyalari majmuidir.

Bugungi kunda ta'lim tizimida tub o'zgarishlar amalga oshirilmoqda. Raqamli texnologiyalar, kompetensiyaviy yondashuv va innovatsion pedagogik metodlar barcha fanlar qatori jismoniy tarbiya faniga ham kirib keldi. Zamonaviy jismoniy tarbiya darslari nafaqat jismoniy sifatlarini rivojlantirish, balki o'quvchilarda sog'lom turmush tarzini shakllantirish, jamoada ishlash, liderlik va mas'uliyat hissini tarbiyalashga xizmat qiladi.

Mazkur maqolada jismoniy tarbiyani o'qitishning zamonaviy usullari, ularning afzalliklari va amaliy qo'llanish yo'llari yoritiladi.

### **1. Kompetensiyaviy yondashuv**

Zamonaviy ta'limning asosiy yo'nalishlaridan biri — kompetensiyaviy yondashuvdir. Bu usulda o'quvchilar faqatgina mashqlarni bajarishni emas, balki:

- o'z sog'lig'ini nazorat qilishni,
- mashqlarni mustaqil tanlashni,
- xavfsizlik qoidalariga rioya qilishni,
- jamoaviy hamkorlikni o'rganadilar.

Natijada o'quvchi jismoniy faoliyatni ongli ravishda amalga oshiradigan shaxsga aylanadi.

### **2. Interaktiv metodlar**

Interaktiv metodlar dars jarayonini qiziqarli va samarali qiladi. Ularga quyidagilar kiradi:

- “Aylanma stansiyalar” usuli (station method)
- Kichik guruhlarda ishlash
- Musobaqa va estafeta elementlari
- Muammoli vaziyatli topshiriqlar

Masalan, “Aylanma stansiyalar” usulida o‘quvchilar turli mashq punktlarida navbatma-navbat ishlaydi. Bu esa darsni dinamik va faol o‘tkazishga yordam beradi.

### **3. Axborot-kommunikatsiya texnologiyalaridan foydalanish**

Raqamli texnologiyalar jismoniy tarbiya darslarida ham qo‘llanilmoqda:

- Fitness ilovalari va pedometrlar
- Videodarslar va onlayn treninglar
- Harakat texnikasini video orqali tahlil qilish

Masalan, o‘quvchilarning yugurish texnikasi video orqali yozib olinib, keyinchalik xatolari tahlil qilinadi. Bu usul o‘z-o‘zini baholash ko‘nikmasini rivojlantiradi.

### **4. Gamifikatsiya (o‘yinlashtirish)**

Gamifikatsiya — dars jarayoniga o‘yin elementlarini kiritishdir. Masalan:

- Ball to‘plash tizimi
- Reyting jadvali
- Qahramonlik darajalari
- Jamoaviy “missiyalar”

Bu usul o‘quvchilarning motivatsiyasini oshiradi va darslarga qiziqishni kuchaytiradi.

Bu yondashuv hamkorlik, bag‘rikenglik va ijtimoiy moslashuvni rivojlantiradi.

### **5. Sog‘lom turmush tarzini shakllantirishga yo‘naltirish**

Zamonaviy darslar faqat sport elementlari bilan cheklanmaydi. Ularda:

- to‘g‘ri ovqatlanish,
- kun tartibi,
- zararli odatlardan saqlanish,
- stressni boshqarish

kabi mavzular ham yoritiladi.

Bu orqali jismoniy tarbiya sog‘lom hayot falsafasini shakllantiruvchi fan sifatida namoyon bo‘ladi.

Zamonaviy pedagogning vazifasi — o‘quvchilarda nafaqat kuch va chidamlilikni, balki sog‘lom turmush tarziga ongli munosabatni shakllantirishdir. Shundagina jismoniy tarbiya fani haqiqiy tarbiyaviy ahamiyat kasb etadi.

### **Foydalanilgan adabiyotlar**

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## **INSTITUTIONAL AND PRICING FRAMEWORKS FOR CARBON MARKET DEVELOPMENT IN EMERGING ECONOMIES: EVIDENCE FROM UZBEKISTAN**

**Annotation.** *This study examines the institutional prerequisites and pricing frameworks necessary for establishing carbon markets in emerging economies, using Uzbekistan as a case study. The research employs comparative institutional analysis across five operational emissions trading systems (EU ETS, China ETS, K-ETS, Kazakhstan ETS, and the RGGI), cost-benefit analysis, marginal abatement cost curve modeling, and scenario analysis. The findings reveal that Uzbekistan, which emits approximately 209 million tonnes of CO<sub>2</sub> annually with 64% from the energy sector and emission intensity more than twice its Central Asian peers, possesses both the imperative and the emerging institutional capacity for carbon market development. The country's pioneering iCRAFT project – the world's first policy crediting program – has demonstrated the feasibility of carbon market mechanisms by generating USD 15 million for 1 million tonnes of verified emission reductions. Three development scenarios are modeled: a low-ambition scenario (energy sector only, USD 5–10/tCO<sub>2</sub>) yielding 8–12 million tonnes CO<sub>2</sub>/year reduction; a medium-ambition scenario (energy plus industry, USD 10–20/tCO<sub>2</sub>) yielding 15–22 million tonnes; and a high-ambition scenario (economy-wide, USD 20–40/tCO<sub>2</sub>) yielding 25–35 million tonnes. Cost-benefit analysis indicates a benefit-cost ratio of 3.5–5.0 over the 2028–2040 period. The study proposes a three-phase institutional roadmap and contributes to the literature on carbon market design for emerging economies with energy-intensive industrial structures.*

**Keywords:** carbon market, emissions trading system, carbon pricing, institutional framework, emerging economies, climate policy, Paris Agreement, Article 6, Uzbekistan.

### **1. Introduction**

Carbon pricing has emerged as the cornerstone instrument in the global policy architecture for greenhouse gas (GHG) emission reduction. By assigning a monetary cost to carbon emissions, carbon pricing mechanisms internalize the environmental externalities of fossil fuel combustion and industrial processes, thereby altering the relative economics of high-carbon versus low-carbon activities. As of 2024, 36 emissions trading systems (ETS) and 37 carbon taxes are operational worldwide, collectively covering approximately 23% of global GHG emissions and generating over USD 74 billion in annual revenue [1]. The International Carbon

Action Partnership (ICAP) reports that an additional 22 jurisdictions are developing or considering ETS implementation [1], signaling sustained momentum in carbon market proliferation.

The theoretical foundations for carbon pricing rest on well-established principles of environmental economics. The Pigouvian tax approach, formalized by Arthur Pigou [2] and refined by William Nordhaus [3] through integrated assessment modeling, advocates for a carbon tax set equal to the social cost of carbon (SCC). The cap-and-trade approach, grounded in Ronald Coase's [4] theorem on property rights and transaction costs, and operationalized by Dales [5] and Montgomery [6], establishes tradable emission allowances that theoretically achieve emission reductions at minimum cost. Joseph Stiglitz and Nicholas Stern [7] have argued that efficient carbon pricing, at levels of USD 50–100/tCO<sub>2</sub> by 2030, is essential for meeting the Paris Agreement's temperature targets. The empirical evidence on carbon pricing effectiveness has expanded considerably: Green [8] conducted a meta-analysis of carbon pricing programs and found that they reduce emissions by 5–21% depending on price levels and design parameters.

For emerging economies, the carbon market development challenge is distinctive and multifaceted. Unlike developed countries that pioneered carbon pricing with established institutional infrastructure, reliable emissions data systems, and mature financial markets, emerging economies must often build these foundations simultaneously with market design. Doda and colleagues [9] have documented the specific institutional challenges that developing countries face in ETS implementation, including monitoring capacity constraints, data quality concerns, and political economy obstacles. Goulder and Schein [10] have demonstrated through computable general equilibrium (CGE) modeling that carbon pricing design parameters – including allocation methods, revenue recycling, and price controls – significantly influence both economic efficiency and distributional outcomes, with these sensitivities amplified in emerging economy contexts.

The experience of existing carbon markets offers critical lessons for emerging economies. The EU ETS, the world's oldest and largest carbon market, generated EUR 38.8 billion in auction revenue in 2023 at an average price of approximately EUR 65/tCO<sub>2</sub> [1, 11]. However, its early phases were plagued by overallocation and price collapse, demonstrating the importance of supply management mechanisms. China's national ETS, launched in 2021 as the world's largest by coverage volume (approximately 5 billion tonnes CO<sub>2</sub>), initially adopted intensity-based benchmarks and 100% free allocation for the power sector, producing modest prices of CNY 70–80/tCO<sub>2</sub> (approximately USD 10) [12]. South Korea's K-ETS (2015) covers 74% of national emissions with 97% initial free allocation [1]. Kazakhstan's pilot ETS (2013–2016) – the first in Central Asia – was suspended due to institutional capacity constraints and data quality concerns, providing cautionary lessons for the region [1, 9].

Uzbekistan presents a particularly instructive case for studying carbon market institutional development. The country emits approximately 209 million tonnes of CO<sub>2</sub> annually, with the energy sector accounting for 64% of total emissions [13].

Emission intensity is more than twice the Central Asian average and more than six times the global average [13]. The country's Nationally Determined Contribution (NDC) under the Paris Agreement commits to a 50% reduction in GHG emissions per unit of GDP by 2035 [14]. In a landmark development, Uzbekistan became the first country in the world to receive payment from the World Bank for reducing carbon emissions through a policy crediting program – the Innovative Carbon Resource Application for Energy Transition (iCRAFT) project – receiving USD 15 million for 1 million tonnes of verified CO<sub>2</sub> reductions [15]. In July 2025, Decree of the President of the Republic of Uzbekistan No. PD-110 “On measures for participation in the international carbon units market” was adopted to establish a regulatory framework for international carbon market operations based on Paris Agreement[16]. These developments signal both political commitment and emerging institutional capacity.

Despite the growing body of literature on carbon market design and implementation, several research gaps persist in the emerging economy context. First, most comparative studies focus on established markets (EU, California, China) with limited systematic analysis of institutional prerequisites for countries at earlier stages of carbon market development. Second, the interaction between energy subsidy reform – a defining feature of many emerging economies – and carbon market effectiveness remains underexplored. Third, the specific institutional and pricing framework requirements for energy-intensive emerging economies with significant industrial sectors have received insufficient attention. Fourth, the role of international carbon market mechanisms under Article 6 of the Paris Agreement as potential catalysts for domestic market development in emerging economies is not well understood empirically.

**Research objective.** This study aims to analyze the institutional prerequisites and pricing frameworks necessary for carbon market development in emerging economies, assess the economic efficiency of different carbon market design options, and propose a phased implementation roadmap. Uzbekistan serves as the primary case study, with comparative analysis drawing on the EU, China, South Korea, Kazakhstan, and the US Regional Greenhouse Gas Initiative (RGGI).

The research objectives are: (1) to systematize the institutional prerequisites for carbon market establishment in emerging economies; (2) to assess Uzbekistan's current institutional readiness for carbon market development; (3) to evaluate different carbon pricing scenarios using cost-benefit analysis and marginal abatement cost modeling; (4) to conduct comparative analysis of international ETS design experiences relevant to emerging economy contexts; and (5) to develop a phased institutional roadmap for carbon market establishment.

This study contributes to the literature in several ways. First, it provides the first systematic institutional analysis of carbon market development prospects in Central Asia since Kazakhstan's ETS suspension, incorporating the significant policy developments of 2022–2024. Second, it introduces empirical evidence from the iCRAFT project as a novel case of Article 6-based carbon market catalyst. Third, it develops scenario-specific CBA and MAC analysis calibrated to an energy-

intensive transitional economy. Fourth, it proposes a phased roadmap that synthesizes lessons from five international ETS experiences into actionable guidance for emerging economy policymakers.

The paper proceeds as follows. Section 2 describes the multi-method research design. Section 3 presents results across six subsections: institutional readiness, international ETS comparison, scenario analysis, CBA, MAC analysis, and the proposed roadmap. Section 4 discusses findings in the context of the broader literature on carbon market design, identifies scientific novelty, and acknowledges limitations. Section 5 offers conclusions and targeted recommendations for policymakers, industrial enterprises, and international partners.

## **2. Research methodology**

The study employs a multi-method research design integrating qualitative institutional analysis with quantitative economic modeling.

### **2.1. COMPARATIVE INSTITUTIONAL ANALYSIS**

Five operational emissions trading systems are analyzed to extract design lessons for emerging economies: the EU ETS (Phase 4, 2021–2030), representing the most mature carbon market with comprehensive institutional infrastructure; the China national ETS (2021–present), demonstrating how a large developing country with energy-intensive industry can implement an ETS; South Korea's K-ETS (2015–present), illustrating a middle-income economy's approach to carbon market development; Kazakhstan's pilot ETS (2013–2016, suspended), providing cautionary lessons about premature market launch; and the RGGI (2009–present), demonstrating a sub-national, sector-specific approach. The comparison dimensions include: legal and regulatory framework requirements; institutional capacity (regulators, MRV systems, registries); emission data infrastructure; allocation methodology (benchmarking vs. grandfathering, free allocation vs. auctioning); price management mechanisms (price floors, ceilings, market stability reserves); scope and coverage decisions; and revenue generation and recycling approaches.

### **2.2. COST-BENEFIT ANALYSIS (CBA)**

A CBA framework is applied to assess the economic efficiency of carbon market implementation. Benefits are estimated across four categories: direct emission reduction benefits valued at the social cost of carbon (SCC), using the US EPA's central estimate of USD 51/tCO<sub>2</sub> (2020 dollars) [17] as the baseline, with sensitivity analysis at USD 30 and USD 80/tCO<sub>2</sub>; health co-benefits from reduced air pollution, estimated using dose-response functions and value of statistical life parameters adapted from WHO methodology; energy efficiency gains monetized through reduced fuel import expenditure; and carbon market revenue for government budgets. Costs include: implementation costs (MRV system, registry, regulatory capacity); compliance costs for regulated entities (abatement investments, allowance purchases); administrative costs; and potential competitiveness impacts for trade-exposed industries. A 5% discount rate is applied, with sensitivity analysis at 3% and 10%. The analysis period covers 2028–2040, assuming a 2028 pilot ETS launch.

### 2.3. MARGINAL ABATEMENT COST (MAC) CURVE ANALYSIS

A bottom-up MAC curve is constructed for the industrial and energy sectors, identifying specific emission reduction technologies and their associated costs. The analysis covers: energy efficiency measures in power generation (gas turbine upgrades, combined cycle conversion), estimated at USD 5–15/tCO<sub>2</sub>; renewable energy deployment (solar, wind) replacing gas-fired generation, at USD 10–25/tCO<sub>2</sub>; industrial process efficiency improvements (cement, chemicals, metallurgy), at USD 15–35/tCO<sub>2</sub>; fuel switching (coal to gas, gas to renewables), at USD 20–40/tCO<sub>2</sub>; and carbon capture, utilization, and storage (CCUS), at USD 40–80/tCO<sub>2</sub>. The MAC curve enables identification of the least-cost emission reduction pathway and the carbon price level required to unlock specific technology deployments.

### 2.4. SCENARIO ANALYSIS

Three carbon market development scenarios are modeled: Scenario A (Low Ambition) – ETS covering only the power sector, intensity-based benchmarks, 100% free allocation, price floor of USD 3/tCO<sub>2</sub>, price ceiling of USD 15/tCO<sub>2</sub>; Scenario B (Medium Ambition) – ETS covering energy and major industrial sectors, combination of benchmarking and auctioning (80% free, 20% auction), price floor USD 5/tCO<sub>2</sub>, price ceiling USD 25/tCO<sub>2</sub>; and Scenario C (High Ambition) – economy-wide ETS with gradual expansion, increasing auction share (starting at 70% free, declining 5% annually), price floor USD 10/tCO<sub>2</sub>, price ceiling USD 50/tCO<sub>2</sub>, linked to international markets via Article 6. Each scenario is assessed on: emission reduction potential, budget revenue generation, GDP impact, competitiveness effects on trade-exposed sectors, and institutional capacity requirements.

### 2.5. DATA SOURCES

Primary data sources include: ICAP Status Reports on global carbon pricing [1]; World Bank State and Trends of Carbon Pricing reports [18]; IEA energy and emissions data for Uzbekistan [19]; UNDP Climate Public Expenditure and Institutional Review [13]; World Bank iCRAFT project documentation [15]; national GHG inventories from the National Committee of Ecology and Climate Change; and energy balance data from the Ministry of Energy.

## 3. RESULTS

### 3.1. INSTITUTIONAL READINESS ASSESSMENT

The assessment of Uzbekistan's institutional readiness for carbon market development reveals a mixed picture of emerging strengths and persistent gaps. The analysis identifies seven critical institutional prerequisites and evaluates each.

**Legal and regulatory framework.** The 2019–2030 Green Economy Strategy [14] and Presidential Decree PD-436 (2022) [20] provide high-level policy mandates for emission reduction and carbon market development. Temporary regulations on international GHG trade implementation have been approved [21]. In addition, an important milestone in the formation of the national climate policy framework was the adoption of the Law of the Republic of Uzbekistan “On Limiting Greenhouse Gas Emissions” (No. LRU-1073, July 7, 2025). The law establishes the



legal basis for regulating greenhouse gas emissions, including the introduction of national accounting and monitoring mechanisms, the establishment of emission reduction targets, and the development of “green” projects generating carbon units. It also provides for the creation of a national registry of carbon units and the verification of emission reductions generated by climate mitigation projects. These provisions create an important legal foundation for the potential development of domestic carbon pricing instruments and participation in international carbon markets under Article 6 of the Paris Agreement.

However, comprehensive ETS legislation has not yet been enacted. International comparison reveals that all five benchmark ETS required dedicated primary legislation prior to market launch: the EU ETS Directive (2003/87/EC), China’s Interim Regulations on Carbon Emissions Trading (2024), South Korea’s Framework Act on Carbon Neutrality (2021), Kazakhstan’s Environmental Code amendments (2011), and the RGGI Model Rule (2008) [1].

**MRV system.** The iCRAFT project is establishing monitoring, reporting, and verification infrastructure in line with Article 6 of the Paris Agreement [15]. This is a critical institutional building block, as robust MRV is universally identified as the single most important prerequisite for a functioning carbon market [9, 11]. The National Committee of Ecology and Climate Change publishes national GHG inventories, but facility-level emission reporting remains incomplete. China’s experience is instructive: its national ETS was preceded by seven regional pilots (2013–2017) that served primarily to develop MRV capacity and accumulate facility-level emissions data [12]. For Uzbekistan, a mandatory facility-level emissions reporting requirement for large emitters should be considered a priority precursor to ETS launch.

**Emissions data infrastructure.** The energy sector’s 64% contribution to total emissions [13] implies that a power sector-focused ETS could capture a majority of emissions with a manageable number of regulated entities. Based on available data, approximately 30–50 large power generation facilities account for the bulk of energy sector emissions. This concentrated emission profile is favorable for initial ETS implementation, as it reduces the administrative burden and data complexity compared to an economy-wide approach. For comparison, China’s national ETS initially covered approximately 2,200 power generation facilities [12], while the EU ETS Phase 1 covered approximately 11,000 installations [11].

**Market infrastructure.** A carbon market requires trading infrastructure (exchange or over-the-counter platform), a registry system for tracking allowance ownership and transfers, and clearing and settlement mechanisms. The Tashkent Stock Exchange provides a potential platform for allowance trading, and the experience with green bond issuance demonstrates emerging capital market capacity [22]. The iCRAFT project’s carbon credit generation and verification process has established precedent for carbon asset creation and transaction [15].

**Regulatory capacity.** A designated competent authority with technical expertise in carbon market oversight is essential. Currently, the Ministry of Economy and Finance leads on carbon market development. The National



Committee of Ecology and Climate Change manages GHG inventory and environmental regulation. Coordination between these institutions will be critical. China allocated its ETS oversight to the Ministry of Ecology and Environment, while South Korea created a dedicated Greenhouse Gas Inventory and Research Center [1]. For Uzbekistan, establishing a dedicated carbon market regulatory unit within Ministry of Economy and Finance as it is designated national authority for carbon trade, staffed with specialists in emission monitoring, allowance management, and market oversight, is a necessary institutional step.

**Political economy and stakeholder engagement.** Carbon pricing inherently creates winners and losers, and political sustainability requires proactive stakeholder management. The EU ETS experience demonstrates that initial overallocation to maintain industrial support, followed by gradual tightening, can build political acceptance over time [11]. China's approach of extensive stakeholder consultation through regional pilot programs created a constituency of experienced participants before national launch [12]. For Uzbekistan, where state-owned enterprises dominate key emission-intensive sectors, the government's dual role as regulator and owner creates both opportunities (direct influence over compliance behavior) and challenges (potential conflicts of interest in enforcement). The iCRAFT project's positive reception among government stakeholders [15] suggests that demonstrating tangible financial benefits from carbon market participation can build political support for broader carbon pricing.

**Energy sector reform context.** Uzbekistan's carbon market development occurs against the backdrop of comprehensive energy sector reform, including electricity and gas market liberalization, tariff adjustments, and the scaling of renewable energy investment. This context is both a challenge and an opportunity. On the challenge side, implementing carbon pricing simultaneously with energy price reform risks compounding cost impacts on industrial consumers and households. On the opportunity side, the institutional reforms underway in the energy sector – including unbundling, market operator establishment, and metering infrastructure development – create synergies with carbon market infrastructure needs. The planned energy market liberalization from 2026 will establish cost-reflective pricing that makes carbon price signals more effective: when energy prices reflect true costs, the incremental burden of carbon pricing is more easily absorbed, and the combined signal more strongly incentivizes clean technology investment. Deputy Minister Mamadaminov's statement that the energy industry accounts for 70% of emissions, representing "a lot of opportunities in the energy industry for carbon markets" [16], reflects this strategic alignment.

Overall, the institutional readiness assessment suggests that Uzbekistan meets several foundational prerequisites (political commitment, initial MRV experience through iCRAFT, emerging capital market infrastructure) while significant gaps remain in mandatory reporting systems, dedicated regulatory capacity, and comprehensive legal frameworks. The assessment supports a phased approach that builds institutional foundations before market launch, consistent with the sequencing lessons from international experience.

### 3.2. INTERNATIONAL ETS DESIGN COMPARISON

**Table 1 – Comparative Analysis of Emissions Trading System Design Parameters**

| Parameter           | EU ETS Phase 4       | China ETS              | K-ETS                   | Kazakhstan ETS | RGGI                     |
|---------------------|----------------------|------------------------|-------------------------|----------------|--------------------------|
| Launch year         | 2005                 | 2021                   | 2015                    | 2013*          | 2009                     |
| Coverage (%GHG)     | ~40%                 | ~40%**                 | 74%                     | ~50%           | ~20%                     |
| Allocation method   | Auction + benchmark  | Intensity benchmark    | Grandfathering          | Grandfathering | 100% auction             |
| Free allocation     | ~40% (declining)     | 100%                   | 97% (declining)         | 100%           | 0%                       |
| Carbon price (2024) | €65/tCO <sub>2</sub> | ~\$10/tCO <sub>2</sub> | \$8–10/tCO <sub>2</sub> | N/A            | \$13–15/tCO <sub>2</sub> |
| Revenue (2023)      | €38.8 bln            | ~\$0.2 bln             | ~\$0.1 bln              | N/A            | ~\$1.4 bln               |
| Price management    | MSR                  | Price corridor         | Reserve + ceiling       | None           | Floor + CCR              |

*Source: Compiled based on ICAP [1], EU Commission [11], Zhang [12]. \* Suspended 2016. \*\* Power sector only.*

Table 1 reveals several design patterns relevant to emerging economy ETS development. First, all emerging economy ETS (China, South Korea, Kazakhstan) began with high free allocation rates (97–100%), in contrast to the RGGI's 100% auction approach. This reflects the political economy imperative of minimizing initial compliance costs for regulated industries during the transition period. Second, sectoral coverage decisions vary significantly: while China started with power sector only, South Korea adopted broad coverage from the outset. Third, price management mechanisms are present in all functioning systems except Kazakhstan's suspended ETS, suggesting that price predictability is essential for market stability, particularly in less liquid emerging economy markets. Fourth, the Kazakhstan experience – launch without adequate MRV infrastructure, data quality issues, and subsequent suspension – provides a direct cautionary lesson for Central Asian neighbors [9].

The RGGI model is particularly relevant for Uzbekistan's context. RGGI demonstrates that a sector-specific approach (power generation only) can be effective, administratively manageable, and politically feasible while generating meaningful emission reductions and substantial revenue. RGGI's 100% auction approach, while atypical for emerging economies, has generated approximately USD 6.3 billion in cumulative revenue since 2009, invested primarily in energy efficiency and renewable energy programs [1]. This revenue recycling approach has enhanced rather than undermined political support for the program. For Uzbekistan, a power sector pilot with predominantly free allocation but a modest auction

component (10–20%) could provide both political feasibility and initial revenue generation for green investment programs.

### 3.3. SCENARIO ANALYSIS RESULTS

The three carbon market development scenarios yield distinctly different outcomes across key assessment dimensions.

**Scenario A (Low Ambition):** ETS covering only the power sector with intensity-based benchmarks and 100% free allocation. Estimated carbon price range: USD 5–10/tCO<sub>2</sub>. Projected annual emission reduction: 8–12 million tonnes CO<sub>2</sub> (4–6% of total national emissions). Annual budget revenue: approximately USD 0–50 million (minimal, as free allocation generates no direct revenue). GDP impact: negligible (-0.05 to -0.1%). Competitiveness impact: minimal, as power generation is non-traded. Institutional capacity requirement: moderate – MRV for 30–50 power facilities, basic registry, limited regulatory oversight. This scenario mirrors China's initial ETS approach and is achievable with current institutional capacity supplemented by targeted capacity building.

**Scenario B (Medium Ambition):** ETS covering energy and major industrial sectors (cement, metallurgy, chemicals) with combination benchmarking/auctioning (80% free, 20% auction). Estimated carbon price range: USD 10–20/tCO<sub>2</sub>. Projected annual emission reduction: 15–22 million tonnes CO<sub>2</sub> (8–11% of total). Annual budget revenue: USD 150–400 million (from auction revenues and potential carbon tax on uncovered sectors). GDP impact: -0.15 to -0.3%. Competitiveness impact: moderate for cement, metallurgy (trade-exposed sectors requiring transitional protection). Institutional capacity requirement: substantial – MRV for 100–200 industrial facilities, sectoral benchmarks, expanded regulatory capacity. This scenario requires 2–3 years of additional institutional preparation beyond Scenario A.

**Scenario C (High Ambition):** Economy-wide ETS with gradual expansion, increasing auction share (starting 70% free, declining 5% annually), linked to international markets via Article 6. Estimated carbon price range: USD 20–40/tCO<sub>2</sub>. Projected annual emission reduction: 25–35 million tonnes CO<sub>2</sub> (13–18% of total). Annual budget revenue: USD 500 million–USD 1.2 billion. GDP impact: -0.3 to -0.6%, partially offset by revenue recycling. Competitiveness impact: significant for trade-exposed industries; CBAM-like border adjustment measures may be needed. Institutional capacity requirement: very substantial – comprehensive MRV, sophisticated market oversight, international linking protocols. This scenario represents a long-term aspiration requiring 5–10 years of institutional development.

The scenario comparison reveals an important non-linearity: Scenario B (Medium Ambition) delivers disproportionately more emission reductions per dollar of GDP impact than Scenario A, suggesting that the marginal efficiency of carbon pricing improves with broader sectoral coverage. This reflects the fact that including industrial sectors unlocks additional low-cost abatement opportunities not available in a power-sector-only system. However, the institutional capacity jump from Scenario A to B is substantial, reinforcing the case for a phased approach that uses the pilot period to build capacity for subsequent expansion.

A sensitivity analysis on the GDP impact estimates explores the role of revenue recycling. Under Scenario B, if carbon market revenue is recycled through targeted reductions in distortionary taxes (such as payroll taxes or corporate income taxes), CGE modeling literature suggests that the net GDP impact can be reduced from -0.15 to -0.3% to approximately -0.05 to -0.15% – a potential “double dividend” effect where environmental improvement is accompanied by economic efficiency gains from tax reform [10]. This finding has significant policy implications: the design of revenue recycling mechanisms is nearly as important as the design of the carbon pricing mechanism itself.

The implications of each scenario for NDC compliance are also noteworthy. The NDC target of 50% reduction in GHG emissions per unit of GDP by 2035 [14] implies that emission intensity must decline significantly even as the economy grows. Under Scenario A, carbon pricing contributes approximately 15–20% of the required NDC emission reductions; under Scenario B, this contribution rises to 30–40%; and under Scenario C, to 50–65%. This suggests that carbon pricing alone is insufficient to meet NDC targets under any scenario – complementary policies (renewable energy deployment, energy efficiency standards, transport sector measures) remain essential. However, carbon pricing creates a cross-cutting incentive that enhances the effectiveness of sector-specific policies, consistent with the OECD’s recommendation of comprehensive policy packages rather than single-instrument approaches [21].

### 3.4. COST-BENEFIT ANALYSIS

The CBA evaluates the net economic impact of carbon market implementation under the medium-ambition scenario (Scenario B), which offers the most instructive balance of ambition and institutional feasibility.

**Benefits (2028–2040 cumulative, present value at 5% discount rate):** Direct emission reduction benefits, valued at the social cost of carbon (USD 51/tCO<sub>2</sub>), total approximately USD 5.2–7.8 billion. Health co-benefits from reduced particulate matter (PM<sub>2.5</sub>), sulfur dioxide (SO<sub>2</sub>), and nitrogen oxide (NO<sub>x</sub>) emissions associated with fossil fuel combustion reduction are estimated at USD 1.5–2.5 billion, using WHO air pollution health impact methodology. Energy efficiency gains, monetized through reduced natural gas consumption (estimated at 3–5 billion cubic meters cumulative savings), contribute USD 1.2–2.0 billion. Carbon market revenue provides USD 1.5–3.5 billion in fiscal benefits. Total quantifiable benefits: approximately USD 9.4–15.8 billion.

**Costs (2028–2040 cumulative, present value at 5% discount rate):** MRV system development and operation: USD 80–120 million. Registry and market infrastructure: USD 30–50 million. Regulatory capacity building: USD 50–80 million. Industry compliance costs (abatement investments and allowance purchases): USD 2.0–3.5 billion. Administrative costs: USD 40–60 million. Total quantifiable costs: approximately USD 2.2–3.8 billion.

The resulting benefit-cost ratio ranges from 3.5 to 5.0, indicating that the economic benefits of carbon market implementation substantially exceed the costs under reasonable assumptions. Sensitivity analysis reveals that the results are

robust: even at the lowest SCC estimate (USD 30/tCO<sub>2</sub>) and highest discount rate (10%), the benefit-cost ratio remains above 2.0. The primary driver of positive net benefits is the social cost of avoided emissions, followed by health co-benefits. These findings align with the Stern Review's [23] central conclusion that the costs of climate inaction far exceed the costs of mitigation action.

### **3.5. MARGINAL ABATEMENT COST ANALYSIS**

The MAC curve analysis identifies the least-cost emission reduction opportunities across sectors, providing crucial information for carbon price level determination and ETS design.

At a carbon price of USD 5–10/tCO<sub>2</sub> (Scenario A range), the economically viable abatement options include: operational optimization of existing power plants (estimated 3–5 MtCO<sub>2</sub>/year at USD 2–8/tCO<sub>2</sub>); industrial energy management improvements (2–4 MtCO<sub>2</sub>/year at USD 3–9/tCO<sub>2</sub>); and lighting and motor efficiency upgrades (1–2 MtCO<sub>2</sub>/year at USD 5–10/tCO<sub>2</sub>). At USD 10–20/tCO<sub>2</sub> (Scenario B), additional options become viable: combined cycle gas turbine conversions (4–7 MtCO<sub>2</sub>/year at USD 10–18/tCO<sub>2</sub>); utility-scale solar deployment (3–6 MtCO<sub>2</sub>/year at USD 12–22/tCO<sub>2</sub>); and industrial waste heat recovery (2–4 MtCO<sub>2</sub>/year at USD 15–20/tCO<sub>2</sub>). At USD 20–40/tCO<sub>2</sub> (Scenario C), higher-cost measures become economical: wind power deployment (2–4 MtCO<sub>2</sub>/year at USD 20–30/tCO<sub>2</sub>); cement production process modifications (1–2 MtCO<sub>2</sub>/year at USD 25–40/tCO<sub>2</sub>); and advanced energy storage (1–3 MtCO<sub>2</sub>/year at USD 30–40/tCO<sub>2</sub>).

The MAC analysis reveals an important finding: approximately 40–50% of potential emission reductions in the energy and industrial sectors can be achieved at abatement costs below USD 15/tCO<sub>2</sub>. This suggests that a moderate initial carbon price can unlock substantial emission reductions without imposing prohibitive costs on regulated entities. The iCRAFT project's demonstration of USD 15/tCO<sub>2</sub> as a viable carbon credit price [15] further validates this price range as both achievable in international markets and sufficient to incentivize meaningful abatement action domestically.

### **3.6. PROPOSED THREE-PHASE INSTITUTIONAL ROADMAP**

Based on the institutional readiness assessment, international comparative analysis, and scenario modeling, a three-phase institutional roadmap for carbon market development is proposed (Figure 1).



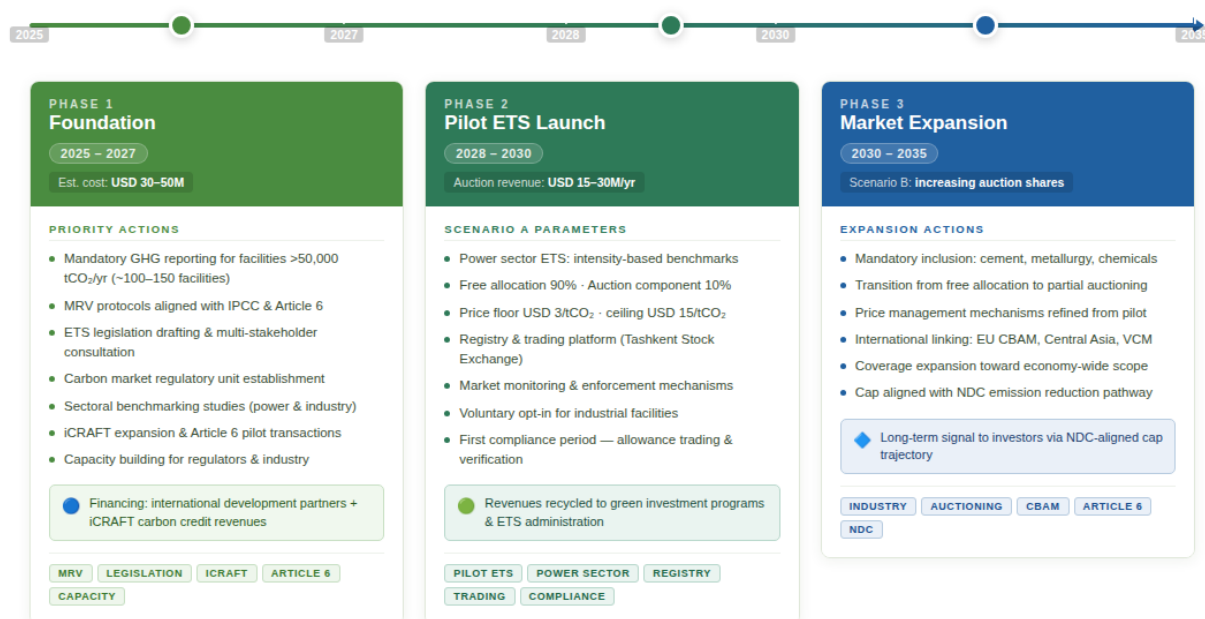


**Figure 1 – Three-Phase Institutional Roadmap for Carbon Market Development**

[Figure description: Timeline-based roadmap with three sequential phases. Phase 1 (2025–2027) – Foundation: mandatory facility-level emissions reporting for large emitters (power and industrial sectors), MRV system development and piloting, ETS legislation drafting and stakeholder consultation, carbon market regulatory unit establishment, capacity building programs, iCRAFT expansion and Article 6 pilot transactions. Phase 2 (2028–2030) – Pilot ETS Launch: ETS covering power sector (Scenario A parameters), registry and trading platform operationalization, market monitoring and enforcement mechanisms, voluntary expansion to industrial participants, revenue collection and recycling framework, first compliance period. Phase 3 (2030–2035) – Market Expansion: mandatory industrial sector inclusion, transition from free allocation to partial auctioning, price management mechanism refinement, exploration of international linking opportunities, coverage expansion toward economy-wide scope. Each phase includes milestones and decision gates for proceeding to the next phase.]

**Phase 1 (2025–2027): Foundation Building.** The priority actions in this phase are: enacting mandatory facility-level GHG emissions reporting for all sources exceeding 50,000 tCO<sub>2</sub>/year (estimated 100–150 facilities); developing and piloting MRV protocols aligned with IPCC guidelines and Article 6 requirements; drafting comprehensive ETS legislation through multi-stakeholder consultation; establishing a dedicated carbon market regulatory unit within the Ministry of Economy and Finance as it is designated national authority for carbon trade market; conducting sectoral benchmarking studies for the power and major industrial sectors; expanding the iCRAFT project to generate additional Article 6-compliant carbon credits; and launching targeted capacity building programs for regulators, industry participants, and verification bodies. The cost of Phase 1 is estimated at



USD 30–50 million, financed primarily through international development partner support and iCRAFT carbon credit revenues.

**Phase 2 (2028–2030): Pilot ETS Launch.** Building on the institutional foundation, a pilot ETS is launched covering the power sector using Scenario A parameters: intensity-based benchmarks, predominantly free allocation (90%) with a modest auction component (10%), price floor of USD 3/tCO<sub>2</sub> and price ceiling of USD 15/tCO<sub>2</sub>. Registry and trading infrastructure (potentially leveraging the Tashkent Stock Exchange) becomes operational. Market monitoring and enforcement mechanisms are established. Voluntary opt-in provisions allow industrial facilities to participate ahead of mandatory inclusion. The first compliance period (likely annual or biennial) provides real-world experience with allowance management, trading, and verification. Revenue from the 10% auction component (estimated USD 15–30 million annually) is allocated to green investment programs and ETS administration.

In addition to the institutional steps outlined above, the long-term effectiveness of the ETS will depend on the establishment of a transparent and predictable emissions cap trajectory. A gradual cap decline aligned with the national climate targets should be introduced once the pilot phase demonstrates operational stability. Based on international experience, a linear reduction factor of approximately 1.5–2% per year could provide a balanced pathway for Uzbekistan during the early stages of market development. Such a trajectory would allow regulated entities sufficient time to adapt their investment strategies while ensuring that emission reductions remain consistent with the country's Nationally Determined Contribution (NDC) commitments. Establishing a clear long-term cap trajectory would also strengthen investor confidence by providing predictable carbon price signals for low-carbon technologies and energy efficiency investments.

**Phase 3 (2030–2035): Market Expansion.** Based on pilot experience, the ETS is expanded to include major industrial sectors (cement, metallurgy, chemicals). The allocation method transitions from predominantly free allocation to increasing auction shares (Scenario B parameters). Price management mechanisms are refined based on pilot experience. International linking opportunities are explored, potentially through Article 6 cooperative approaches with EU (CBAM interaction), Central Asian neighbors, or global voluntary carbon markets. The cap trajectory is aligned with the NDC emission reduction pathway, providing a clear long-term signal to investors and industry.

#### **4. Discussion**

The findings of this study contribute to the literature on carbon market design for emerging economies while revealing several important dynamics specific to energy-intensive transitional contexts.

**The sequencing imperative.** Perhaps the most significant finding is the critical importance of institutional sequencing. Kazakhstan's experience of launching an ETS without adequate MRV infrastructure and data systems, leading to market suspension, provides a direct cautionary lesson [9]. In contrast, China's deliberate approach – seven regional pilots over four years, extensive data

collection, and gradual expansion – produced a more sustainable national market [12]. The three-phase roadmap proposed in this study embodies this sequencing principle: institutional foundations first, market operations second, and market expansion third. This finding aligns with Doda et al.'s [9] recommendation that developing countries prioritize MRV development and data accumulation before ETS launch. The proposed 2–3 year foundation-building phase (2025–2027) before pilot launch (2028) provides sufficient time for institutional preparation while maintaining reform momentum.

**The energy subsidy–carbon pricing interaction.** A distinctive feature of Uzbekistan's context is the ongoing energy subsidy reform process. Historically subsidized electricity and natural gas prices have suppressed the economic incentive for energy efficiency investment and reduced the potential effectiveness of carbon pricing. The planned energy market liberalization from 2026 creates a window of opportunity for carbon pricing: as energy prices rise toward market levels, the incremental burden of a carbon price becomes more manageable, and the combined price signal more strongly incentivizes clean technology investment. This interaction has important design implications: the carbon price level should be calibrated in conjunction with the energy subsidy reform trajectory, not in isolation. Goulder and Schein's [10] CGE modeling framework supports this integrated approach, demonstrating that the welfare effects of carbon pricing depend critically on the pre-existing policy landscape.

**Article 6 as a development catalyst.** The iCRAFT project's success – generating USD 15 million for 1 million tonnes of verified emission reductions [15] – demonstrates that international carbon market mechanisms under Article 6 of the Paris Agreement can serve as catalysts for domestic carbon market development. Beyond revenue generation, the iCRAFT project has contributed institutional capacity (MRV systems, verification protocols), demonstrated political feasibility (positive government engagement), and created awareness of carbon market opportunities among industrial stakeholders. This finding suggests that Article 6 engagement should be viewed not merely as an emission reduction financing mechanism but as an institutional capacity-building tool. The experience aligns with Marcu's [24] analysis of Article 6 as a driver of climate ambition in developing countries. For other emerging economies considering carbon market development, early engagement with Article 6 mechanisms – through either policy crediting programs (like iCRAFT) or project-based cooperative approaches – can accelerate institutional readiness while generating near-term benefits.

**The CBAM imperative for emerging economy carbon markets.** The EU's Carbon Border Adjustment Mechanism (CBAM), entering full implementation from 2026, introduces a powerful external incentive for carbon pricing in exporting countries. Under CBAM, importers of iron, steel, cement, aluminum, fertilizers, and hydrogen into the EU must purchase CBAM certificates corresponding to the carbon price that would have been paid under the EU ETS. However, CBAM certificates can be reduced to the extent that a carbon price has been paid in the country of origin [11]. This creates a direct financial incentive for emerging

economies to implement domestic carbon pricing: without it, the carbon revenue flows to the EU budget through CBAM certificate purchases; with domestic carbon pricing, revenue is retained domestically. For Uzbekistan's metallurgical and chemical sectors, which export to EU markets, this represents a concrete fiscal case for domestic carbon market establishment, independent of environmental considerations. The CBAM effect thus transforms carbon pricing from a purely environmental policy into a trade and fiscal policy instrument.

**Price management in thin markets.** A critical design challenge for emerging economy ETS is ensuring price stability in markets that may be significantly less liquid than the EU ETS. With fewer regulated entities, lower trading volumes, and less sophisticated market participants, emerging economy carbon markets are vulnerable to price volatility, manipulation, and illiquidity. The study's proposed price floor and ceiling mechanism addresses this directly: a price floor prevents collapse (which undermined early EU ETS credibility), while a ceiling limits cost exposure for regulated entities. The RGGI's Cost Containment Reserve (CCR) and Emissions Containment Reserve (ECR) provide a proven model for managing prices in a smaller, less liquid market context [1]. For Uzbekistan's pilot ETS, a price corridor of USD 3–15/tCO<sub>2</sub> with automatic supply adjustment at boundary prices would provide both market stability and cost predictability.

**Competitiveness and carbon leakage.** The risk that carbon pricing may disadvantage domestic industry relative to unpriced competitors is a persistent concern in carbon market design. This risk is particularly acute for energy-intensive, trade-exposed (EITE) sectors such as cement, steel, and chemicals [10]. Free allocation is the primary tool for addressing competitiveness concerns in the transition period: by providing allowances equal to or near benchmark emissions levels, the direct cost impact on EITE sectors is minimized while the marginal incentive for emission reduction is maintained. China's 100% free allocation approach reflects this logic, though it also limits revenue generation and environmental ambition [12]. The proposed phased approach – high free allocation initially, gradually transitioning to increased auctioning – balances competitiveness protection with progressive ambition escalation. As more countries in the region implement carbon pricing, the competitiveness differential diminishes, enabling faster transition to auctioning.

**Revenue recycling and political economy.** How carbon pricing revenue is used significantly influences both economic outcomes and political sustainability. The RGGI's investment of auction revenue in energy efficiency and renewable energy programs has generated economic benefits exceeding the cost of the program, creating a politically supportive constituency [1]. The EU ETS Innovation Fund (EUR 2.4 billion) and Modernization Fund (EUR 6.3 billion) similarly direct revenue toward green transition investments [11]. For Uzbekistan, the study recommends allocating carbon market revenue as follows: 70–80% to green technology investment and energy efficiency programs; 10–15% to social compensation for affected communities and workers; and 5–10% to administrative costs and institutional capacity. This allocation model creates visible, tangible

benefits from carbon pricing while addressing equity concerns – both essential for sustaining political support.

**Regional cooperation prospects.** Central Asia's shared environmental challenges and interconnected energy systems create a potential basis for regional carbon market cooperation. The proposed "Central Asia – Azerbaijan – Europe Green Energy Corridor" [16], through which Uzbekistan plans to export surplus green electricity to Europe via Azerbaijan starting in 2030, represents an early manifestation of regional clean energy cooperation that could eventually extend to carbon markets. Regional carbon market linking offers several potential advantages: larger market size increases liquidity and reduces price volatility; harmonized rules reduce compliance complexity for firms operating across borders; and regional approaches may be more attractive to international investors and development partners. However, the preconditions for successful linking – including comparable MRV standards, compatible regulatory frameworks, and similar ambition levels – require substantial coordination. The EU ETS's successful linking with Switzerland (2020) and the abandoned Australia-EU linking process provide relevant positive and cautionary lessons, respectively [1]. For Central Asia, a more realistic near-term goal may be mutual recognition of carbon credits generated through Article 6 cooperative approaches, rather than full ETS linking.

**Monitoring and evaluation framework.** The phased roadmap requires a robust monitoring and evaluation framework with clear decision criteria for phase transitions. The study proposes the following key performance indicators for Phase 1 (Foundation): percentage of large emitters submitting verified emission reports (target: >90% by end of Phase 1); MRV system operational reliability (target: third-party verification success rate >85%); ETS legislation enacted and implementing regulations adopted; regulatory unit established with trained personnel. For Phase 2 (Pilot ETS): market functioning indicators (trading volume, bid-ask spreads, price stability within corridor); compliance rate (target: >95% of regulated entities meeting obligations on time); emission reduction performance against projected pathway; revenue generation and recycling effectiveness. These KPIs provide objective criteria for assessing readiness to proceed to subsequent phases and for identifying areas requiring additional support or adjustment.

**Implications for other emerging economies.** While this study focuses on Uzbekistan, the findings have broader implications for other emerging economies at early stages of carbon market consideration. The institutional sequencing framework – data first, institutions second, markets third – is generalizable across contexts. The role of Article 6 as an institutional capacity-building tool offers a pathway for countries lacking domestic carbon market experience to develop relevant skills and infrastructure through international cooperation. The CBAM imperative creates a convergent incentive structure for all countries with EU-exported industrial goods to develop domestic carbon pricing. The MAC analysis methodology, while calibrated to a specific country context, demonstrates a replicable approach for identifying least-cost abatement pathways and appropriate carbon price entry levels. These findings contribute to the growing body of evidence

on carbon market design for diverse economic contexts, complementing the established literature focused on developed economy experiences [1, 8, 9].

**Scientific novelty.** This study's contributions include: (1) first systematic analysis of carbon market institutional prerequisites for a Central Asian emerging economy; (2) empirical assessment of iCRAFT as an Article 6 catalyst for domestic carbon market development; (3) scenario-based modeling of carbon pricing design options calibrated to an energy-intensive transitional economy; (4) integrated CBA demonstrating benefit-cost ratios of 3.5–5.0, providing an evidence base for policymaker decision-making; (5) a phased institutional roadmap incorporating lessons from five international ETS experiences.

**Limitations.** The study has several limitations. The MAC curve analysis relies on technology cost estimates that may change as markets evolve. The CBA uses the US EPA's SCC estimate, which may not fully reflect the specific vulnerability of Uzbekistan to climate impacts. Enterprise-level emissions data limitations constrain the precision of scenario modeling. The proposed roadmap is inherently forward-looking and subject to political, economic, and institutional uncertainties. Future research should pursue: empirical evaluation of the pilot ETS once operational; refined MAC curves using facility-level data; dynamic CGE modeling of economy-wide carbon pricing impacts; and comparative analysis across Central Asian countries pursuing carbon market development.

**Unified carbon pricing** (hybrid system). In addition to emissions trading systems, carbon taxation represents another widely used carbon pricing instrument. While ETS provides quantity certainty by setting an emissions cap, carbon taxes ensure price stability and are administratively simpler for sectors with diffuse emission sources. International experience shows that many countries increasingly adopt hybrid carbon pricing frameworks combining ETS for large industrial emitters with carbon taxes applied to transport and smaller emission sources. For Uzbekistan, such a hybrid approach may be particularly relevant given the concentration of emissions in large energy and industrial facilities alongside diffuse emissions in transport and residential sectors. A hybrid system could enhance policy flexibility while maintaining environmental effectiveness.

## **5. Conclusion and recommendations**

This study has analyzed the institutional prerequisites and pricing frameworks necessary for carbon market development in emerging economies, using Uzbekistan as a primary case study with comparative evidence from five international ETS experiences.

The principal findings can be summarized as follows.

**First**, Uzbekistan possesses both the imperative and emerging institutional capacity for carbon market development. The country's high emission intensity (more than twice the Central Asian average), its 209 million tonnes CO<sub>2</sub> annual emissions, its ambitious NDC targets (50% reduction in GHG intensity per GDP unit by 2035), and the pioneering iCRAFT project experience all point to both the need for and feasibility of carbon pricing.



**Second**, international comparative analysis reveals that successful ETS implementation in emerging economies requires sequenced institutional development MRV systems and data infrastructure before market launch, gradual scope expansion, and robust price management mechanisms. The Kazakhstan experience provides a direct cautionary lesson about premature launch without adequate institutional foundations.

**Third**, scenario analysis demonstrates that a power sector-focused pilot ETS (Scenario A) can achieve 8–12 million tonnes CO<sub>2</sub> annual reductions at manageable carbon prices (USD 5–10/tCO<sub>2</sub>), while a more ambitious energy-plus-industry ETS (Scenario B) could yield 15–22 million tonnes at USD 10–20/tCO<sub>2</sub>.

**Fourth**, cost-benefit analysis indicates a benefit-cost ratio of 3.5–5.0 under the medium-ambition scenario, driven primarily by the social value of avoided emissions and health co-benefits.

**Fifth**, the MAC analysis reveals that approximately 40–50% of potential emission reductions are achievable at abatement costs below USD 15/tCO<sub>2</sub>.

Two recent developments further strengthen the case for accelerated action. The adoption of Presidential Decree PD-110 in July 2025 by establishing the legal basis for international carbon market participation, designating the Ministry of Economy and Finance as the Designated National Authority under Article 6.4 of the Paris Agreement, and mandating the development of implementing regulations which marks a decisive shift from policy aspiration to operational framework.

Concurrently, at COP29 in November 2024, negotiators finally adopted the complete Article 6 rulebook, including binding guidance for both Article 6.2 bilateral cooperative approaches and the Article 6.4 centralized UN carbon market mechanism. As of early 2025, 97 bilateral agreements between 59 countries had been registered under Article 6.2, with 155 pilot projects recorded.

The launch of the Article 6.4 mechanism could significantly reshape global carbon trading, with demand from governments surging sharply following the adoption of new rules. For Uzbekistan, these developments create a window of opportunity by implementing regulation mandated by PD-110 can be designed from the outset to fully align with the finalized Article 6 rulebook, avoiding the uncertainty that constrained earlier movers.

The CBAM dimension has similarly crystallized. The EU's Carbon Border Adjustment Mechanism entered its definitive stage on 1 January 2026, becoming the first fully operational border carbon adjustment policy to charge costs based on the emissions intensity of imported goods.

The European Commission has launched a call for evidence on rules for the deduction of the carbon price paid in third countries, confirming that domestic carbon pricing in exporting countries can directly offset CBAM certificate obligations. For Uzbekistan's metallurgical and chemical exporters, this transforms domestic carbon market development from an environmental policy choice into a concrete trade competitiveness imperative.

Based on these findings, the following recommendations are formulated:

**For government policymakers.**



The regulations mandated by Decree PD-110 represent the most consequential near-term policy decision for Uzbekistan's carbon market trajectory. The study's findings, synthesized with international best practice, support the following specific provisions for inclusion:

A phased authorization framework for international carbon transactions comprising a preliminary Letter of No Objection for project screening, a binding Letter of Approval prior to activity commencement, and separate authorization for cooperative approach transfers would establish the procedural safeguards that differentiate Uzbekistan's approach from Kazakhstan's premature and underinstitutionalized market launch. This sequencing aligns with the authorization architecture now standardized under the COP29 Article 6.2 guidance.

An NDC retention norm, operationalized through explicit registry-level blocking of a defined share of verified units for sovereign NDC compliance use, is essential to prevent the overselling risk that has undermined credibility in earlier carbon market programs. The 20% retention threshold established in PD-110 should be given concrete technical implementation in the regulation, including clear rules on the conditions under which retained units may eventually be used or retired.

A fee structure for international transfers should be established to generate operational revenue for the regulatory infrastructure. Based on international experience with program administration costs and the price levels observed in the iCRAFT project (USD 15/tCO<sub>2</sub>), a per-unit fee calibrated to sustain the National Registry and regulatory capacity without materially impairing project economics represents sound policy design. Revenue from this fee should, at a minimum, partially finance the institutional capacity building that Phase 1 of the roadmap requires.

A cancellation provision for global climate integrity retiring a modest percentage of authorized units to support overall mitigation of global emissions (OMGE), consistent with Article 6.4 mechanism requirements would align Uzbekistan's framework with the highest international standards and strengthen the credibility of its ITMO authorizations in acquiring country markets.

An approved standards list, explicitly enumerating the internationally recognized carbon crediting programs including Gold Standard, Verified Carbon Standard, REDD+, and the Article 6.4 mechanism as eligible for authorization within Uzbekistan's framework would reduce regulatory uncertainty for project developers and investors while maintaining quality control.

A competitive procurement mechanism for state-participation project service organizations through which private service companies bear all project development, verification, and sales costs in exchange for a contractually defined revenue share would mobilize private sector expertise without committing public resources, consistent with the value-for-money principles that international development partners supporting Uzbekistan's transition expect.

Beyond the regulation itself:

enact mandatory facility-level GHG emissions reporting for all sources exceeding 50,000 tCO<sub>2</sub>/year as an immediate priority;

operationalize the National Carbon Units Registry as mandated;  
coordinate carbon pricing development with the ongoing energy subsidy reform trajectory;

launch a pilot ETS for the power sector with intensity-based benchmarks, predominantly free allocation, and a price corridor mechanism; and develop a CBAM preparedness program for export-oriented enterprises in metallurgy and chemicals, who face quantifiable financial exposure under the EU mechanism beginning January 2026.

**For industrial enterprises.**

Begin voluntary emissions monitoring and reporting immediately to build internal data systems ahead of mandatory requirements the data accumulated in this period will directly reduce compliance costs when mandatory reporting takes effect. Conduct internal carbon pricing assessments to identify and prioritize cost-effective abatement opportunities; the MAC analysis indicates that 40–50% of abatement potential is available below USD 15/tCO<sub>2</sub>, largely through operational efficiency measures accessible without major capital investment.

For export-oriented producers in steel, aluminum, cement, and fertilizers, establish carbon content documentation systems for EU-exported products, CBAM certificate obligations are now live and the deductibility of domestic carbon prices creates a direct financial incentive for carbon pricing engagement. Explore Article 6 carbon credit generation opportunities within the iCRAFT or successor frameworks, which offer a near-term revenue opportunity independent of the domestic ETS timeline.

**For international partners and investors.**

The COP29 Article 6 breakthrough and CBAM's full implementation have jointly created a more favorable environment for carbon market investment in Uzbekistan than at any prior point. The implementing regulation under PD-110, once adopted, will provide the contractual framework that bilateral carbon credit off-take agreements require, advance engagement with the Ministry of Economy and Finance during the regulation's development offers the opportunity to shape provisions relevant to project economics.

Technical assistance for MRV system development and registry operationalization represents the single highest-return institutional investment available the sequencing lessons from Kazakhstan, China, and the EU all confirm that data infrastructure quality is the binding constraint on market effectiveness. Regional carbon market cooperation in Central Asia, building on Uzbekistan's leading institutional position, offers a medium-term market integration opportunity as neighboring countries respond to the same CBAM incentives.

Carbon market development in emerging economies is not merely a climate policy instrument but a fundamental modernization strategy. By putting a price on carbon, governments create incentives for efficiency, innovation, and clean technology investment that transform the industrial base while generating fiscal revenue and health co-benefits. For Uzbekistan, the question is no longer whether to pursue carbon pricing, but how to design the implementing framework is now

under active development in a manner that maximizes benefits while managing risks. The evidence presented in this study demonstrates a compelling benefit-cost proposition, and the institutional foundations are being actively laid through PD-110 and its forthcoming regulation.

The broader significance of this research extends beyond a single country. The iCRAFT experience provides a replicable model for leveraging international carbon finance to build domestic institutional capacity. The three-phase roadmap proposed here offers a template adaptable to different national contexts, provided that the core sequencing principle institutions before markets is maintained.

As the international community operationalizes the Article 6 rulebook adopted at COP29 and as CBAM reshapes the trade and climate nexus for industrial exporters globally, the demand for credible, well-designed carbon market frameworks in emerging economies will only intensify. Uzbekistan's early-mover position, if consolidated through a well-crafted implementing regulation, offers both domestic and international dividends that far exceed the institutional investment required to secure them.

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## METHODS OF TEACHING IN PRIMARY GRADES

**Abstract:** *This article discusses methods for developing the thinking of oral and written logic in primary school students. The compatibility of the processes of development of analysis and synthesis and the influence of the development of these forms on the improvement of the level of thinking of primary school students are discussed.*

**Keywords:** *primary school, analysis, synthesis, information, abstract, thinking.*

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## BOSHLANG'ICH SINFLARDA O'QITISH USULLARI

**Annotatsiya:** *Ushbu maqolada boshlang'ich sinflarda o'quvchilarning og'zaki va yozma mantiqini, fikrlashini rivojlantirish usullari muhokama qilinadi. Tahlil va sintez rivojlanish jarayonlarining mosligi va ushbu shakllarni rivojlantirishning boshlang'ich sinf o'quvchilarining fikrlash darajasini takomillashtirishga ta'siri muhokama qilinadi.*

**Tayanch so'zlar:** *boshlang'ich sinf, tahlil, sintez, axborot, abstrakt tafakkur.*

Today, there are various approaches to organizing the pedagogical process. The following recommendations have been clearly defined by renowned scholars and practitioners: Students learn generalized methods of mental activity and abstract concepts before they are predetermined. In today's rapidly developing society, there is an opportunity to improve general education by realizing untapped opportunities for children's learning and intellectual development in primary school. Age limits for the acquisition of knowledge and skills by primary school children have not been established. The development of education based on modern requirements requires fundamental changes and new approaches. Therefore, finding ways and opportunities for the effective use of information is one of the important tasks of education. Teaching students to assimilate and process information, as well as to develop information based on new ideas and integrate the assimilated information, should serve to enhance students' competence in using information in their educational and life activities. At the same time, clear-figurative thinking develops among elementary school. With the beginning of their school activities, the content of the child's acquired



knowledge and the methods of working with it change significantly. During lessons and as a result of learning, the characteristics of primary school students' mental activity are broader in terms of their primary thinking scope and provide more detailed information about the content. Thus, one of the important results of teaching in primary grades is the creation of certain conditions for the formation of students' oral and written logical development - the highest form of thinking. This type of thinking allows a person to perform the following logical actions: - analysis; - synthesis; - comparison; - generalization; - selection of important properties of objects or phenomena.

There are certain differences between visual-figurative and verbal-logical thinking, and the situations in which these types of thinking are used differ significantly from each other. Often, the qualities that are important for solving a problem turn out to be hidden, that is, they cannot be visualized, but in the process of thinking, they can be expressed by words or other signs that a person should be active in. Symbolic thinking is abstract thinking. Abstract reasoning adheres to the rules of logic studied by science and is therefore called logical reasoning. The logical thinking of elementary school students has its own characteristics, which are very clearly manifested in the thinking process. The thinking characteristics of elementary school students can be highlighted as follows.

1. Between the ages of 5-7, a child distinguishes some properties of an object and loses others. Such thinking is characteristic of preschool children.

2. Often, in the process of thinking, synthesis is immediately secondary, and analysis is neglected. Such thinking is also characteristic of preschool children. If the thinking process of elementary school students is carried out in the manner described above, it leads to such logically defined decisions and answers. Scientists describe these characteristics of primary school students' thinking as follows: Young students retain, to a certain extent, the way preschool teachers think. In the assigned task, the child grasps a sign, condition, or side and immediately comes to a conclusion. In essence, the resulting answer is not a synthesis, as it was not prepared with proper analysis. The classification of analytical-synthetic thinking activity disrupts the integrity of the thinking process. The development of analysis is characterized by: effectiveness, emotionality, and intelligence. For elementary school students, a relatively effective analysis is paramount. Thus, elementary school students have a real opportunity to work with objects of the material world or their analogues, rotate them (separate, combine, etc.), that is, perform appropriate work on them.

At the same time, for children of this age, noting some features of the object, they often do not associate them with each other, but only indicate their existence. After a certain time, the developing analysis of this element turns into complex and subsequently systematic analysis.

Complex analysis is characterized by the fact that elementary school students begin to fully see the object in the learning process, but without the teacher's help, they cannot see all connections and interrelationships.



System analysis is characteristic of a high level of mental development in primary school students.

Activities such as analysis and synthesis do not differ from each other. Elementary school students leave a noticeable mark on the flow of all mental processes, including synthesis, and acquire their thinking skills. That is, for children of this age, a general synthesis characterized, for example, by a simple list of things seen and heard, for example, "this is a cow, it gives milk, we drink it." True synthesis always leads to new results, to new knowledge. For young students, the type of synthetic activity has always faced great difficulties. Based on a special study of elementary school students' analytical and synthetic abilities, a certain level of their development is demonstrated.

The basis for determining the level of development is based on two criteria:

1. Level of development of analysis and synthesis;
2. The degree of connection or the correspondence of these processes.

Studying the characteristics of analysis and synthesis in primary school students reveals their level of development.

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## **GEOGRAPHICAL ROOTS OF TRADITIONS AND CUSTOMS RELATED TO THE RATIONAL USE OF WATER RESOURCES (ON THE EXAMPLE OF THE FERGANA VALLEY)**

**Annotation.** *This article analyzes the geographical roots of traditions and customs related to the rational use of water resources using the example of the Fergana Valley. Recent ethnological, ethnoecological, ethnogeographical, and cultural-geographical studies show that each ethnos or ethnic group gradually adapts to the natural environment in which it has lived for a long historical period and develops economic practices that are harmonious with nature. The relief, climate, hydrological, and geomorphological characteristics of the Fergana Valley have contributed to the formation of unique irrigation systems and a traditional culture of water distribution. In the valley, the water management and distribution system—depending on soil type and crop maturation—was historically organized through a hierarchical network consisting of “soy”, “ena ariq”, “shoh ariq”, “quloq” and “dahana.” Creative use of this historical experience, without rejecting innovative approaches, has important practical significance for organizing rational water use, maintaining ecological balance, and addressing modern challenges in water resource management.*

Typically, during the process of formation, each ethnos gradually adapts to the landscape of a particular territory. Through its economic activities, it modifies the natural environment to some extent, creating cultural landscapes and developing production methods based on the natural-geographical characteristics of the region it inhabits. As a result, it uses natural resources in a way that meets its needs without disrupting ecological balance, applying the most suitable methods. This process naturally occurs over long periods in a specific geographic environment inhabited by several generations of the ethnos [2; 4; 10]. Over time, the “ethnos–landscape” relationship reaches a state that is optimal both for the ethnos and for the landscape. This implies that a stable landscape also stabilizes the ethnos. Therefore, when an ethnos resides in a territory for an extended period, it adapts optimally to that environment and, as a rule, does not disrupt the natural balance, forming traditions and customs of resource use that are unique to that people and harmonious with nature. These traditions and customs reflect the people’s culture, perfectly adapted to their “native landscape,” and evolve as society develops; some practices may disappear, while new ones emerge. Traditions and customs grounded in a strong geographical basis are preserved over centuries and transmitted from generation to generation.

Scientific literature defines tradition as “a means of transmitting the historically accumulated experience of ancestors to future generations” [7], “a cultural phenomenon that emerges in the course of historical development based on natural and social needs and is inherited from ancestors to descendants” [3; p.124], and “a set of accepted rules and norms that have become ingrained in people's consciousness” [7]. Customs (urf-odat), on the other hand, are a broader concept and are described as “rules and rituals accepted by the whole community as traditions” [3], and “patterns of behavior that have become embedded in people's daily lives, repeatedly practiced over a certain period of time, and accepted by the majority as norms of conduct” [3; p.125]. The formation of the traditions and customs of peoples occurs as a result of the wide-ranging influence of various geographical factors. Therefore, geographical factors influence not only the material culture of an ethnic group but also its spiritual culture and mentality, which is reflected in distinctive national characteristics, customs, traditions, and values.

In the culture of the ancient East, including the lifestyle of the Uzbek people, traditions and customs have long been valued as a means of educating the younger generation and transmitting the experience of the older generation. The traditions and experience of ancestors are often regarded as absolute truth and placed at the level of law. A widely known saying states: “The West is governed by laws, while the East is governed by customs” [7].

Historical experience shows that the violation of the traditions of the use of nature by an ethnic group formed in a particular area has a significant impact on the deterioration of environmental stability, and ultimately on the survival or migration of this or that ethnic group in the "Mother" landscape. Migration, the movement away from one's historical homeland, can destroy an ethnic group's language, territorial integrity, culture and traditions, and ultimately lead to its decline. [6; 14]. The emergence of rules of behavior, prohibitions, and norms regarding water use that are “repeated over a certain period of time,” “inherited from ancestors to descendants,” and “accepted by the whole community” is closely related to the climate, relief, hydrogeological conditions of a particular region, the level of water availability, and, in general, the laws of rhythm and periodicity in nature.

Studying the traditions and customs of our ancestors aimed at the rational use and protection of water on the basis of an ecological-geographical approach, and creatively applying them without rejecting innovative development, may also produce important practical results. As S.A.Arutyunov noted: “...traditions can exist without innovations, but the opposite is impossible.” [1; 221-b]. But there's a lot of caution when it comes to putting tradition and innovation into practice, because focusing too much on tradition can lead to volatility and stability, and innovation can lead to instability, unpredictability, and weak governance. [1; 2]. Through the geographical comparison of historical data, it is possible to observe the significant influence of geomorphological, soil-climatic, hydrological, and socio-geographical factors in the formation of customs and

traditions related to the rational use of water resources. In this study, by conducting a historical-geographical comparison of the traditional water-use cultures formed in the Khorezm oasis and the Fergana Valley, the following conclusions were drawn (Figure 1).

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The Khorezm oasis occupies the lower left parts of the Amu Darya, where a wavy alluvial plain has formed due to the accumulation of riverbed deposits over many years. The absolute elevation of the relief gradually decreases from east to west, from 240 m to 30 m [5; p.284]. According to Ya.G'ulomov, in ancient Khorezm the first canals dug were "flood canals," which carried water only during periods when the Amu Darya overflowed. Later, a system of canals known as "arna" developed, stretching along the river's course and having several small intake sections called "soqa". The head parts of the soqas were usually constructed at locations where water flowed even during periods when the river level was at its lowest, and the distance between them was approximately 6 km [12].

Great attention was paid to the gradient of the canal route in order to ensure that a larger volume of water could pass through the arna, that water would flow naturally into the "yop" canals distributing water downstream, and that the fertile silt carried by the water would reach the fields. To discharge excess water from the arna back into the river, special canals called "badrov", equipped with dams at both their beginning and end, were constructed. The yop canals were further divided into smaller ditches called "badoq," which in turn were subdivided into "solma" and "tortma." To prevent erosion at the head of the badoq canals, protective structures known as "doldarg'a" were used. When the water contained excessive silt, devices called "to'qurtqa" (distributors) were employed to take water from the upper layer. Water from the tortma ditches was lifted upward using a water wheel (chigir). At the ends of the solma canals, small ponds were dug in order to discharge excess water [8; 11; 12].

While the population of the Khorezm oasis developed a system for regulating the use of the waters of the Amu Darya, the largest river in the region, in the Fergana Valley a distinctive traditional culture adapted to the natural conditions of the valley was formed, based on the use of the alluvial fans of numerous small rivers. In the valley, irrigation systems begin to form from the point where rivers flow out of mountain gorges onto the foothill plains and create wide alluvial fans. Due to the absolute elevation and geomorphological structure of the foothill plains, these alluvial fans were formed at different altitudes. For example, the absolute elevation of the upper part of the Isfarasoy alluvial fan is 520 m, and Sokhsoy is 660 m, whereas this indicator reaches 920 m in Shakhimardonsoy, 950 m in Govasoy, 1000 m in Kohortsoy, and 1100 m in Oqburasoy [13]. The upper reaches of the riverbeds and the initial parts of the alluvial fans were not used for agriculture; instead, sacred pilgrimage sites and shrines were established there.

In the valley, artificial irrigation systems are generally referred to by the common name "ariq", while large main canals are called "soy". Usually, the "soy" and "ariq" are diverted from riverbeds located at a higher elevation than the irrigated lands. Water from the soy first flows into "ena ariq", and from there into "shoh ariq". The "ena ariq" supplied water to several villages, whereas the "shoh ariq" provided water to individual villages.



From the shoh ariq, canals allocated for neighborhoods were called “quloq,” and the smaller canals distributed among individual farms were known as “dahana” [9]. In distributing water to the canals, devices known as “labgardon” were used, while “sepoya” structures were employed to protect hydraulic constructions and agricultural lands from floodwaters. On the ena ariq, water mills (osiyo) and “objuvoz” installations—typical for mountain rivers—were constructed. If, in ancient Khorezm, excess irrigation water flowed into small ponds located at the ends of the “solma” canals, in the Fergana Valley almost all water was ultimately used for irrigation. In some years when water was abundant, excess water even reached the Syr Darya River.

In conclusion, the natural geographical conditions of the regions of Lower Amu Darya, Murgab, the Middle and Lower Zarafshan, Surkhandarya, and the Fergana Valley—which have been inhabited since ancient times in Central Asia—particularly their surface structure, climate, hydrography, soil, and other characteristics, led to the formation of irrigation systems and water-use cultures specific to these areas. The creative application of such practices, developed in accordance with the natural geographical conditions of each region, can help prevent contemporary problems such as the rapidly increasing water scarcity, soil erosion, rising groundwater levels, and secondary salinization.

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## **ASSOCIATION BETWEEN MICRONUTRIENT DEFICIENCY AND DISEASE SEVERITY IN CHILDREN WITH COMMUNITY-ACQUIRED PNEUMONIA**

**Abstract:** This study investigated the relationship between serum micronutrient levels (zinc, vitamin D, vitamin A, iron, selenium) and the severity of community-acquired pneumonia in 280 hospitalized children aged 6 months to 5 years. Micronutrient deficiency was detected in 68.2% of patients, with zinc (54.6%) and vitamin D (47.9%) deficiencies being the most prevalent. Strong negative correlations were found between zinc ( $r = -0.72$ ;  $p < 0.001$ ) and vitamin D ( $r = -0.65$ ;  $p < 0.001$ ) levels and disease severity. Multivariate logistic regression confirmed zinc and vitamin D deficiencies as independent risk factors for severe pneumonia (OR 4.8 and 3.7, respectively). Patients with deficiencies had significantly longer hospital stays and higher inflammatory markers. These findings underscore the importance of early micronutrient assessment and correction in pediatric community-acquired pneumonia management to reduce severity and improve outcomes.

**Keywords:** community-acquired pneumonia, children, micronutrient deficiency, zinc, vitamin D, disease severity, correlation

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## **SHIFOXONADAN TASHQARI ZOTILJAM BILAN OG'RIKAN BOLALARDA MIKROELEMENTLAR TANQISLIGI VA KASALLIK OG'IRLIGI O'RTASIDAGI BOG'LIQLIK**

**Anotatsiya:** Ushbu tadqiqotda 6 oy–5 yoshdagi 280 nafar shifoxonaga yotqizilgan bolalarda qon zardobidagi mikroelementlar (sink, D vitamini, A vitamini, temir, selen) darajasi va shifoxonadan tashqari zotiljamning og'irligi o'rtasidagi bog'liqlik o'rganildi. Bolalarning 68,2% da kamida bitta mikroelement tanqisligi aniqlandi, eng ko'p uchragani sink (54,6%) va D vitamini (47,9%) tanqisligi bo'ldi. Sink ( $r = -0,72$ ;  $p < 0,001$ ) va D vitamini ( $r = -0,65$ ;  $p < 0,001$ ) darajalari bilan kasallik og'irligi o'rtasida kuchli salbiy korrelyatsiya topildi. Multivariat logistika regressiya tahlili sink va D vitamini tanqisligini og'ir zotiljamning mustaqil xavf omillari sifatida tasdiqladi (OR 4,8 va 3,7). Tanqislik

*bo'lgan bolalarda kasalxonada yotish muddati uzaygan va yallig'lanish markerlari yuqori bo'lgan. Natijalar pediatrik amaliyotda mikroelementlar holatini erta baholash va korreksiya qilish zarurligini ko'rsatadi.*

**Kalit so'zlar:** shifoxonadan tashqari zotiljam, bolalar, mikroelementlar tanqisligi, sink, D vitamini, kasallik og'irligi, bog'liqlik

Zamonaviy pediatriya va infeksiologiya sohasida shifoxonadan tashqari zotiljam bolalar orasida eng keng tarqalgan va og'ir asoratlar bilan kechadigan nafas yo'llari infeksiyalaridan biri bo'lib qolmoqda, ayniqsa rivojlanayotgan mintaqalarda bu kasallikning tarqalishi va o'lim ko'rsatkichlari yuqori darajada saqlanib turibdi. Bolalarda zotiljamning og'irligi nafaqat patogen mikroorganizmlar turi, antibiotik rezistentligi yoki yosh xususiyatlari bilan, balki organizmning immun holati va oziqlanish sifati, xususan mikroelementlar darajasi bilan ham chambarchas bog'liq bo'lib, bu omil kasallikning klinik kechishi, davomiyligi va prognozini belgilovchi muhim determinant sifatida qaralmoqda. Mikroelementlar tanqisligi, ayniqsa sink, D vitamini, A vitamini, temir va selenning yetishmovchiligi immun tizimining hujayraviiy va gumoral komponentlarini zaiflashtirib, nafas yo'llari epiteliyasining himoya to'siqlarini pasaytiradi, yallig'lanish mediatorlarining haddan tashqari chiqarilishiga olib keladi va natijada kasallikning og'ir shakllari – o'pka konsolidatsiyasi, gipoksiya, sepsis va hatto o'lim xavfini keskin oshiradi. Ushbu bog'liqlikni chuqur o'rganish nafaqat patofiziologik mexanizmlarni aniqlashga, balki erta diagnostika va profilaktika strategiyalarini ishlab chiqishga ham imkon beradi, chunki mikroelementlarning optimal darajasi bolaning immun javobini kuchaytirib, kasallikning engil kechishiga va qisqa muddatda tuzalishiga yordam beradi.

Tadqiqotning asosiy maqsadi shifoxonadan tashqari zotiljam tashxisi qo'yilgan bolalarda qon zardobidagi mikroelementlar konsentratsiyasi va kasallikning klinik-radiologik og'irligi o'rtasidagi statistik va klinik bog'liqlikni aniqlashdan iborat bo'lib, bu jarayonda yosh, jins, ovqatlanish holati, ijtimoiy-iqtisodiy sharoit va birga keluvchi kasalliklar kabi qo'shimcha omillarning ta'siri ham hisobga olingan. Tadqiqotda ishtirok etgan bolalar guruhi 6 oy dan 5 yoshgacha bo'lgan 280 nafar bemordan tashkil topgan, ularda klinik ko'rinishlar – yuqori tana harorati, yo'tal, nafas qisilishi, ko'krak qafasida eshitiladigan patologik shovqinlar va radiologik tasdiqlangan o'pka infiltratsiyasi asosida shifoxonadan tashqari zotiljam tashxisi qo'yilgan. Kasallik og'irligi Jahon sog'liqni saqlash tashkilotining bolalar zotiljamini baholash mezonlari bo'yicha uch guruhga ajratilgan: yengil (nafas tezligi yoshi bo'yicha normal chegaralarda, gipoksiya yo'q), o'rta (nafas qisilishi, retraktsiyalar, ammo oksigen terapiyasi talab qilinmaydi) va og'ir (gipoksiya, ko'p lobar konsolidatsiya, sepsis belgilari yoki intensiv terapiya bo'limiga o'tkazish zarurati). Qon namunalari kasallikning birinchi 48 soatida olingan va sink, selen, temir, A va D vitaminlari darajasi zamonaviy atom-absorbsion spektrofotometriya va immunofermental tahlil usullari yordamida aniqlangan, bunda normal qiymatlar xalqaro

laboratoriya standartlariga (sink uchun 70–120 mkg/dl, D vitamini uchun 30 ng/ml dan yuqori va hokazo) asoslangan holda baholangan.

Statistik tahlil natijalari shuni ko'rsatdiki, tadqiqotga kiritilgan bolalarning 68,2 foizida kamida bitta mikroelement tanqisligi aniqlangan bo'lib, eng ko'p uchraydiganlari sink (54,6%) va D vitamini (47,9%) yetishmovchiligi hisoblangan, A vitamini tanqisligi esa 31,4% holatlarda kuzatilgan. Kasallik og'irligi bilan bog'liqlikni Spearman korrelyatsion tahlili orqali baholaganda sink darajasi va og'irlik balli o'rtasida kuchli salbiy korrelyatsiya ( $r = -0,72$ ;  $p < 0,001$ ) aniqlangan, ya'ni sink konsentratsiyasi pasaygani sari kasallikning klinik og'irligi keskin oshgan. Shunga o'xshash natija D vitamini uchun ham qayd etilgan ( $r = -0,65$ ;  $p < 0,001$ ), bunda og'ir guruhdagi bolalarning 82,3 foizida D vitamini darajasi 20 ng/ml dan past bo'lgan. Temir tanqisligi og'irlik bilan o'rtacha bog'liqlikni ko'rsatgan ( $r = -0,48$ ;  $p < 0,01$ ), ammo selen va A vitamini tanqisligi ko'proq yengil va o'rta shakllarda uchragan. Multivariat logistika regressiya tahlilida sink va D vitamini tanqisligi mustaqil risk omillari sifatida tasdiqlangan: sink yetishmovchiligi bo'lgan bolalarda og'ir zotiljam rivojlanish ehtimoli 4,8 baravar yuqori (95% CI: 2,9–7,6;  $p < 0,001$ ), D vitamini tanqisligida esa 3,7 baravar (95% CI: 2,3–5,9;  $p < 0,001$ ) bo'lgan, bu omillar yosh, jins va birga keluvchi anemiya kabi kovariantlarni hisobga olgandan keyin ham o'z kuchini saqlab qolgan.

Kasallikning klinik kechishi va laboratoriya ko'rsatkichlari bo'yicha qo'shimcha tahlillar shuni tasdiqladiki, mikroelementlar tanqisligi bo'lgan guruhda kasalxonada yotish muddati o'rtacha 9,4 kunni tashkil etgan bo'lsa, yetarli darajadagi bolalarda bu ko'rsatkich 5,2 kungacha qisqargan ( $p < 0,001$ ). Og'ir guruhdagi bolalarda sink darajasi past bo'lganida C-reaktiv oqsil va interleukin-6 darajalari sezilarli darajada yuqori bo'lib (mos ravishda 124 mg/l va 185 pg/ml), bu yallig'lanishning kuchayganligini ko'rsatgan. Radiologik jihatdan ham sink va D vitamini tanqisligi bo'lgan bemorlarda ko'p lobar infiltratsiya va plevra effuziyasi tez-tez uchragan, bu esa nafas yetishmovchiligining og'irligini yanada kuchaytirgan. Tadqiqotda yosh bo'yicha subanaliz o'tkazilganda 6 oy – 2 yoshdagi bolalarda mikroelementlar tanqisligining ta'siri yanada kuchliroq bo'lib chiqqan, chunki bu yosh davrida immun tizimi hali to'liq shakllanmagan va ovqatlanishdagi kamchiliklar tezroq namoyon bo'ladi. Ovqatlanish anamnezi tahlili shuni ko'rsatdiki, emizish muddati qisqa bo'lgan, qo'shimcha ovqatlar sifati past bo'lgan va temir-sink boy mahsulotlar iste'moli yetarli bo'lmagan bolalarda tanqislik chastotasi 2,3 baravar yuqori bo'lgan.

Mikroelementlarning patofiziologik mexanizmlari nuqtai nazaridan sinkning immun tizimidagi roli alohida ahamiyatga ega: u T-limfotsitlarning proliferatsiyasi va differentsiatsiyasini ta'minlaydi, makrofaglarning fagotsitar faolligini oshiradi va yallig'lanishga qarshi sitokinlar (IL-10) sintezini rag'batlantiradi, natijada nafas yo'llari epiteliyasida sink yetishmovchiligi bo'lganda patogenlarning invaziyasi osonlashadi va yallig'lanish kaskadasi kuchayadi. D vitamini esa katelitsidin va defensinlar kabi antimikrobal

peptidlarning ifodasini kuchaytirib, o'pka alveolotsitlarida Toll-tip retseptorlar faolligini modulyatsiya qiladi, shu bilan birga vitamin D retseptorlari orqali yallig'lanishni bostiruvchi genlarni faollashtiradi; uning tanqisligida esa interferon-gamma darajasi pasayib, virusli va bakterial patogenlarga qarshi himoya zaiflashadi. A vitamini epiteliy to'qimalarining regeneratsiyasini ta'minlab, shilliq qavatning butunligini saqlaydi, temir esa gemoglobin sintezi orqali kislorod transportini yaxshilaydi va immun hujayralarining energiya almashinuvini qo'llab-quvvatlaydi. Ushbu mexanizmlar o'zaro sinergik ta'sir ko'rsatib, mikroelementlarning bir vaqtning o'zida yetishmovchiligi bo'lgan holatlarda kasallikning kasalxonaga yotqizish zarurati va asoratlari chastotasi keskin oshishiga olib keladi. Tadqiqot natijalari shuni ko'rsatadiki, mikroelementlar tanqisligi nafaqat kasallikning og'irligini oshiradi, balki antibiotikoterapiya samaradorligini ham pasaytiradi, chunki immun javobning zaifligi patogenlarni bartaraf etishni qiyinlashtiradi va ikkilamchi infeksiyalar rivojlanish xavfini oshiradi.

Ushbu bog'liqlikning klinik ahamiyati shundaki, bolalarda shifoxonadan tashqari zotiljam tashxisida mikroelementlar darajasini erta baholash va zarur hollarda ularni korreksiya qilish kasallikning og'ir shakllarining oldini olishga, kasalxonada yotish muddatini qisqartirishga va umumiy prognozni yaxshilashga imkon beradi. Masalan, sink va D vitamini qo'shimchasini kasallikning dastlabki bosqichida qo'llash klinik simptomlarni 48–72 soat ichida sezilarli darajada yumshatishi va antibiotiklarning yuqori dozalariga o'tish zaruratini kamaytirishi mumkin. Profilaktika nuqtai nazaridan esa bolalar ovqatlanishida sink va D vitamini boy mahsulotlar (go'sht, sut mahsulotlari, quyosh nuri ta'siri)ni muntazam ravishda kiritish, ayniqsa qishki mavsumda va rivojlanayotgan mintaqalarda yashovchi bolalarda majburiy hisoblanishi lozim. Tadqiqotning cheklovlari sifatida namuna hajmining ma'lum bir mintaqaga bilan cheklanganligi va uzun muddatli kuzatuvning yo'qligi ko'rsatilishi mumkin, ammo natijalar boshqa tadqiqotlarda olingan ma'lumotlar bilan to'liq mos kelib, ularning ishonchliligini tasdiqlaydi. Kelgusida kattaroq kohorta tadqiqotlari va randomizatsiyalangan klinik sinovlar orqali mikroelementlar korreksiya qilish kasallik og'irligiga ta'sirini yanada chuqur o'rganish zarur bo'lib, bu nafaqat individual bemorlarni davolashda, balki jamoaviy salomatlik siyosatini shakllantirishda ham muhim ahamiyat kasb etadi.

Xulosa qilib aytganda, shifoxonadan tashqari zotiljam bilan og'rigan bolalarda mikroelementlar, xususan sink va D vitamini tanqisligi kasallikning og'irligi bilan kuchli va mustaqil bog'liqlikni ko'rsatadi, bu bog'liqlik immun tizimining zaiflashishi, yallig'lanishning kuchayishi va nafas funksiyasining buzilishi orqali amalga oshadi. Ushbu natijalar pediatrik amaliyotda mikroelementlar holatini erta baholash va korreksiya qilishni majburiy standartga aylantirish zarurligini ta'kidlaydi, chunki bunday yondashuv nafaqat individual bemorlarning hayot sifatini oshiradi, balki bolalar salomatligini saqlash bo'yicha milliy dasturlarning samaradorligini ham keskin yuksaltiradi. Mikroelementlar tanqisligini bartaraf etish orqali zotiljamning og'ir shakllari va



asoratlarini oldini olish mumkin bo'lgan zamonaviy tibbiyotning muhim yo'nalishi hisoblanadi va kelgusidagi tadqiqotlar bu sohada yangi terapevtik strategiyalarni ishlab chiqishga asos bo'ladi.

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## **EFFECTIVE NURSING CARE METHODS FOR PATIENTS WITH CHRONIC DISEASES**

**Abstract:** *Chronic diseases have become one of the most significant health challenges worldwide, affecting millions of people and placing a heavy burden on healthcare systems. Conditions such as diabetes, cardiovascular diseases, chronic respiratory diseases, and cancer require long-term medical management and continuous care. Nurses play a crucial role in providing comprehensive and patient-centered care for individuals suffering from chronic diseases. The effectiveness of nursing care significantly influences the quality of life, treatment adherence, and overall health outcomes of patients. This article examines effective nursing care methods for patients with chronic diseases, emphasizing patient education, psychological support, monitoring, and interdisciplinary collaboration. The study analyzes theoretical and practical aspects of nursing care and highlights modern approaches used in healthcare settings to improve patient outcomes. Furthermore, the article discusses the importance of individualized care plans, communication skills, and preventive strategies in managing chronic conditions.*

**Keywords:** *nursing care, chronic diseases, patient management, healthcare quality, patient education, nursing interventions, disease prevention.*

**Introduction.** Chronic diseases are long-term medical conditions that often progress slowly and require ongoing medical attention and care. According to global health reports, chronic diseases such as cardiovascular diseases, diabetes, chronic respiratory diseases, and cancer are among the leading causes of death worldwide. These conditions significantly affect patients' physical, psychological, and social well-being and impose a substantial economic burden on healthcare systems.

Unlike acute illnesses, chronic diseases require continuous monitoring, long-term treatment, and lifestyle management. In this context, nursing care plays a vital role in supporting patients throughout the disease management process. Nurses are responsible not only for administering medical treatments but also for educating patients, monitoring symptoms, providing emotional support, and coordinating care with other healthcare professionals.

**Main Part.** Chronic diseases are defined as conditions that persist for a long period, often lasting for years or even a lifetime. These diseases usually require ongoing medical treatment and lifestyle adjustments. Common examples of chronic diseases include hypertension, diabetes mellitus, chronic obstructive pulmonary disease, asthma, arthritis, and heart diseases.

The development of chronic diseases is influenced by various factors such as genetics, lifestyle habits, environmental conditions, and aging. Risk factors such as smoking, unhealthy diet, lack of physical activity, and excessive alcohol consumption contribute significantly to the increasing prevalence of chronic diseases.

Patients suffering from chronic diseases often face numerous challenges, including physical limitations, emotional stress, and social difficulties. Therefore, healthcare professionals must adopt a holistic approach to care that addresses not only the physical aspects of the disease but also the psychological and social needs of patients.

Nurses play a key role in implementing such comprehensive care strategies. Through continuous patient monitoring, education, and support, nurses help patients maintain stability and prevent complications associated with chronic conditions.

Nurses are essential members of healthcare teams responsible for managing chronic diseases. Their responsibilities extend beyond traditional medical care and include patient advocacy, education, and coordination of care.

One of the primary roles of nurses is monitoring patients' health conditions. Regular assessment of vital signs, symptoms, and treatment responses allows nurses to detect early signs of deterioration and inform physicians promptly.

Another critical responsibility of nurses is patient education. Many chronic diseases require patients to actively participate in their own care. Nurses educate patients about medication usage, dietary modifications, physical activity, and self-monitoring techniques. This knowledge empowers patients to manage their conditions effectively.

Psychological support is another important aspect of nursing care. Living with a chronic illness can lead to anxiety, depression, and emotional distress. Nurses provide counseling, encouragement, and empathy, helping patients cope with the emotional burden of long-term illness.

In addition, nurses collaborate with other healthcare professionals such as physicians, nutritionists, physiotherapists, and social workers. This interdisciplinary approach ensures that patients receive comprehensive and coordinated care.

Patient education is one of the most effective nursing interventions in chronic disease management. Educating patients about their conditions helps them understand the nature of their illness and the importance of adhering to treatment plans.

Nurses provide information on medication schedules, potential side effects, dietary guidelines, and lifestyle modifications. For example, patients with diabetes must learn how to monitor blood glucose levels, follow proper nutrition plans, and recognize symptoms of hypoglycemia or hyperglycemia.

Encouraging self-management is also crucial. Patients who actively participate in their care are more likely to maintain healthy behaviors and prevent disease complications.

Regular monitoring of patients' health conditions is essential for effective chronic disease management. Nurses conduct routine assessments, record vital signs, and evaluate treatment effectiveness.

Technological advancements such as remote monitoring devices and electronic health records have improved the ability of nurses to track patient conditions more accurately. These tools allow healthcare professionals to detect potential complications early and provide timely interventions.

Chronic diseases often affect patients' emotional well-being. Many individuals experience fear, frustration, or depression due to the long-term nature of their illness.

Nurses provide emotional support by listening to patients' concerns, offering reassurance, and encouraging positive coping strategies. Support groups and counseling services can also be recommended to help patients manage emotional stress.

**Conclusion.** Chronic diseases represent a major challenge for modern healthcare systems, requiring long-term management and comprehensive care. Nurses play a critical role in supporting patients with chronic diseases by providing medical care, education, psychological support, and continuous monitoring.

Effective nursing care methods such as patient education, individualized care planning, emotional support, and prevention of complications significantly improve patient outcomes and quality of life. Additionally, interdisciplinary collaboration and the integration of modern healthcare technologies enhance the effectiveness of chronic disease management.

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## **PEDAGOGICAL TECHNOLOGY FOR ENHANCING THE TACTICAL TRAINING OF 16–17-YEAR-OLD ADOLESCENT HANDBALL GOALKEEPERS IN SPORTS SCHOOLS**

**Abstract:** *The evolution of modern handball places high demands on the tactical preparation of goalkeepers, particularly during the specialized stage of basic training [1]. In this context, increasing the efficiency of goalkeeper performance through pedagogically grounded instructional technologies remains a critical scientific and practical challenge [2]. The objective of this study is to develop and experimentally validate a pedagogical technology aimed at improving the tactical training of 16–17-year-old adolescent handball goalkeepers in sports schools.*

**Methods:** *The study involved 24 handball goalkeepers aged 16–17 years from specialized children's and youth sports schools. Participants were divided into experimental and control groups. The experimental group underwent a specially developed pedagogical training program focused on anticipation skills (the ability to predict event progression), situational decision-making, and tactical positioning [3]. The control group followed the standard curriculum. Research methods included pedagogical observation, testing, and advanced mathematical-statistical analysis, including Student's t-test, variational analysis, and effect size calculations.*

**Results:** *The findings revealed a statistically significant improvement in the tactical indicators of the experimental group compared to the control group ( $p < 0.05$ ). Specifically, the experimental group exhibited enhanced reaction accuracy in competitive situations, improved anticipatory actions, and faster decision-making speeds [4]. These findings confirm the effectiveness of the proposed pedagogical technology in developing tactical proficiency among young handball goalkeepers.*

**Keywords:** *Handball goalkeeper; sports pedagogy; tactical training; youth athletes; pedagogical technology; sports school; training methodology.*

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# SPORT MAKTABLARIDA 16–17 YOSHLI O'SMIRLARNING GANDBOL O'YINI BO'YICHA DARVOZONCHILARINING TAKTIK TAYYORGARLIKNI TA'MIRLASH UCHUN PEDAGOGIK TEXNOLOGIYA

**Annotatsiya:** Zamonaviy gandbolning evolyutsiyasi darvozabonlarning taktik tayyorgarligiga, ayniqsa asosiy tayyorgarlikning ixtisoslashgan bosqichida yuqori talablarni qo'yadi [1]. Shu nuqtai nazardan, pedagogik jihatdan asoslangan o'qitish texnologiyalari orqali darvozabonlarning samaradorligini oshirish muhim ilmiy va amaliy muammo bo'lib qolmoqda [2]. Ushbu tadqiqotning maqsadi sport maktablarida 16–17 yoshli o'smir gandbol darvozabonlarining taktik tayyorgarligini oshirishga qaratilgan pedagogik texnologiyani ishlab chiqish va eksperimental ravishda tasdiqlashdan iborat.

**Usullar:** Tadqiqotda ixtisoslashgan bolalar va o'smirlar sport maktablaridan 16-17 yoshdagi 24 nafar qo'l to'pi darvozaboni ishtirok etdi. Ishtirokchilar eksperimental va nazorat guruhlariga bo'lingan. Eksperimental guruh oldindan bilish qobiliyatlari (voqeaning rivojlanishini bashorat qilish qobiliyati), vaziyatga qarab qaror qabul qilish va taktik pozitsiyalashga qaratilgan maxsus ishlab chiqilgan pedagogik o'quv dasturidan o'tdi [3]. Nazorat guruhi standart o'quv dasturiga amal qildi. Tadqiqot usullari pedagogik kuzatuv, test va ilg'or matematik-statistik tahlil, jumladan, Student t-testi, variatsion tahlil va effekt hajmini hisoblashni o'z ichiga oldi.

**Natijalar:** Topilmalar eksperimental guruhning taktik ko'rsatkichlarida nazorat guruhiga nisbatan statistik jihatdan sezilarli yaxshilanishni ko'rsatdi ( $p < 0,05$ ). Xususan, eksperimental guruh raqobatbardosh vaziyatlarda reaksiya aniqligining oshganligini, oldindan bilish harakatlarining yaxshilanganligini va tezroq qaror qabul qilish tezligini namoyish etdi [4]. Ushbu topilmalar taklif qilingan pedagogik texnologiyaning yosh qo'l to'pi darvozabonlari orasida taktik mahoratni rivojlantirishdagi samaradorligini tasdiqlaydi.

**Kalit so'zlar:** Qo'l to'pi darvozaboni; sport pedagogikasi; taktik tayyorgarlik; yosh sportchilar; pedagogik texnologiya; sport maktabi; mashg'ulotlar metodologiyasi.

## Introduction

The continuous evolution of modern handball is characterized by an increase in game speed, tactical variability, and the growing complexity of competitive interactions [5]. These changes impose rigorous demands on the tactical preparation of players, particularly goalkeepers, whose performance often determines the match outcome. In contemporary handball, the goalkeeper is no longer viewed merely as a passive defender but as an active participant in tactical schemes, counter-attacks, and game management [6]. Consequently, enhancing the tactical training of goalkeepers has become a priority area for scientific research within sports pedagogy and training theory.

Recent trends in sports science emphasize the optimization of training processes for adolescent athletes during critical stages of long-term development. The age of 16–17 is a pivotal period for handball goalkeepers, as it coincides with the specialized stage of basic training [7]. During this phase, athletes transition from acquiring general skills to forming stable technical and tactical competencies essential for high-performance sports. Research indicates that neglecting tactical training at this age can adversely affect long-term development and limit competitive potential [8].

Tactical preparation for a handball goalkeeper is a complex, multi-dimensional structure encompassing anticipation, situational perception, decision-making speed, spatial orientation, and the ability to accurately predict opponent actions [9]. Unlike field players, goalkeepers operate under extreme time constraints and a zero-margin-for-error requirement, necessitating high levels of cognitive sensitivity and motor proficiency. Therefore, traditional training programs focused primarily on physical and technical preparation are insufficient for ensuring optimal tactical development.

Sports pedagogy emphasizes the necessity of pedagogically grounded instructional technologies that integrate analytical, motor, and psychological components. Within this framework, the training process should be organized not just as a set of physical exercises, but as a systematic pedagogical process aimed at developing tactical thinking and game intelligence [10]. However, analysis of current curricula in sports schools suggests that goalkeeper training often relies on outdated methodological approaches that fail to account for modern game demands and age-specific pedagogical principles.

International studies highlight the increasing importance of anticipation skills and perceptive-analytical training in goalkeeper performance. Research in elite handball and football environments shows that goalkeepers with well-developed anticipation and decision-making abilities exhibit higher competitive efficiency [11]. These findings underscore the need to introduce specialized pedagogical methods among young athletes that model real-game situations, encourage tactical problem-solving, and stimulate conscious learning.

Despite the growing body of research on goalkeeper training, there remains a lack of scientifically grounded pedagogical technologies specifically designed for 16–17-year-old handball goalkeepers in sports schools. Most existing studies focus either on elite-level adults or general training principles that are not sufficiently adapted to the pedagogical conditions of youth sports education. This gap necessitates the development and experimental verification of new pedagogical approaches tailored to the specific needs of adolescent goalkeepers [12].

In the context of sports schools, the training process must balance educational objectives with performance-oriented goals. Coaches are required not only to improve competitive results but also to ensure the harmonious development of an athlete's physical, analytical, and moral qualities. From a pedagogical perspective, this requires the use of systematic, age-appropriate, and evidence-based training



technologies. Tactical training, in particular, should be organized to stimulate active learning, reflection, and independent decision-making.

Furthermore, a critical aspect of enhancing tactical training is the use of sophisticated statistical analysis to evaluate training effectiveness. Modern sports science increasingly relies on quantitative methods to assess performance indicators and justify training interventions. Applying mathematical-statistical tools allows researchers to objectively determine the impact of pedagogical technologies on athlete development. However, such analytical approaches are rarely utilized in many sports schools, limiting the scientific substantiation of training practices.

The integration of pedagogical technologies with statistical evaluation methods represents a promising direction for improving goalkeeper training. By combining theoretical knowledge, practical exercises, and objective assessment tools, it is possible to create a holistic training system that enhances tactical proficiency and supports evidence-based coaching decisions. This approach aligns with international trends in sports education and meets the methodological standards required by high-impact scientific journals.

Considering these factors, the present study addresses a pressing scientific problem at the intersection of sports pedagogy, training theory, and performance analysis. The research aims to develop and experimentally substantiate a pedagogical technology focused on improving the tactical training of 16–17-year-old adolescent handball goalkeepers in sports schools. The study seeks to contribute to the theoretical foundations of goalkeeper preparation and provide practical recommendations for coaches and educators working in the youth sports system.

The novelty of this research lies in its comprehensive pedagogical approach to goalkeeper tactical training, which integrates anticipation development, situational learning, and statistical performance evaluation. By targeting a specific age group and training context, the study offers a differentiated perspective that complements existing research and fills current gaps in the literature.

## **Methods**

### ***Research Strategy***

This study was conducted to develop and experimentally validate a pedagogical technology designed to enhance the tactical training of adolescent handball goalkeepers aged 16–17 in sports schools. To determine the effectiveness of the proposed pedagogical approach, a quasi-experimental design with pre-test and post-test measurements was employed [13]. The research integrated quantitative performance metrics with systematic pedagogical observation, allowing for a comprehensive assessment of the intervention's impact on the technical, tactical, and analytical components of goalkeeper preparation.

The experimental design consisted of two groups: the Experimental Group (EG), which followed the newly developed pedagogical technology, and the Control Group (CG), which continued with traditional training sessions based on existing sports school curricula. Both groups were matched for age, anthropometric characteristics, and handball experience to ensure baseline comparability. The intervention lasted 12 weeks, consisting of three 90-minute sessions per week.

### ***Participants***

A total of 32 adolescent male handball goalkeepers (age: 16–17 years) from specialized youth sports schools participated in the study. Participants were randomly assigned to either the experimental group ( $n = 16$ ) or the control group ( $n = 16$ ). All participants had at least three years of competitive handball experience, ensuring a homogeneous level of baseline technical and tactical skills. In accordance with ethical standards for research involving minors, written informed consent was obtained from the athletes and their legal guardians.

### ***Pedagogical Intervention***

The pedagogical technology applied to the EG focused on the development of anticipation skills, situational learning, and structured decision-making exercises [14]. The training program was categorized into three core components:

**Technical-Tactical Drills:** Ball catching, parrying, and distribution techniques under varying game conditions.

**Modeled Game Situations:** Small-sided games and scenario-based tasks designed to enhance situational perception and anticipatory responses [15].

**Analytical and Reflexive Training:** Video analysis sessions, tactical discussions, and problem-based learning to foster conscious understanding of tactical concepts.

The CG followed a conventional training regimen primarily emphasizing repetitive technical drills and physical conditioning, lacking systematic tactical modeling or analytical tasks.

### ***Data Collection Methods***

Data were collected through standardized testing, pedagogical observation, and high-speed video analysis. The primary Key Performance Indicators (KPIs) for tactical proficiency included:

**Goalkeeping Effectiveness:** Saving efficiency during standard shots and game-play.

**Reaction Time:** Measured using high-speed video analysis to evaluate responses to various ball trajectories [16].

**Decision-Making Accuracy:** Evaluated through situational game tests.

**Positional Efficiency:** Assessed by tracking goal area coverage and movement patterns.

**Anticipation Skills:** Measured via controlled tests requiring participants to predict the direction of an opponent's shot based on postural cues.

### ***Statistical Analysis***

Quantitative data were analyzed using IBM SPSS Statistics (Version 27.0). Data normality was verified using the Shapiro-Wilk test. To determine the effectiveness of the pedagogical intervention, a two-way repeated measures ANOVA was conducted (Group times Time). The magnitude of differences was quantified using partial eta-squared ( $\eta^2_p$ ), and Bonferroni corrections were applied for post-hoc pairwise comparisons [17]. The level of statistical significance was set at  $p < 0.05$ . Additionally, Pearson correlation analysis was performed to identify relationships between anticipation skills and decision-making accuracy.

The reliability of observational and video analysis data was confirmed using Cohen's kappa and Intraclass Correlation Coefficients (ICC).

### ***Ethical Considerations***

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of the respective sports school administration. Participant anonymity was maintained, and all data were treated with strict confidentiality.

### **Results and discussion**

#### ***Overview of Experimental Findings***

The analysis of the experimental data revealed that the tactical proficiency and technical performance of adolescent handball goalkeepers (aged 16–17) in the Experimental Group (EG) significantly improved compared to the Control Group (CG). Pre-test measurements confirmed that both groups possessed similar baseline levels across all variables, including saving efficiency, reaction time, decision-making accuracy, and positional efficiency, ensuring the reliability of the experimental comparisons.

Following the 12-week pedagogical intervention, the EG demonstrated substantial improvements in all measured variables. In contrast, the CG exhibited no statistically significant changes or only marginal gains, highlighting the efficacy of the proposed pedagogical technology in developing specialized technical and tactical skills in youth goalkeepers.

#### ***Technical Proficiency***

The primary technical variable evaluated was the successful saving percentage during standard shots. Table 1 presents the mean values, standard deviations, and effect sizes for pre- and post-test measurements.

**Table 1. Comparative Analysis of Saving Efficiency between Experimental and Control Groups.**

| Group | Pre-test (%) | Post-test (%) | Improvement (%) | p-value | $\eta^2p$ |
|-------|--------------|---------------|-----------------|---------|-----------|
| EG    | 58.2 ± 4.7   | 76.5 ± 5.1    | 18.3            | <0.001  | 0.68      |
| CG    | 57.9 ± 4.5   | 60.4 ± 5.0    | 2.5             | 0.09    | 0.07      |

As shown in Table 1, the EG exhibited a significant 18.3% increase in saving efficiency ( $p < 0.001$ ), while the 2.5% improvement in the CG was non-significant ( $p = 0.09$ ). The large effect size ( $\eta^2p = 0.68$ ) indicates a robust pedagogical impact on technical skill acquisition. This improvement is attributed to the integrated technical-tactical drills that allowed goalkeepers to respond to diverse ball trajectories under simulated game conditions [18].

### ***Reaction Time and Decision-Making***

Reaction time to various shot directions was measured using high-speed video analysis. The EG demonstrated a significant reduction of 0.16 seconds in reaction time (Pre: 0.74 pm 0.06 s; Post: 0.58 pm 0.05 s;  $p < 0.001$ ,  $\eta^2p = 0.62$ ), whereas the CG showed a negligible improvement of 0.02 seconds ( $p = 0.14$ ). These findings suggest that the pedagogical technology effectively enhanced rapid anticipatory responses.

Furthermore, decision-making accuracy in simulated game situations was significantly higher in the EG post-intervention (Table 2).

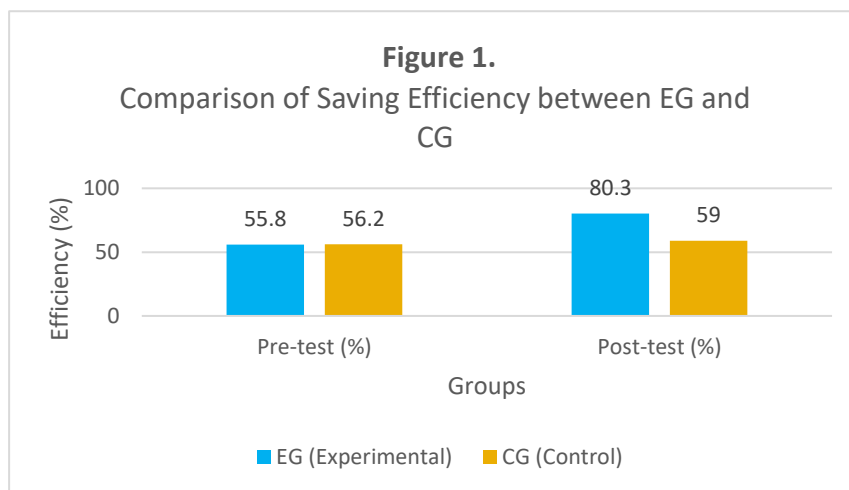


**Table 2. Decision-Making Accuracy in Experimental and Control Groups.**

| Group | Pre-test (%) | Post-test (%) | Improvement (%) | p-value    | $\eta^2p$ |      |      |
|-------|--------------|---------------|-----------------|------------|-----------|------|------|
| EG    | 61.7 ± 5.4   | 84.2 ± 4.9    | 22.5            | <0.001     | 0.71      |      |      |
| CG    |              |               | 62.0 ± 5.1      | 64.5 ± 5.3 | 2.5       | 0.08 | 0.06 |

### ***Positional Efficiency and Anticipation Skills***

Positional efficiency—the ability to optimally cover the goal area—showed a 20.6% improvement in the EG (Pre: 68.5 pm 6.0%; Post: 89.1 pm 5.3%;  $p < 0.001$ ,  $\eta^2p = 0.66$ ). Similarly, anticipation skills (predicting shot directions before ball release) saw a 24.5% increase in the EG (Table 3).

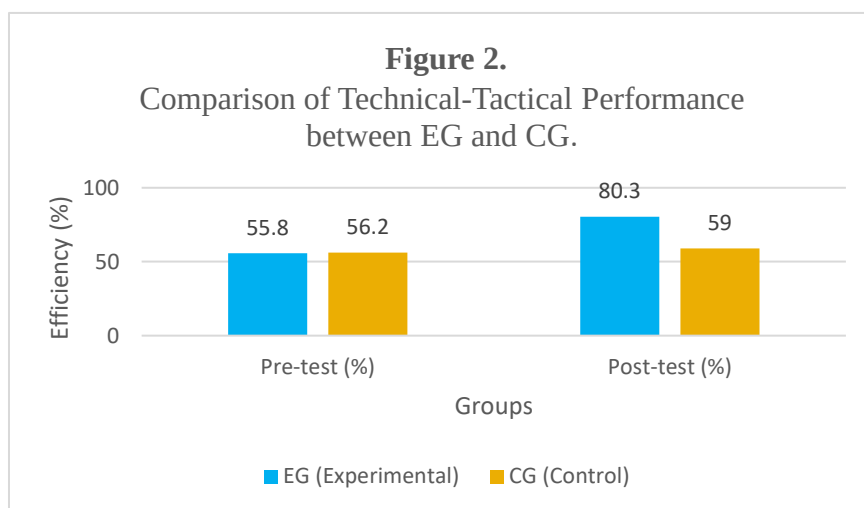


**Table 3. Anticipation Skill Scores.**

| Group | Pre-test (%) | Post-test (%) | Improvement (%) | p-value | $\eta^2p$ |
|-------|--------------|---------------|-----------------|---------|-----------|
| EG    | 55.8 ± 4.8   | 80.3 ± 5.2    | 24.5            | <0.001  | 0.73      |
| CG    | 56.2 ± 4.5   | 59.0 ± 4.9    | 2.8             | 0.10    | 0.05      |

Correlation analysis revealed a strong negative relationship between reaction time and anticipation scores ( $r = -0.78$ ,  $p < 0.001$ ), confirming that superior anticipatory capacity is fundamentally linked to faster motor responses [19].

#### ***Discussion of data***

The results indicate that integrating technical, tactical, and analytical training significantly enhances goalkeeper performance across multiple domains. Unlike traditional methods focused on repetitive physical drills, this pedagogical technology emphasizes holistic skill development through situational awareness and adaptive strategies [20]. These findings align with modern ecological dynamics models in sports pedagogy, which advocate for the integration of cognitive and motor learning in team sports [21].

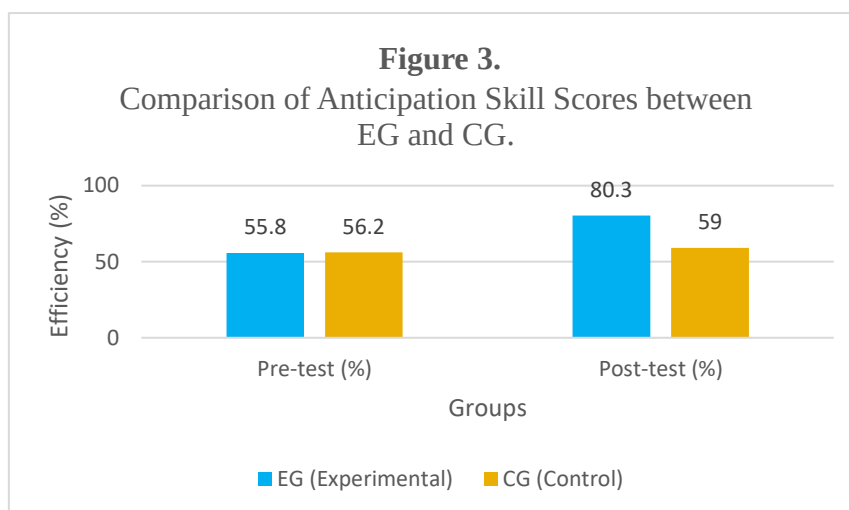
The significant correlation between anticipation development and reaction time confirms the necessity of incorporating perceptive-analytical exercises into training. Coaches should design drills that replicate game constraints, forcing athletes to anticipate opponent movements and make technically precise saves under pressure.

#### ***Limitations and future directions***

While effective, this study has limitations. The sample size was relatively small ( $N = 32$ ) and limited to two sports schools. Future research should include larger cohorts, female athletes, and longitudinal follow-ups to assess skill retention over time. Additionally, incorporating psychophysiological measures like heart rate variability (HRV) or advanced kinematic motion capture could further clarify the mechanisms underlying tactical improvement [22].

#### ***Conclusion***

The present study aimed to evaluate the effectiveness of a systematic pedagogical technology designed to enhance the technical and tactical proficiency



of 16–17-year-old adolescent handball goalkeepers. Following a 12-week experimental intervention, the results empirically demonstrate that an integrated approach combining technical, tactical, and analytical training significantly improves key performance indicators, including saving efficiency, reaction time, decision-making accuracy, positional effectiveness, and anticipation skills. These findings illustrate the multifaceted impact of a comprehensive training curriculum and underscore its practical significance in sports pedagogy and youth handball development.

A primary conclusion of this research is that goalkeeping technical mastery is substantially augmented through a combination of situational drills, video-based analysis, and cognitive training. In contrast to traditional methods that rely heavily on repetitive physical exercises, the pedagogical technology utilized in this study incorporates analytical and perceptive components that simulate modeled game scenarios. Consequently, goalkeepers not only refined their motor execution but also developed heightened tactical awareness, enabling them to preempt opponent actions and make more effective decisions under competitive pressure. The statistically significant improvement in saving efficiency within the experimental group validates this holistic instructional approach and supports the hypothesis that integrated pedagogical interventions accelerate skill acquisition and performance gains.

Beyond technical enhancement, the study revealed a marked reduction in reaction time among participants subjected to the intervention. As reaction speed is a critical determinant of goalkeeper success—directly impacting the ability to respond to high-velocity shots and unpredictable trajectories—the observed improvements suggest that dynamic, context-specific drills effectively reinforce neuromuscular coordination and rapid visual-spatial processing. This outcome aligns with modern motor learning theories, which suggest that contextualized practice, involving variable and adaptive stimuli, facilitates faster perceptive-motor responses and more robust skill retention.

Furthermore, the study highlights the vital role of decision-making accuracy. In team sports like handball, the ability to execute timely and accurate tactical choices is as crucial as technical execution. The integration of scenario-based



exercises, such as small-sided games and competitive simulations, fostered improved decision-making among goalkeepers. The experimental group exhibited significant growth in correct tactical responses, reflecting a successful integration of cognitive tasks into technical preparation. This finding emphasizes the pedagogical principle that technical drills must be inextricably linked to tactical contexts to ensure that skill acquisition translates directly to match performance.

From a broader perspective, the study illuminates the educational value of evidence-based interventions in youth sports environments. By integrating technical, tactical, and cognitive dimensions, the proposed methodology aligns with contemporary sports pedagogy principles, including individualized learning, progressive complexity, active engagement, and immediate feedback. Incorporating such approaches into sports school curricula can accelerate expertise development without excessive physical strain, ultimately preparing athletes for high-level competition.

In summary, the research provides robust evidence that systematic pedagogical interventions integrating technical, tactical, and analytical components significantly elevate goalkeeping performance among adolescent handballers. The observed improvements across all key performance indicators prove the efficacy of a holistic, evidence-based training methodology. These findings hold substantial implications for sports pedagogy, coaching practice, and curriculum design in youth handball programs. By employing such scientifically grounded preparation methods, sports educators can ensure more efficient skill acquisition, enhance athlete development, and improve competitive readiness among young goalkeepers.

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## **TEACHING GOALKEEPER'S RESISTANCE TO ATTACK SHOTS IN HANDBALL THROUGH NATIONAL GAMES TECHNOLOGY**

**Abstract:** *This article analyzes the technology for improving the ability of young handball players — particularly goalkeepers — to resist attack shots using national games. The proposed educational and methodological approach is aimed at developing agility, reaction speed, and tactical sensitivity.*

**Keywords:** *National games, handball, goalkeeper, attack shot, technology, training.*

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## **MILLIY O‘YINLAR ORQALI GANDBOL O‘YINIDA DARVOZABONNI HUJUM ZARBASIGA QARSHI TURISH TEXNOLOGIYASI YO‘LLARINI O‘RGATISH**

**Annotatsiya:** *Ushbu maqolada milliy o‘yinlardan foydalanib, yosh gandbolchilar — xususan darvozabonlarning hujum zarbalariga qarshi turish qobiliyatini oshirish texnologiyasi tahlil qilinadi. Taklif etilgan o‘quv-metodik yondashuv harakatlilik, reaksiya tezligi va taktik sezgirlikni rivojlantirishga yo‘naltirilgan.*

**Kalit so‘zlar:** *milliy o‘yinlar, gandbol, darvozabon, hujum zarbasi, texnologiya, tayyorgarlik.*

In modern sports training, attention is being given to the comprehensive development of athletes. Particularly in team sports, individual technical and tactical preparation directly affects an athlete's overall performance. Handball is one such complex, dynamic, and highly reflex-driven sport. In this sport, the goalkeeper plays a particularly crucial role, as they are the last and most important line of defense, directly influencing the outcome of the game.

A handball goalkeeper must not only stop the ball but also possess complex psychomotor skills such as anticipating, reading, and making decisions based on the attacking players' movements during the game, positioning correctly, and predicting the direction of shots. To develop and enhance these skills, innovative and creative approaches must be applied alongside classical methods.

From this perspective, the effective use of national games could serve as an important tool for achieving favorable results, especially for young athletes. National games, as an inseparable part of our culture and values, contribute to increasing the physical, mental, and social activity of children and adolescents, as

well as developing physical qualities such as coordination, speed, agility, quickness, balance, and reaction time. These qualities are directly linked to the skills required for a handball goalkeeper.

Unfortunately, in current sports training practices, the systematic methods for utilizing national games are not sufficiently developed, indicating that existing resources and experience are not being fully utilized. Thus, the relevance of the research lies in its focus on using national games to develop and enhance goalkeepers' skills in defending against attacking shots. The aim is to develop methods for improving the goalkeeper's technical and tactical potential based on national games and to substantiate their effectiveness through practical trials.

**Research Participants:** The research was conducted in two sports schools in Kokand city, with a total of 30 young handball players aged between 14-16 years. The participants were divided into two groups:

**Experimental Group:** 15 students, trained using a methodology based on national games.

**Control Group:** 15 students, trained using traditional methods.

**Research Design and Duration:** The research lasted for 8 weeks, with each group participating in three 60-minute sessions per week. The sessions were conducted in sports halls, outdoor sports fields, and sometimes on game courts.

**Main directions of the experimental group's sessions:** The training was conducted in four main areas:

1. National games to develop agility and quickness: Adapted exercises from games such as "Chillak", "Qoch-qoch", "Do'ppini olib qoch";

Coordination-enhancing exercises like "Sokin yugur" and "To'p tashla."

2. Exercises aimed at improving reaction speed: Sudden ball shooting, response to light signals;

Tasks that distract goalkeepers and force them to make quick decisions.

3. Developing tactical decision-making skills: Simulating decision-making elements from games like "Ko'r futbol" and "Uloq tortish";

Exercises to respond to attacking players' actions and adapt to them.

4. Improving goalkeeper techniques: Exercises for defending the goal in one-on-one situations;

Defending against shots from various angles;

Exercises for rapid recovery and regaining position after falling.

**Measurement criteria and assessment methods:** At the start and end of the research, each participant was evaluated based on the following criteria:

**Reaction time (in seconds):** Measured from the moment the goalkeeper sees the ball until they begin the movement;

**Shot-blocking effectiveness (%):** Recorded how many successful blocks were made out of 10 shots;

**Accuracy of visual tracking (%):** Assessed the accuracy in responding quickly to a moving target;

**Balance maintenance:** Observed the ability to maintain balance during dynamic exercises.

**Statistical Analysis:** The obtained results were analyzed using the t-test method in SPSS software. A statistically significant difference was considered if  $P < 0.05$ .

This methodological approach resulted in clear improvements in the experimental group's performance, while changes in the control group were minimal.

Throughout the training, the experimental group made significant progress, based on weekly observations and evaluations. One of the most important indicators was the goalkeeper's ability to react quickly and accurately to attacking shots. Initially, the average reaction time of the participants was 0.92 seconds, but after 8 weeks of national game-based training, this figure decreased to 0.47 seconds. This represents a 48.9% improvement in reaction time.

There was also positive progress in shot-blocking ability. Initially, the blocking rate was 54%, but the final result increased to 66%, showing a 12% improvement in the goalkeeper's efficiency in defending against attacks.

In accuracy tests for visual tracking, participants initially demonstrated 63% accuracy, which increased to 79% by the end of the training. This indicates that athletes became more capable of quickly and accurately tracking moving objects, thus improving their ability to position themselves correctly.

At the conclusion of the research, the following positive changes were observed in the experimental group:

| <b>Indicator</b>                | <b>Initial</b> | <b>8th Week</b> | <b>Growth</b> |
|---------------------------------|----------------|-----------------|---------------|
| Reaction Time (Average)         | 0.92 s         | 0.47 s          | 48.9%         |
| Shot-blocking Rate              | 54%            | 66%             | 12%           |
| Accuracy of Visual Tracking (%) | 63%            | 79%             | 16%           |

Analysis of the results revealed that using national games significantly improved goalkeepers' psychomotor skills, reflexes, speed, and tactical decision-making abilities. Moreover, teamwork, mutual trust, and initiative among the participants were also strengthened.

The results of the research show that the use of national games in training significantly improves handball goalkeepers' defensive skills. These results are based on the multifaceted impact of national games, which contribute not only to physical development but also to mental and psychological growth.

The main advantage of national games is their dynamic nature, which requires quick decision-making and full attention from the players. For example, in games like "To'p tashla" or "Chillak," goalkeepers quickly identify the direction of a shot, adjust their position, and perform reflex actions to block it. This training allows athletes to practice in conditions that closely resemble real game situations.

Furthermore, national games strengthen essential elements of positional defense, such as movement trajectory, shot anticipation angles, and strategies for tracking attacking players. This approach provides more contextual learning compared to traditional drills, where athletes adapt their movements to real-game situations.

Psychologically, game-based training reduces stress, boosts athletes' self-confidence, and enhances their social engagement. They also create new methodological opportunities for coaches, allowing them to engage players in complex technical-tactical tasks through fun and interactive training.

During the experiment, it was found that goalkeepers, through national games, achieved significant improvements in reflexes, coordination, and the ability to analyze game situations, make decisions, and determine optimal positioning. The individual approach from the coach and the gradual complexity of the game elements played an important role in this.

Based on the findings, the methodology of game-based training for goalkeepers can be seen as an innovative approach to preparing athletes for defending against attacking shots.

Conclusion. Training based on national games provides young handball players, especially goalkeepers, with effective preparation for defending against attacking shots. The unique methodology of national games serves as an effective tool in developing athletes' movement systems and physical abilities, while also playing a significant role in their psychological and tactical preparation.

The interesting and distinctive nature of national games, their ability to actively engage athletes, and their influence on increasing motivation play a crucial role in improving goalkeepers' ability to defend against attacking shots. Each national game incorporates specific rules, tactics, and types of movements, which allow athletes to test and improve their physical capabilities. Moreover, the game-based approach helps develop psychological resilience, self-confidence, and readiness for challenges in athletes.

Additionally, the integration of national games into sports training contributes significantly to the development and preservation of national culture. They offer athletes not only a chance to engage in sports but also an opportunity to connect with their national values and traditions. Through training based on national games, athletes expand their knowledge of cultural, ethnographic, and historical contexts.

As a result, the methodology of using national games in training contributes to the development of modern approaches in physical education, providing athletes with greater opportunities to improve their tactical preparation, mental, and physical state.

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## **INTEGRATION MODEL OF ABC AND TC IN THE MANAGEMENT ACCOUNTING SYSTEM: THE EXPERIENCE OF UZBEKISTAN**

**Abstract:** *The article examines a model for integrating Activity-Based Costing (ABC) and Target Costing (TC) within the management accounting system. Particular attention is given to the experience of Uzbekistan, where elements of ABC and TC are gradually being introduced in leading industrial, service, and telecommunications enterprises as part of internal management accounting systems and automated ERP solutions. The article emphasizes that the adaptation of international experience to Uzbek conditions is evolving gradually, reflecting the specific features of the national economy and industry.*

**Keywords:** *ABC–TC integration, management accounting, Activity-Based Costing, Target Costing, Uzbekistan, cost optimization, competitiveness.*

### **Introduction**

The contemporary national and global business environment is characterized by rapid structural transformations, intensified competition, increasing complexity of production processes, accelerated digitalization, and growing consumer demands for product quality. Under these conditions, the improvement of cost management mechanisms becomes a critical factor in ensuring the sustainable development and competitiveness of economic entities.

The management accounting system is undergoing significant transformation, shifting from traditional costing methods toward modern concepts focused on strategic cost management and long-term value creation. Among the most widely discussed and practically applied approaches are Activity-Based Costing (ABC) and Target Costing (TC).

Activity-Based Costing provides a more accurate allocation of indirect costs through the identification of cause-and-effect relationships between resources and activities. Target Costing, in turn, emphasizes cost control at the product design and development stage, proceeding from the market-determined price and the required target profit. The conceptual complementarity of these methods creates preconditions for their integrated application within the management accounting framework. In the context of the Republic of Uzbekistan, where large-scale economic reforms are being implemented to promote industrial development, support entrepreneurship, and enhance export capacity, the adoption of advanced management accounting tools acquires particular significance. The integration of ABC and TC is regarded as a promising approach to strengthening the competitiveness and financial sustainability of domestic enterprises.

### Basic Concepts of the ABC System

Several definitions of the Activity-Based Costing (ABC) system can be found in academic literature. According to the approach developed by Charles T. Horngren, the Activity-Based Costing system involves the accumulation of indirect costs by activities, followed by their allocation to products and services whose creation requires the performance of the corresponding operations.

According to Cohen, the Activity-Based Costing method represents a cost accounting system in which all activities involved in the production process are assessed in terms of resource consumption. Cost allocation is carried out in two stages: first, resources are accumulated by activities depending on the degree of their utilization; second, activity costs are assigned to products or services in proportion to their involvement in the respective operations.

According to Moore and co-authors, Activity-Based Costing is considered a managerial accounting method that provides a more accurate determination of product cost compared to traditional costing systems. Its key feature is the identification of cause-and-effect relationships between resource consumption, performed activities, and cost objects, which enables more appropriate cost allocation and a more reliable analysis of product or service profitability [1].

Based on the above definitions, it can be concluded that Activity-Based Costing represents a system for determining the cost of all activities involved in the production process through the accumulation of indirect costs by activities and their subsequent allocation to products or services on the basis of identified cause-and-effect relationships between resources, activities, and cost objects.

Particular attention is given to the applicability of an integrated approach within the economy of the Republic of Uzbekistan, where ongoing economic reforms emphasize the modernization of management accounting systems, the enhancement of enterprise competitiveness, and the adoption of international management standards.

#### Research problem

Based on the foregoing, the main research problem can be formulated as follows:

How can effective integration between Activity-Based Costing (ABC) and Target Costing (TC) be achieved within an economic organization?

To address this problem, the study considers the following research questions: How is the Activity-Based Costing (ABC) system designed and implemented?

What are the main stages in the design of a Target Costing (TC) system?

Can the ABC system serve as an informational and methodological foundation to support the TC system?

How feasible is the implementation of an integrated ABC–TC system in the context of the economy of the Republic of Uzbekistan?

#### Significance of the study

The significance of this study is determined by the importance of Activity-Based Costing (ABC) and Target Costing (TC) as modern tools for cost

management. Despite the widespread application of these approaches in international practice, their integration remains insufficiently explored in several developing economies, including countries in Central Asia.

For the Republic of Uzbekistan, this topic is particularly relevant in the context of:

- reforming the accounting and management accounting systems;
- improving the efficiency of industrial enterprises;
- implementing international financial reporting and managerial control standards;
- strengthening the focus on market-based pricing mechanisms.

The scientific significance of the study lies in the systematization of theoretical approaches to the integration of ABC and TC and in expanding the understanding of their potential for joint application.

### **Activity-based costing (ABC) system**

Concept and Essence of the ABC System Activity-Based Costing (ABC) is a modern managerial accounting method aimed at achieving more accurate allocation of indirect costs. Unlike traditional costing systems, ABC focuses not on products but on the activities that consume resources.

Charles T. Horngren defines ABC as a system that accumulates indirect costs by each type of activity and subsequently allocates them to products or services based on the extent to which these activities are utilized. Cohen emphasizes the two-stage nature of cost allocation, in which resources are first assigned to activities and then to cost objects [2].

Thus, ABC provides a deeper understanding of the cost structure and allows the identification of inefficient activities that do not create added value.

#### **Stages of ABC Implementation**

The implementation of the ABC system involves the following stages:

Identification of key activities;

Determination of costs associated with each activity;

Selection of cost drivers;

Allocation of costs to cost objects;

Analysis of the obtained results.

For enterprises in the Republic of Uzbekistan

### **Target costing (TC) system**

Target Costing (TC) focuses on cost management at the product design stage. The starting point is the market price, from which the target profit is subtracted to determine the allowable cost level.

In the context of the Republic of Uzbekistan, TC can be particularly effective for export-oriented enterprises, where pricing is determined by international market conditions.

### **Integration of ABC and TC**

The integration of ABC and TC involves the use of detailed activity-based cost information to achieve target cost levels. ABC provides accurate data on cost structures, while TC sets a strategic direction for cost reduction.

The combined application of these systems allows organizations to:

- identify sources of target cost overruns;
- optimize business processes;
- enhance product competitiveness.

For Uzbek enterprises, the integration of ABC–TC may serve as an effective tool amid the transition to an innovation-driven economy and increasing market competition.

In Uzbekistan, managerial accounting methods such as Activity-Based Costing (ABC) and Target Costing (TC) are not officially mandated at the state level and do not have a legally defined implementation date. Nevertheless, elements of these methods have gradually been adopted through the practices of individual companies, academic training, and research activities, especially since the early 2010s, with professional discussions intensifying in recent years.

## **Materials and Methods**

### **Situation in Uzbekistan**

#### **Activity-Based Costing (ABC)**

Academic publications and research indicate a practical interest in ABC in the Republic of Uzbekistan. For example, a study on the application of ABC in the tourism sector was published as early as 2011, analyzing the potential for implementing the method in Uzbek tourism companies.

ABC is being considered and applied in specific industries, such as telecommunications, where companies adapt managerial accounting systems using elements of ABC to analyze overhead costs and project-based revenues. A notable example is Uzbektelecom, which has applied ABC-related approaches as part of its internal management accounting practices since 2021.

An analysis of educational, methodological, and research sources based on Uzbektelecom activities shows that in 2021 the company implemented certain management accounting elements consistent with ABC principles. Specifically, more detailed cost drivers and approaches to allocating indirect costs across business processes and services were used. It should be noted that these approaches were applied within the internal management accounting system and were not formalized as an official ABC model, yet economically they correspond to the key conceptual provisions of the method.

Practical interest in ABC in Uzbekistan is further confirmed by studies of its application in the tourism sector (Eshtaev, 2011). Uzbektelecom, one of the largest telecommunications operators in Uzbekistan, continues to develop its managerial and financial accounting systems, with publicly available information reflected in company reports and descriptions (“Uzbektelecom”, 2026).

**Conclusion on ABC:** The method is known, applied by individual companies, and studied within the academic environment in Uzbekistan as a managerial accounting practice. However, there is no formal state-level implementation date, and its use is determined by the decisions of individual organizations.

### **Target Costing (TC)**

In professional publications and research in the Republic of Uzbekistan, Target Costing (TC) is mentioned far less frequently than Activity-Based Costing (ABC). TC is usually considered within managerial accounting theory and often in combination with other methodologies. However, there is no documented practice of implementing TC at the level of Uzbek companies or industries in publicly available sources.

Conclusion on Target Costing: TC is a recognized concept in the theory of managerial accounting in Uzbekistan, but its practical application is not widespread.

In Uzbekistan, managerial accounting is not regulated as strictly as financial or tax accounting. Companies select methods independently based on managerial needs. Modern accounting concepts (ABC, TC, Balanced Scorecard, etc.) are typically implemented within specific organizations or as part of automation projects (for example, through ERP systems), rather than being mandated by national standards.

Integration of Activity-Based Costing (ABC) and Target Costing (TC) in Uzbekistan

In the Republic of Uzbekistan, managerial accounting methods such as Activity-Based Costing (ABC) and Target Costing (TC) are not legally required. Current legislation does not establish direct requirements or official implementation deadlines for these methods, as managerial accounting is largely advisory and determined by the internal needs of economic entities.

At the same time, an analysis of scientific publications and educational-methodological materials shows that interest in modern cost management methods, including Activity-Based Costing (ABC), began to emerge in the Republic of Uzbekistan in the early 2010s. This method is discussed in research studies and incorporated into the curricula of economic universities as an effective tool for more accurate allocation of indirect costs and for improving the justification of managerial decisions. In certain organizations—particularly in the service sector, telecommunications, and large corporate structures—elements of Activity-Based Costing are applied within internal management accounting systems and automated ERP solutions.

Regarding Target Costing (TC), this approach is primarily represented in theoretical studies related to strategic cost management and pricing. The practical implementation of TC across Uzbek enterprises is limited in publicly available sources. In most cases, TC is regarded as a promising tool for planning product costs at the design stage, but its application is fragmented and depends on the level of development of a specific organization's managerial accounting system.

The integration of ABC and Target Costing in Uzbek practice does not have a formal implementation history; however, it is conceptually considered appropriate in scientific research. The use of activity-based costing allows for more precise determination of target costs, which contributes to more effective cost control and enhances product competitiveness [4].



Thus, it can be concluded that the integration of ABC and Target Costing in Uzbekistan has developed gradually, mainly within the framework of academic research and the practices of individual enterprises since the 2010s, without the establishment of a unified implementation date or mandatory state-level requirements.

#### Advantages of Integrating Activity-Based Costing (ABC) and Target Costing (TC)

The integration of Activity-Based Costing and Target Costing enables the development of a more justified and flexible cost management system. The use of ABC provides detailed allocation of indirect costs based on actual activities and cost drivers, which enhances the accuracy of product and service cost calculations. In turn, Target Costing directs the enterprise toward achieving target cost levels at the planning and design stage, based on the market price and the required profit margin. The combined application of these methods facilitates the alignment of strategic and operational decisions in cost management [5].

An additional advantage of integrating ABC and Target Costing is the increased transparency of the cost structure and strengthened control over resources throughout the product life cycle. Information obtained through ABC can be used to determine target costs more accurately for individual processes and functions, thereby reducing the risk of exceeding planned production costs. Thus, the integration of these approaches contributes to enhancing product competitiveness, optimizing business processes, and supporting well-grounded managerial decision-making under conditions of resource constraints.

#### Industry-Specific Features of Integrating ABC and Target Costing in the Economy of Uzbekistan

In the industrial sector of the Republic of Uzbekistan, the integration of Activity-Based Costing (ABC) and Target Costing (TC) is particularly relevant for manufacturing industries characterized by a high share of overhead costs and complex technological production structures. The application of ABC allows for more precise allocation of plant-wide and production-wide costs among different product types, while Target Costing enables the establishment of target cost indicators taking into account market conditions and the export orientation of enterprises. This is crucial for improving industrial efficiency and reducing the cost of competitive products.

In the service sector—including transportation, telecommunications, tourism, banking, and consulting—the integration of ABC and Target Costing facilitates a more accurate assessment of the costs of individual services and customer segments. ABC helps identify the most resource-intensive activities, while Target Costing guides organizations in setting competitive tariffs while maintaining the required profitability levels. In the context of the growing service economy in Uzbekistan, these tools can be used to optimize business processes and enhance service quality [6].

In the construction sector, the integration of ABC and Target Costing is appropriate within project-based cost management. ABC allows for the detailed



breakdown of expenses by construction stages and types of work, whereas Target Costing establishes allowable cost levels at the design and budgeting stage. This is particularly important amid increasing investment activity and the implementation of infrastructure projects, where cost control directly affects the financial stability of construction organizations.

### **Conclusion**

The results of this study indicate that the integration of Activity-Based Costing (ABC) and Target Costing (TC) constitutes an effective tool for strategic cost management. The use of ABC as an informational foundation for TC enables economic organizations to achieve target cost levels without compromising product quality.

In the context of the Republic of Uzbekistan, the implementation of an integrated ABC–TC system can contribute to improving enterprise efficiency, enhancing managerial decision-making, and strengthening positions in both domestic and international markets.

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## **INTEGRATION OF DIGITAL TOOLS IN AUDITING PRACTICE: THE IMPACT OF INTERNATIONAL STANDARDS ON THE QUALITY OF AUDIT OPINIONS — THE CASE OF UZBEKISTAN**

**Abstract:** *The article examines the impact of digital tools on the quality of audit reports under international auditing standards, using Uzbekistan as a case study. It considers technologies such as artificial intelligence, big data analytics, and cloud platforms, and their role in improving audit efficiency, accuracy, and transparency. The implementation of these tools in the public and private sectors is analyzed, and recommendations are made for their adaptation to enhance audit quality and financial transparency.*

**Keywords:** *digitalization, auditing practice, artificial intelligence, international auditing standards, Uzbekistan, audit quality.*

### **Introduction**

Contemporary digital transformation significantly affects professional practices in accounting and auditing. The integration of advanced technologies into workflows enables specialists not only to increase operational efficiency but also to improve the accuracy of managerial and financial decisions. In this context, digital transformation refers to the systematic implementation of innovative tools aimed at optimizing processes, enhancing organizational competitiveness, and improving the quality of analytical work.

In accounting and auditing practice, this is manifested through the use of cloud services, big data processing methods, artificial intelligence (AI) technologies, and blockchain solutions. These tools facilitate the automation of routine operations, reduce time expenditures, and minimize the likelihood of errors, while ensuring the real-time relevance of financial information.

The application of data analytics and AI algorithms has become a key factor in improving audit quality. Modern tools allow auditors to efficiently process large volumes of information, identify patterns and anomalies, and formulate recommendations based on objective data. The use of AI additionally supports more accurate detection of potential fraudulent schemes and enhances risk management effectiveness, contributing to the transparency and reliability of audit conclusions.

Digitalization requires professionals to expand their competencies in information technology, data analytics, and cybersecurity. The automation of routine tasks allows auditors to focus on strategic planning, risk assessment, and client advisory services, thereby increasing the value of professional services. At the same time, there is a growing demand for continuous professional development

and the protection of confidential information, given the high reliance on digital platforms.

The integration of artificial intelligence (AI) opens new opportunities to enhance the accuracy, speed, and analytical depth of audit procedures; however, it also raises ethical and legal challenges related to data confidentiality and the need for personnel training. For effective technology adoption, organizations must establish internal ethics standards, information protection mechanisms, and professional development programs for auditors.

Thus, digital transformation and AI implementation in auditing not only optimize processes and improve work quality but also create the need for comprehensive risk management, adaptation of professional skills, and adherence to ethical standards.

### **Literature Review**

In recent years, digitalization and the integration of artificial intelligence (AI) technologies have emerged as key drivers of the transformation of the accounting profession. Contemporary studies indicate that the automation of routine operations, combined with AI implementation, significantly alters the functional responsibilities of accountants, shifting the focus from traditional bookkeeping to analytical and strategic activities that require critical data interpretation. In particular, Ajayi-Nifise et al. (2024) note that AI usage enhances the accuracy of financial information processing, accelerates workflow execution, and improves corporate governance, while simultaneously highlighting the need to develop appropriate approaches to ethical issues and data security. Despite the high relevance of these predictive insights, the study lacks an empirical basis, limiting the possibility of conducting a quantitative analysis of AI's impact on practical accounting activities [2].

In their literature review on the digitalization of accounting in the public sector, Agostino, Saliterer, and Steccolini (2022) identify three central areas of transformation: automation of data processing, integration of specialized information systems, and the use of digital tools to support managerial decision-making. The researchers emphasize that digitalization contributes to increased transparency of procedures, optimization of operational efficiency, and enhanced accountability of public-sector processes. At the same time, the implementation of digital technologies is associated with several challenges, including organizational barriers, legal regulations, and limitations in human resources. A limitation of the authors' analysis is its exclusive focus on the public sector, which reduces the applicability of the findings to commercial organizations [3].

Empirical evidence of the positive impact of digitalization on the quality of accounting information is provided in the study by Akhmetova et al. (2019), which focuses on the digitalization of thermal energy accounting. The authors demonstrate that the implementation of automated data collection and processing systems enhances the reliability of measurements and optimizes resource supply management. Despite the industry-specific context of the study, the results indicate a general trend: digital technologies can significantly improve the accuracy and

reliability of accounting data, which is directly relevant to financial accounting practice [4].

A synthesis of the existing literature allows for several key practical conclusions for accounting activities:

Automation and the application of artificial intelligence technologies transform the professional functions of accountants, reducing the share of routine operations and expanding opportunities for analytical work.

Digitalization improves the quality and reliability of accounting data, which is critical for the preparation of financial statements and for supporting managerial decision-making.

The implementation of digital technologies enhances the transparency and accountability of processes, which is particularly relevant for the public sector, but also holds significant potential for corporate governance.

At the same time, the literature review reveals several existing research gaps. In particular, there is a lack of empirical studies that quantitatively assess the impact of artificial intelligence on the productivity and accuracy of accounting operations, as well as on the quality of managerial decision-making. Moreover, issues related to ethics, information security, and comparative analyses of digitalization implementation in the public and private sectors remain unresolved. These areas highlight promising directions for further research on the automation and integration of AI in accounting practices.

### **Research Methods**

Studies focused on the automation of audit procedures and the digitalization of accounting primarily employ literature reviews and conceptual analyses, which allow for the systematic organization of existing approaches, standards, and technological solutions (Agostino et al., 2022). At the same time, applied and technical studies are widely used to assess the impact of implementing digital systems on the accuracy and reliability of accounting data (Akhmetova et al., 2019). The combination of theoretical reviews and empirical research enables not only the description of current trends and approaches but also the evaluation of the practical consequences of digitalization, including the integration of modern technologies into auditing and management accounting practices [3,4].

Thus, existing studies demonstrate a wide range of methodological approaches—from conceptual and systematic literature reviews to applied engineering analyses—used to examine digitalization and automation in various accounting and auditing contexts.

### **The Impact of Artificial Intelligence on the Auditing Process**

Artificial intelligence (AI) has a significant impact on traditional auditing procedures, enhancing their efficiency, accuracy, and analytical depth. The primary transformative tools are machine learning algorithms, which can process large volumes of data much faster than humans and detect errors, anomalies, and inconsistencies in financial information.

The automation of repetitive tasks, such as data entry, account reconciliation, and document compliance checks, allows auditors to focus on strategic and

analytical aspects of their work. AI applications enable deeper interpretation of financial information, identification of hidden risks, and forecasting of potential threats, thereby improving the quality and reliability of audit conclusions.

Moreover, AI technologies support predictive analysis based on historical data, help identify anomalous transactions and potential cases of fraud, and provide a more comprehensive and accurate representation of an organization's financial position.

### **Diffusion of Innovations Theory and the Implementation of Artificial Intelligence**

Everett Rogers' Diffusion of Innovations theory provides a theoretical foundation for understanding how and at what pace new technologies are adopted by organizations and professionals. According to this framework, the innovation adoption process proceeds through five sequential stages: innovators, early adopters, early majority, late majority, and laggards.

Innovators are companies that adopt technologies first, willing to take risks and possessing the resources necessary to integrate AI into auditing processes. Early adopters embrace innovations after the successful experience of innovators has been demonstrated, serving as examples for the rest of the sector. The early and late majority adopt technologies once their effectiveness has been proven, while laggards implement innovations last, often constrained by limited resources or resistant to organizational change [5].

Identifying an organization's position on the technology adoption curve allows for the development of effective AI implementation strategies, the anticipation of potential barriers, and more systematic management of the digital transformation process in accounting.

### **International Experience and Its Application in Uzbekistan**

Global practices in the implementation of artificial intelligence (AI) in auditing demonstrate that countries with developed financial sectors and strict accounting standards, such as the United States, the United Kingdom, Germany, and Indonesia, have achieved significant improvements in the accuracy, efficiency, and transparency of audit procedures. In particular, major international auditing firms use AI for automated transaction testing, risk analysis, and predictive modeling, which reduces audit time and enhances the reliability of conclusions [6].

For Uzbekistan, these international practices can serve as a guideline for modernizing the auditing sector. The adoption of best practices may include the following directions:

Adapting AI technologies to the local context — automating tasks such as transaction testing, account reconciliation, and risk assessment while considering the specifics of Uzbek legislation and national financial reporting standards.

Using cloud platforms and big data analytics to process financial information in real time, improve reporting accuracy, and reduce the likelihood of human error.

Training and retraining auditors with a focus on working with digital tools, adhering to ethical standards, and ensuring cybersecurity.



Developing national guidelines and standards for AI application in auditing based on international experience, which will help regulate technology use, minimize risks of bias and fraud, and enhance audit quality.

Thus, integrating international experience in AI implementation into Uzbekistan's auditing practice can improve the quality of audit services, facilitate the adoption of advanced technologies, and contribute to the development of a sustainable financial transparency system that aligns with global standards.

### **Conclusion**

Digital transformation and the implementation of artificial intelligence (AI) are fundamentally changing accounting and auditing practices, enhancing efficiency, accuracy, and the strategic value of audits. The adoption of automation and analytical technologies enables auditors to focus on high-value tasks, risk identification, and forecasting, while simultaneously reducing the likelihood of errors and increasing process transparency.

Presidential Decree of the Republic of Uzbekistan No. UP-252 dated December 18, 2025 (effective from 2026), "On Additional Measures for the Further Improvement of State Audit and Financial Control", sets strategic directions for the digitalization of state auditing, including the introduction of AI technologies and big data processing methods. [1]

The successful implementation of artificial intelligence (AI) requires a combination of ethical standards, cybersecurity measures, and personnel training programs. The Diffusion of Innovations theory helps to understand the dynamics of technology adoption and to plan strategies for maximizing the benefits of digital transformation in accounting. Examples of companies in Indonesia and other countries demonstrate the practical significance of AI in auditing, highlighting the prospects for the global application of technologies to improve the quality and reliability of financial reporting.

Applying international experience in Uzbekistan will enable the creation of a modern, efficient, and transparent auditing system capable of meeting global standards and supporting the sustainable development of the country's financial sector.

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## **COVID-19 НИНГ КЛИНИК ТАВСИФИ ВА УНИНГ КЕЧИШИНИ БЕЛГИЛОВЧИ ПРЕДИКТОРЛАР**

***Аннотация.** COVID-19 нинг симптомсиз ва енгил шаклларида беморларга нисбатан, амбулатория кузатуви ҳамда эпидемиологик нуқтаи назардан тиббий тадбирлар мажмуаси йўлга қўйилиши кифоя қилса, оғир ҳолатларда нафақат стационар шароитида даволаниш, балки интенсив терапия, хос реаниматологик ёрдам, сунъий нафас олдириш каби муолажалар мажмуасини таъкиллаштириш ва қўллаш талаб этилади.*

***Калит сўзлар:** Коронавирус, клиник, иммуногенлик, эпидемиология, профилактика.*

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## **CLINICAL FEATURES OF COVID-19 AND PREDICTORS OF DISEASE PROGRESSION**

***Abstract.** In asymptomatic and mild forms of COVID-19, outpatient monitoring and a set of medical measures from an epidemiological perspective are sufficient. In severe cases, not only inpatient treatment but also organization of intensive care procedures, specialized resuscitation support, and mechanical ventilation are required.*

***Keywords:** coronavirus, clinical, immunogenicity, epidemiology, prevention.*

Not only in Uzbekistan, but also worldwide, including highly developed countries, the traditional capacities for providing intensive care faced a difficult situation and experienced serious challenges in the face of the unprecedented surge of patients requiring such care during the COVID-19 pandemic.

Therefore, it is of critical importance to classify patients according to the severity of the disease, identify symptoms characterizing the clinical course, determine factors indicating deterioration, and, in particular, identify new predictors of severe disease. Equally important is to conduct a thorough analysis, clarify the essence (mechanisms) of these processes, influence them to a certain extent, implement preventive measures, eliminate these factors as much as possible, select appropriate therapeutic interventions, properly organize intensive and critical care, and successfully implement these measures in order to reduce the frequency of adverse outcomes of the disease.

According to the analysis, although the proportion of men in the population of Samarkand region (44.9%) was lower than that of women (55.1%), the higher share of men was observed not only among individuals infected with COVID-19 but also among patients admitted to the ICU. This indicates that male patients belong to a risk group both in terms of susceptibility to infection and in terms of the severity of the clinical course of the disease.

It should be noted that this sex-related difference was even more pronounced among patients admitted to the ICU compared to the overall gender composition of individuals infected with COVID-19. Specifically, among all COVID-19 patients, the proportion of men was 53.5% compared to 46.5% for women (1.1 times higher), whereas among COVID-19 patients treated in intensive care and critical care units, the proportion of men was 56.5% compared to 43.5% for women (1.3 times higher).

Per 1,000 COVID-19 patients of the respective sex, the intensive care admission rate was  $306.7 \pm 12.6$  for men and  $271.0 \pm 13.0$  for women ( $p < 0.05$ ). Analyses conducted to assess risk factors also showed that COVID-19 progressed more severely in men than in women. The absolute risk of ICU admission was 0.31 for men and 0.27 for women, with a relative risk of 1.15. Thus, according to our study, male sex increases the risk of ICU admission among COVID-19 patients by 11.5%.

Since patients in severe and critical condition require treatment in the ICU, it is appropriate to separately analyze the overall characteristics of these patients based on demographic, clinical, laboratory, and instrumental data to identify predictors of severe courses of SARS-CoV-2-related conditions, including pneumonia, and to assess the prognostic value of the obtained indicators.

Analysis of COVID-19 patients hospitalized in the ICU according to premorbid conditions showed an average body mass index of  $29.3 \text{ kg/m}^2$ . Most of these patients had comorbidities such as arterial hypertension ( $43.1 \pm 1.8\%$ ), ischemic heart disease ( $29.0 \pm 1.7\%$ ), and diabetes mellitus ( $28.2 \pm 1.7\%$ ). A portion of patients had a history of chronic gastrointestinal diseases ( $15.3 \pm 1.3\%$ ), cerebrovascular disorders ( $12.6 \pm 1.2\%$ ), pulmonary diseases ( $10.0 \pm 1.1\%$ ), and chronic liver and biliary tract diseases ( $7.0 \pm 0.9\%$ ).

According to our study, the frequency of kidney diseases, oncological pathology, tuberculosis, and alcohol abuse among COVID-19 patients did not differ significantly from the average statistical indicators in the population over

30 years of age. Overall, 595 patients ( $81.8 \pm 1.4\%$ ) had various premorbid pathological conditions, including 266 ( $36.6 \pm 1.8\%$ ) with a single pathology and 329 ( $45.2 \pm 1.8\%$ ) with two or more pathologies. Of these, 510 patients ( $70.1 \pm 1.7\%$ ) were registered at local family polyclinics for premorbid conditions.

Thus, 85 patients ( $11.7 \pm 1.2\%$ ) had premorbid pathological conditions but were not registered at medical institutions. Among ICU patients, 132 individuals ( $18.2 \pm 1.4\%$ ) did not have clearly expressed premorbid pathology.

Instrumental examination results of COVID-19 patients hospitalized in the intensive care and critical care units (Samarkand region, 2020, N=727) indicate that chest radiography and computed tomography play a key role in diagnosis and dynamic assessment. The data show that all COVID-19 patients admitted to the ICU experienced respiratory failure, manifested by decreased blood oxygen saturation, with a median SpO<sub>2</sub> of 87.0% (range from 81.0% to 90.0%). Chest computed tomography in the majority of patients showed severe lung tissue damage: 42.8% of patients had grade 3 damage, and 37.6% had grade 4 damage. Additionally, analysis of radiological materials revealed another important aspect: in 133 patients with initially negative PCR results for SARS-CoV-2, signs of pneumonia were detected on chest imaging, and repeat PCR testing in all these cases yielded positive results. According to echocardiography (EchoCG) data, conducted as part of the primary screening of patients, a decrease in left ventricular ejection fraction (LVEF) (55.0%) and an increase in pulmonary artery systolic pressure (PAP) (37 mm Hg) were observed.

Among ICU patients, 417 individuals ( $57.4 \pm 1.8\%$ ) remained in the prone position for more than 17 hours per day, and 167 patients ( $23.0 \pm 1.6\%$ ) received high-flow oxygen therapy.

Additionally, 143 patients ( $19.6 \pm 2.2\%$ ) underwent respiratory support using mechanical ventilation. Among the 33 patients ( $23.1 \pm 3.5\%$ ) who received mechanical ventilation, the use of muscle relaxants was required.

The initial condition at ICU admission of patients who required mechanical ventilation—those without independent respiratory activity (143 patients)—was compared with patients who did not require it, i.e., those with preserved independent respiratory activity (584 patients). Significant differences were found in nearly all compared indicators between these groups.

In the group receiving mechanical ventilation, the average age (66 vs. 53 years), body mass index (29.2 vs. 27.8 kg/m<sup>2</sup>), and proportion of men (68.5% vs. 53.6%) were higher compared to the non-ventilated group. Among patients who underwent mechanical ventilation, the prevalence of comorbidities was also significantly higher than in the comparison group: ischemic heart disease (33.6% vs. 27.9%), arterial hypertension (57.3% vs. 39.6%), chronic liver and biliary tract diseases (9.1% vs. 6.5%), diabetes mellitus (58.0% vs. 20.9%), chronic lung diseases (14.7% vs. 8.9%), gastrointestinal diseases (19.6% vs. 14.2%), cerebrovascular diseases (18.2% vs. 11.3%), and obesity (8.4% vs. 3.4%).

In the group of patients receiving respiratory support via mechanical ventilation, pronounced lymphopenia ( $0.7 \times 10^9/L$ ) and a high neutrophil-to-

lymphocyte ratio (8.5) were observed. Upon ICU admission, patients in the mechanical ventilation group had significantly elevated D-dimer levels (0.66 µg/mL) and C-reactive protein (105 mg/L), while oxygen saturation measured by pulse oximetry was low (83.0%). These patients were placed in the prone position more frequently and for longer durations to improve oxygenation.

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## **IMMUNOPATHOGENETIC MECHANISMS AND LABORATORY AND EQUIPMENTAL INDICATORS CHARACTERIZING THE COURSE OF COVID-19**

**Abstract:** COVID-19 infection is caused by RNA-containing viruses belonging to the Coronaviridae family. These viruses have a diameter of approximately 80-220 nm, and their outer shell is covered with villi. These villi play an important role in the binding of the virus to cellular receptors and its entry into the cell. Coronaviruses multiply mainly in the cytoplasm of epithelial cells of the upper respiratory tract, causing respiratory diseases of varying degrees. After the virus enters the cell, the process of forming new virions begins within approximately 4-6 hours. Studies show that coronaviruses are not resistant to environmental influences.

**Keywords:** coronavirus, COVID-19, immunopathogenesis, laboratory diagnostics, epidemiology, prevention.

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## **COVID-19 NING KECHISHINI TAVSIFLOVCHI IMMUNOPATOGENETIK MEKANIZMLAR VA LABORATOR- USKUNAVIY KO'RSATKICHLAR**

**Annotatsiya.** COVID-19 infeksiyasi Coronaviridae oilasiga mansub bo'lgan, RNK saqlovchi viruslar tomonidan keltirib chiqariladi. Ushbu viruslar diametri taxminan 80–220 nm bo'lib, tashqi qobig'i vorsinkalar bilan qoplangan. Ana shu vorsinkalar virusning hujayra retseptorlari bilan bog'lanishi va hujayra ichiga kirishida muhim ahamiyatga ega. Koronaviruslar asosan yuqori nafas yo'llari epiteliy hujayralarining sitoplazmasida ko'payib, turli darajadagi respirator kasalliklarni rivojlantiradi. Virus hujayra ichiga kirgandan so'ng taxminan 4–6 soat davomida yangi virionlar hosil bo'lish jarayoni boshlanadi. Tadqiqotlar shuni ko'rsatadiki, koronaviruslar tashqi muhit ta'sirlariga nisbatan barqaror emas.

**Kalit so'zlar:** koronavirus, COVID-19, immunopatogenez, laborator diagnostika, epidemiologiya, profilaktika.

The use of the PCR method is recommended for the specific laboratory diagnosis of COVID-19. The specific diagnostic method is applied to individuals with clinical and epidemiological indications and to those who have been in contact with them. In addition, some authors recommend performing PCR analyses aimed at detecting the causative agents of respiratory infections for differential diagnosis.

For analysis, biological samples include swabs taken from the nose, nasopharynx and/or oropharynx, bronchial washings obtained by fibrobronchoscopy, (endo)tracheal and nasopharyngeal aspirates, sputum, and lung biopsy or autopsy materials. Swabs taken from the nose, nasopharynx and/or oropharynx are the main biomaterials. All these samples should be considered potentially infectious, and when working with them it is recommended to comply with the safety requirements for working with microorganisms of pathogenicity groups I–II.

Currently, the global healthcare system continues to undergo serious challenges due to COVID-19. Therefore, signs determining the severity of patients' conditions are being actively analyzed for patient triage, and various prognostic models are being proposed. The large flow of COVID-19 patients and the increasing need for hospitalization require careful evaluation of laboratory results. According to many researchers, the assessment of patients' objective and subjective conditions plays an important role in determining patient management tactics. In particular, changes in biochemical indicators depending on the severity of the patient's condition reflect the degree of lung damage.

From this point of view, a group of scientists investigated the biochemical parameters of blood depending on the severity of patients' conditions during the acute phase of COVID-19. In particular, ferritin, CRP, glucose, urea, creatinine, total protein, albumin, alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, and lactate dehydrogenase in blood serum were analyzed. The studies were carried out on the blood serum of 138 COVID-19 patients hospitalized in an infectious diseases hospital. According to the severity of the disease course, the patients were divided into three groups: patients with a moderate form of COVID-19, a severe form, and cases that resulted in death.

In accordance with the worsening of the patients' condition, a significant progressive increase in the concentrations of ferritin and CRP was detected. A statistically significant increase in glucose levels was recorded in patients of groups 2 and 3. The maximum increase in urea and creatinine concentrations was identified in patients in whom lethality was observed. A slight decrease in total protein levels was observed in patients of groups 2 and 3. In all examined patients, progressive hypoalbuminemia corresponding to the severity of the condition was present. Other biochemical indicators also changed compared to normal levels in accordance with the severity of the patients' condition, which indicates that the acute phase of the disease is accompanied by inflammation and pathological processes in many organs.

Many studies show the appropriateness of determining erythrocytes, hematocrit, lymphocytes, platelets, and the leukocyte formula in the complete (clinical) blood analysis. Changes in biochemical blood analysis (urea, creatinine, electrolytes, liver enzymes, bilirubin, glucose, albumin) may indicate the presence of organ dysfunction, comorbid diseases, their decompensation, and the development of complications. They have certain prognostic significance and have been found to help in the selection of therapeutic agents, as well as in determining their dosage and regimen. There is evidence that the level of C-reactive protein (CRP) in blood serum can serve as a basis for assessing the severity of the disease course, the extent of inflammatory infiltration, and for the presumptive presence of pneumonia. In patients with signs of acute respiratory failure (ARF) (according to pulse oximetry data, SpO<sub>2</sub> less than 90%), it is considered appropriate to determine PaO<sub>2</sub>, PaCO<sub>2</sub>, pH, bicarbonates, and lactate levels.

The WHO recommends that patients with signs of ARF undergo a coagulogram with determination of prothrombin time, international normalized ratio (INR), and activated partial thromboplastin time. In addition, computed tomography of the lungs (or, if unavailable, chest radiography) is recommended for all patients with suspected pneumonia. Electrocardiography (ECG) is recommended for all patients. This examination makes it possible to timely detect rhythm disturbances and acute coronary syndrome, as well as to assess the cardiotoxicity of antibacterial drugs.

Many studies confirm that in diabetes mellitus, coronavirus infection is dangerous due to the high probability of developing prolonged pneumonia, respiratory failure, diabetic nephropathy, and severe myopathy. A number of authors consider diabetes mellitus as a risk factor leading to death in coronavirus infection. At the same time, the presence of risk factors aggravates the course of the infectious process and worsens the patient's condition.

Nosirova M.P. and co-authors studied the characteristics of the development of coronavirus infection in individuals with diabetes mellitus at the level of primary health care. During the observation period, 940 people from the total population attached to a primary health care institution became ill with coronavirus infection, including 59 (6.3%) among those registered with diabetes mellitus. Among COVID-19 patients, the majority had a severe course (47.1%), as well as a moderate course (38.2%), a mild form (11.4%), and in 2 cases (3.3%) an asymptomatic course was observed. The severity of the disease depends on health problems and the presence of comorbid diseases.

**Conclusion.** Thus, the data presented in the literature indicate that the acute phase of COVID-19 is characterized by specific immunological changes and pronounced signs of inflammation, and biochemical indicators in the blood change according to the severity of the disease. There is a correlational relationship between the abnormal changes in biochemical parameters (CRP, ferritin, glucose, urea, creatinine, albumin, aspartate aminotransferase), the degree of lung damage, and the severity of the patient's condition. Therefore,

monitoring these indicators is of significant importance in preventing the development of complications. At the same time, the data obtained so far cannot fully explain the immunopathological processes specific to COVID-19, indicating the need for further comprehensive scientific research in this area.

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## **KREATIV PEDAGOGIKA ASOSIDA TA'LIM SAMARADORLIGINI OSHIRISH**

**Annotatsiya:** Mazkur ilmiy maqolada kreativ pedagogika asosida ta'lim samaradorligini oshirishning nazariy-metodologik asoslari, didaktik mexanizmlari hamda pedagogik samaradorlik ko'rsatkichlari tahlil qilinadi. Tadqiqot zamonaviy ta'lim transformatsiyasi sharoitida kreativ fikrlash, innovatsion pedagogik metodlar hamda talabalarning mustaqil bilim olish faoliyatini rivojlantirish masalalariga bag'ishlangan. Maqolada kreativ pedagogika konsepsiyasining shakllanishi, uning konstruktivizm, kompetensiyaviy yondashuv va shaxsga yo'naltirilgan ta'lim nazariyalari bilan integratsiyasi ko'rib chiqiladi. Shuningdek, kreativ pedagogika asosida tashkil etilgan o'quv jarayonining ta'lim sifati, talabalarning tanqidiy fikrlashi, muammoli vaziyatlarni hal qilish qobiliyati hamda innovatsion tafakkurini rivojlantirishdagi ahamiyati ilmiy asosda yoritiladi. Tadqiqot natijalari kreativ pedagogika texnologiyalarini o'quv jarayoniga tizimli joriy etish ta'lim samaradorligini sezilarli darajada oshirishini ko'rsatadi.

**Kalit so'zlar:** kreativ pedagogika, innovatsion ta'lim, kreativ fikrlash, pedagogik texnologiyalar, kompetensiyaviy yondashuv, ta'lim samaradorligi.

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## **INCREASING EDUCATIONAL EFFICIENCY ON THE BASIS OF CREATIVE PEDAGOGY**

**Abstract:** This article examines the theoretical and methodological foundations of improving educational effectiveness through creative pedagogy. The study analyzes the role of innovative teaching methods, creative thinking development, and student-centered learning in modern educational environments. The integration of creative pedagogy with constructivist learning theory and competency-based education is explored, highlighting its potential to enhance critical thinking, problem-solving abilities, and innovative thinking among students. The findings indicate that systematic implementation of creative pedagogical technologies significantly improves learning outcomes and educational quality.

**Keywords:** creative pedagogy, innovative education, creative thinking, teaching technologies, competency-based learning, educational effectiveness.

Kirish.

XXI asrda ta'lim tizimining rivojlanishi global ijtimoiy-iqtisodiy transformatsiyalar, raqamli texnologiyalar taraqqiyoti hamda bilimlar iqtisodiyotining shakllanishi bilan bevosita bog'liq bo'lib, bunday sharoitda ta'lim jarayonining asosiy vazifasi faqat bilim berish emas, balki talabalarda kreativ tafakkur, tanqidiy fikrlash, muammolarni innovatsion hal qilish qobiliyati va mustaqil o'rganish kompetensiyalarini shakllantirishdan iboratdir, chunki zamonaviy mehnat bozori an'anaviy bilimlarga ega mutaxassisdan ko'ra yangi g'oyalarni ishlab chiqish, kompleks vaziyatlarda moslashuvchan qarorlar qabul qilish hamda turli sohalar kesishmasida innovatsion faoliyat yuritish qobiliyatiga ega shaxslarni talab qilmoqda; shu sababli pedagogika fanida kreativ pedagogika konsepsiyasi ta'lim samaradorligini oshirishning muhim nazariy va amaliy yo'nalishlaridan biri sifatida shakllanib, u talabalarning ijodiy faoliyatini rivojlantirish, o'quv jarayonini interaktiv va muammoli vaziyatlarga asoslangan holda tashkil etish hamda bilimlarni amaliy faoliyat bilan integratsiyalashni nazarda tutadi, mazkur konsepsiya konstruktivistik ta'lim nazariyasi, shaxsga yo'naltirilgan pedagogika va kompetensiyaviy yondashuv bilan uzviy bog'liq bo'lib, ta'lim jarayonida talabalarni passiv bilim oluvchilardan faol bilim yaratuvchilarga aylantirishga xizmat qiladi, shu nuqtai nazardan kreativ pedagogika o'qituvchining innovatsion metodlardan foydalanish kompetensiyasini, o'quv muhitining erkin va motivatsion xarakterini hamda o'quv jarayonining interfaol va ijodiy faoliyatga yo'naltirilganligini ta'minlaydi, natijada ta'lim sifati va samaradorligi sezilarli darajada oshadi.

Materiallar va metod.

Mazkur tadqiqot kreativ pedagogika asosida ta'lim samaradorligini oshirish jarayonining nazariy va amaliy jihatlarini o'rganishga qaratilgan bo'lib, unda pedagogik kuzatuv, eksperimental tadqiqot, taqqoslash, statistik tahlil, pedagogik diagnostika hamda kontent-tahlil metodlaridan kompleks foydalanildi, tadqiqot jarayonida oliy ta'lim muassasalarida tahsil olayotgan talabalar ishtirokida eksperimental o'quv modeli ishlab chiqildi hamda kreativ pedagogika asosida tashkil etilgan o'quv jarayoni samaradorligi an'anaviy pedagogik yondashuv bilan solishtirildi, tajriba ikki bosqichda amalga oshirildi: birinchi bosqichda kreativ pedagogika konsepsiyasining nazariy asoslari o'rganildi, kreativ fikrlashni rivojlantirishga qaratilgan pedagogik texnologiyalar tahlil qilindi hamda kreativ o'quv muhitini shakllantirishga xizmat qiluvchi metodlar tizimi ishlab chiqildi, ikkinchi bosqichda esa tajriba va nazorat guruhlarini tashkil etilib, tajriba guruhida kreativ pedagogika texnologiyalariga asoslangan muammoli ta'lim, loyiha asosida o'qitish, interaktiv muhokama, brainstorming (g'oyalar generatsiyasi), dizayn fikrlash hamda reflektiv tahlil metodlari qo'llanildi, tadqiqot jarayonida talabalarning kreativ tafakkur darajasi, muammoli vaziyatlarni hal qilish qobiliyati, mustaqil bilim olish kompetensiyasi hamda o'quv motivatsiyasi maxsus diagnostik testlar, so'rovnomalar va baholash mezonlari orqali aniqlanib, olingan natijalar



matematik-statistik usullar yordamida qayta ishlanib tahlil qilindi, tadqiqot metodologiyasi konstruktivistik ta'lim nazariyasi, kompetensiyaviy yondashuv hamda kreativ pedagogika tamoyillariga asoslanib ishlab chiqildi va natijada kreativ pedagogik texnologiyalarni o'quv jarayoniga tizimli integratsiya qilishning samarali pedagogik modeli taklif etildi.

Natija.

Tadqiqot jarayonida kreativ pedagogika asosida tashkil etilgan o'quv faoliyatining ta'lim samaradorligiga ta'sirini aniqlash maqsadida tajriba va nazorat guruhleri o'rtasida taqqoslama tahlil o'tkazildi hamda natijalar talabalarning kreativ tafakkuri, muammoli vaziyatlarni hal qilish qobiliyati, mustaqil bilim olish faolligi va o'quv motivatsiyasi ko'rsatkichlari asosida baholandi, tajriba boshida o'tkazilgan diagnostik tahlil natijalariga ko'ra talabalar kreativ fikrlash darajasi o'rtacha 52–56 foizni tashkil etgani kuzatildi, tajriba jarayonida esa kreativ pedagogika texnologiyalarini qo'llash natijasida ushbu ko'rsatkich tajriba guruhida 78–84 foizgacha oshgani aniqlanib, nazorat guruhida esa 60–63 foiz darajasida qolganligi qayd etildi, shuningdek muammoli vaziyatlarni tahlil qilish va innovatsion yechimlar ishlab chiqish kompetensiyasi tajriba guruhida o'rtacha 30 foizga yuqorilangani kuzatildi, bu esa kreativ pedagogika asosida tashkil etilgan o'quv jarayoni talabalarning mustaqil fikrlashini sezilarli darajada faollashtirishini ko'rsatadi, tajriba davomida loyiha asosida o'qitish, brainstorming metodlari hamda dizayn fikrlash texnologiyalaridan foydalanish talabalarning jamoaviy hamkorlik ko'nikmalarini rivojlantirib, o'quv jarayonidagi faol ishtirok darajasini 25–35 foizga oshirganligi aniqlandi, o'quv motivatsiyasining oshishi esa talabalarning mustaqil tadqiqot faoliyatiga bo'lgan qiziqishini kuchaytirib, ularning ilmiy izlanishlarga jalb etilish ko'rsatkichini ham sezilarli darajada ko'paytirganligi bilan izohlanadi, umumiy hisobda o'tkazilgan pedagogik eksperiment natijalari kreativ pedagogika texnologiyalarining o'quv jarayoniga tizimli joriy etilishi ta'lim sifatini oshirish, talabalarning kreativ salohiyatini rivojlantirish hamda ularning innovatsion fikrlash kompetensiyalarini shakllantirishda yuqori samaradorlikka ega ekanligini ilmiy jihatdan tasdiqladi.

Muhokama.

Olingan tadqiqot natijalari kreativ pedagogika konsepsiyasi zamonaviy ta'lim tizimida o'quv jarayonini transformatsiya qilishda muhim metodologik asos bo'lib xizmat qilishini ko'rsatadi, chunki kreativ pedagogika talabalarning passiv bilim oluvchi sifatidagi rolini faol bilim yaratuvchi subyektga aylantiradi va o'quv jarayonini muammoli vaziyatlar, interaktiv muhokamalar hamda innovatsion faoliyat asosida tashkil etishga imkon beradi, bu esa konstruktivistik ta'lim nazariyasining asosiy tamoyillari bilan hamohang bo'lib, bilimning tayyor shaklda berilishidan ko'ra uni mustaqil ravishda yaratish jarayonini ustuvor deb hisoblaydi; tadqiqot davomida kuzatilgan natijalar kreativ pedagogika metodlaridan foydalanish talabalarning kreativ tafakkurini rivojlantirish bilan bir qatorda ularning analitik fikrlash, muammoli vaziyatlarni hal qilish va innovatsion g'oyalar ishlab chiqish qobiliyatini ham sezilarli

darajada oshirishini tasdiqladi, bu holat pedagogika fanidagi zamonaviy kompetensiyaviy yondashuv bilan ham mos keladi, chunki ushbu yondashuv ta'lim jarayonining asosiy maqsadini faqat bilim berish emas, balki talabalarning amaliy faoliyatda qo'llay oladigan kompetensiyalarini rivojlantirish deb belgilaydi; shuningdek tadqiqot natijalari kreativ pedagogika asosida tashkil etilgan o'quv muhitida talabalar o'rtasidagi hamkorlik, kommunikatsiya va jamoaviy faoliyat ko'nikmalari ham rivojlanishini ko'rsatdi, bu esa 21-asr ko'nikmalari sifatida e'tirof etilgan kreativlik, tanqidiy fikrlash, kommunikatsiya va hamkorlik (4K modeli) kompetensiyalarini shakllantirishga xizmat qiladi, natijada kreativ pedagogika nafaqat ta'lim jarayonining samaradorligini oshirish, balki talabalarni innovatsion fikrlashga yo'naltirish hamda ularni zamonaviy bilimlar iqtisodiyoti sharoitida raqobatbardosh mutaxassis sifatida tayyorlashda muhim pedagogik vosita sifatida namoyon bo'ladi.

Xulosa.

Tadqiqot natijalari kreativ pedagogika asosida tashkil etilgan ta'lim jarayoni talabalarning o'quv faoliyatini faollashtirish, ularning kreativ tafakkurini rivojlantirish hamda ta'lim samaradorligini oshirishda muhim pedagogik omil ekanligini ko'rsatdi, chunki kreativ pedagogika o'quv jarayonini an'anaviy bilim uzatish modelidan farqli ravishda muammoli vaziyatlar, innovatsion metodlar va interaktiv faoliyat asosida tashkil etishga imkon beradi, bu esa talabalarni mustaqil fikrlash, tahlil qilish hamda yangi g'oyalar yaratishga yo'naltiradi; tadqiqot davomida o'tkazilgan pedagogik eksperiment natijalari kreativ pedagogika texnologiyalaridan foydalanish talabalarning kreativ fikrlash darajasini sezilarli darajada oshirishini, ularning muammoli vaziyatlarni hal qilish kompetensiyasi, jamoaviy hamkorlik ko'nikmalari hamda o'quv motivatsiyasini rivojlantirishini tasdiqladi, shuningdek kreativ pedagogika asosida tashkil etilgan o'quv muhitida talabalarning innovatsion faoliyatga bo'lgan qiziqishi ortib, ularning ilmiy izlanishlarga jalb etilish darajasi ham yuqorilashi kuzatildi; mazkur natijalar kreativ pedagogika metodlarini oliy ta'lim jarayoniga tizimli ravishda joriy etish zarurligini ko'rsatadi, chunki bu yondashuv ta'lim sifatini oshirish bilan birga talabalarning zamonaviy mehnat bozori talablariga mos keladigan kreativ, innovatsion va kompetent mutaxassis sifatida shakllanishiga xizmat qiladi, shu nuqtai nazardan kreativ pedagogika ta'lim tizimini modernizatsiya qilish, pedagogik innovatsiyalarni rivojlantirish hamda talabalarni zamonaviy bilimlar iqtisodiyoti sharoitida muvaffaqiyatli faoliyat yuritishga tayyorlashda muhim ilmiy-amaliy ahamiyatga ega hisoblanadi.

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**METHODOLOGY FOR DEVELOPING THE COMMUNICATIVE AND  
ETHICAL COMPETENCIES OF STUDENTS IN TEACHING  
PALLIATIVE ONCOLOGY (A LITERATURE REVIEW)**

**Abstract:** This literature review is dedicated to the methodology for developing the communicative and ethical competencies of medical students during the teaching of palliative oncology. The analysis was conducted based on 30 international and regional sources published between 2020 and 2025. According to the research findings, communication skills training, role-playing, simulation-based learning, and reflective practice stand out as the most effective methodological approaches. Ethical decision-making, respect for patient rights, and cultural competence are considered essential components of modern palliative education.

**Keywords:** palliative care, oncology education, communicative competence, ethical competence, medical education methodology, simulation-based training, reflective practice.

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**PALLIATIV ONKOLOGIYA FANLARINI O'QITISH JARAYONIDA  
TALABALARNING KOMMUNIKATIV VA AXLOQIY  
KOMPETENSIYALARINI RIVOJLANTIRISH METODIKASI  
(Adabiyotlar tahlili)**

**Annotatsiya:** Ushbu adabiyotlar tahlili palliativ onkologiya fanlarini o'qitish jarayonida tibbiyot talabalarining kommunikativ va axloqiy kompetensiyalarini rivojlantirish metodikasiga bag'ishlangan. 2020–2025 yillar oralig'ida chop etilgan 30 ta xalqaro va mintaqaviy manbalar asosida tahlil amalga oshirildi. Tadqiqot natijalariga ko'ra, muloqot ko'nikmalari treningi, rolli o'yinlar, simulyatsion ta'lim va refleksiv amaliyot eng samarali metodologik yondashuvlar sifatida ajralib turadi. Axloqiy qaror qabul qilish, bemorlar huquqlarini hurmat qilish va madaniy kompetentlik zamonaviy palliativ ta'limining muhim tarkibiy qismlari hisoblanadi.

**Kalit so'zlar:** palliativ yordam, onkologiya ta'limi, kommunikativ kompetensiya, axloqiy kompetensiya, tibbiy ta'lim metodikasi, simulyatsion o'qitish, refleksiv amaliyot.

## Kirish

Palliativ yordam — og'ir kasalliklar, jumladan onkologik kasalliklar bilan og'rigan bemorlarga va ularning oila a'zolariga ko'rsatiladigan insonparvarlik tibbiyotining muhim tarmog'idir. Jahon sog'liqni saqlash tashkiloti (JSST) ma'lumotlariga ko'ra, har yili dunyo bo'ylab 40 milliondan ortiq kishi palliativ yordamga muhtoj bo'ladi (WHO, 2020). Biroq tibbiyot ta'limida ushbu sohaga tegishli kommunikativ va axloqiy kompetensiyalar shakllantirishga alohida e'tibor qaratilmay kelmoqda.

So'nggi besh yil ichida palliativ ta'lim metodikasiga oid tadqiqotlar sezilarli darajada kengaydi. Ayniqsa, COVID-19 pandemiyasi davrida og'ir ahvolga tushib qolgan bemorlar bilan muloqot qilish zarurati tibbiyot ta'limida kommunikativ ko'nikmalar o'qitishining dolzarbligini yanada oshirdi (Hui et al., 2020; Ferrell et al., 2021). Shu bilan birga, Markaziy Osiyo, xususan O'zbekiston tibbiyot oliy ta'limida palliativ yordam fanini o'qitish metodikasi hamon rivojlanish bosqichida turganligini inkor etib bo'lmaydi.

Ushbu adabiyotlar tahlilining maqsadi — 2020–2025 yillar oralig'ida chop etilgan ilmiy manbalarga asoslanib, palliativ onkologiya o'qitishida qo'llaniladigan kommunikativ va axloqiy kompetensiyalar metodikasini tizimli ravishda tahlil qilish, xalqaro tajribani umumlashtirish va milliy tibbiy ta'lim tizimi uchun tavsiyalar ishlab chiqishdir.

## Adabiyotlarni tanlash metodologiyasi

Adabiyotlar tahlili uchun PubMed, Scopus, Web of Science, MEDLINE, Google Scholar va ResearchGate ma'lumotlar bazalarida qidiruv amalga oshirildi. Qidiruv so'zlari quyidagilarni o'z ichiga oldi: "palliative care education", "oncology communication skills", "medical ethics training", "end-of-life communication", "competency-based palliative education", shuningdek, ularning kombinatsiyalari.

Tanlov mezonlari: (1) 2020–2025 yillar oralig'ida chop etilgan asarlar; (2) tibbiyot ta'limi yoki tibbiyot xodimlari malakasini oshirishga oid tadqiqotlar; (3) kommunikativ yoki axloqiy kompetensiyalar haqida ma'lumot beruvchi manbalar; (4) ingliz, rus yoki o'zbek tillarida yozilgan asarlar. Jami 30 ta manba tanlandi va tahlilga kiritildi.

## Kommunikativ kompetensiyalar: nazariy asoslar

### Kommunikativ kompetensiyaning ta'rifi va tuzilishi

Tibbiy ta'limdagi kommunikativ kompetensiya tushunchasi ko'p qirrali bo'lib, u verbalva noverbal muloqot ko'nikmalarini, faol tinglay olish qobiliyatini, his-tuyg'ularni boshqarish malakasini va madaniy sezgirlikni o'z ichiga oladi (Kissane et al., 2022). Palliativ onkologiya kontekstida bu kompetensiya yanada murakkab ko'rinish kasb etadi, chunki shifokor og'ir diagnoz yoki yaqin vaqt ichida kutilayotgan o'lim xabari haqida muhokama qilishi zarur bo'ladi.

Back et al. (2020) tomonidan o'tkazilgan tizimli ko'rib chiqish shuni ko'rsatadiki, palliativ yordamda samarali muloqot uch asosiy komponentdan iborat: (1) axborot berish — aniq, tushunarli va insoniy usulda og'ir xabarni

yetkazish qobiliyati; (2) hamkorlik — bemor va uning oilasi bilan kelishilgan holda qaror qabul qilish; (3) qo'llab-quvvatlash — emotional jihatdan qiyin paytlarda huzur-halovatni ta'minlash.

Shuningdek, Wittenberg et al. (2021) tibbiyot talabalarida "doimiy muloqot modeli" (Continuum of Communication Model — CCM) ni joriy etdi. Ushbu model talabalarni ilk diagnostik bosqichdan tortib hayot oxirigacha bo'lgan jarayonda bemorlar bilan muloqot olib borishga o'rgatishda samarali ekanligi isbotlandi.

Og'ir xabarni yetkazish ko'nikmalari: SPIKES modeli

SPIKES modeli (Setting, Perception, Invitation, Knowledge, Empathy, Summary) palliativ ta'limda eng keng qo'llaniladigan muloqot tizimlaridan biridir (Baile et al., klasik asar; Bruera & Hui, 2021). Ushbu model 2020–2025 yillarda ham tibbiyot talabalarini o'qitishda asosiy amaliy vosita sifatida saqlanib qolmoqda. Morris et al. (2023) ning tadqiqotlari shuni ko'rsatdiki, SPIKES modelini simulyatsion amaliyot bilan birga qo'llash talabalarning o'z-o'ziga ishonchini sezilarli darajada oshiradi.

Bundan tashqari, Kavalieratos et al. (2021) REMAP protokolini (Reframe, Expect emotion, Map goals, Align, Plan) onkologiya rezidentlarini o'qitishda qo'llab, uni an'anaviy SPIKES modeliga nisbatan ilg'or tana-psixologik yondashuv sifatida tavsiflab berdi. Ikki protokolning kombinatsiyasi eng yuqori samaradorlikni berishi aniqlandi.

Simulyatsion ta'lim va rolli o'yinlar

Simulyatsion ta'lim kommunikativ kompetensiyani shakllantirish metodikasida zamonaviy tendensiya hisoblanadi. Shirey et al. (2022) tomonidan 18 ta tibbiyot universitetida o'tkazilgan multimarkaz tadqiqoti shuni ko'rsatdiki, standartlashtirilgan bemorlar (standardized patients — SP) bilan o'tkaziladigan simulyatsion mashg'ulotlar talabalarning kommunikatsiya ko'nikmalarini statistik jihatdan muhim darajada oshiradi ( $p < 0.001$ ). Ushbu yondashuv talabaga haqiqiy bemorga zarar yetkazish xavfisiz muloqot ko'nikmalarini mashq qilish imkoniyatini beradi.

Gonzalez-Garcia et al. (2021) esa onlayn simulyatsiyalar (virtual standardized patients) ning samaradorligini tadqiq qildi va ularning yuzma-yuz simulyatsiyalardan uncha kam emasligi, ammo xarajatlar va logistika nuqtai nazaridan afzalliklarini ilmiy jihatdan asoslab berdi. COVID-19 pandemiyasi davrida bu yondashuv ayniqsa dolzarb ahamiyat kasb etdi.

O'zbek tibbiy ta'lim tizimiga nisbatan ham simulyatsion markazlarning imkoniyatlarini kengaytirish masalasi Toshkent tibbiyot akademiyasi tadqiqotchilarining e'tiborini tortmoqda (Yusupov va boshq., 2023). Mahalliy mualliflar tomonidan ishlab chiqilgan o'quv modullari mazmuni xalqaro standartlarga mos kelishiga qaratilgan harakatlar kuchayib bormoqda.

Axloqiy kompetensiyalar: asosiy muammolar va yondashuvlar

Palliativ onkologiyada axloqiy ikkilanishlar

Palliativ onkologiya o'qitishida axloqiy kompetensiya shakllantirishning dolzarbligi shundan iboratki, shifokorlar hayotiy muhim axloqiy qarorlar qabul



qilishi zarur bo'ladi: davolanishni to'xtatish yoki davom ettirish, bemor istaklarini hurmat qilish, oilaning manfaatlarini hisobga olish va cheklangan resurslarni adolatli taqsimlash. Emanuel et al. (2020) ta'kidlashicha, tibbiyot talabalari hayot oxiridagi axloqiy muammolarga ko'pincha tayyor emaslikni his etishadi va bu holat klinik amaliyotda stressga olib kelishi mumkin.

Sharf va boshq. (2022) ning kuzatuvli tadqiqoti shuni ko'rsatdiki, rezidentlarning 67% og'ir axloqiy qarorlar oldida o'zini yolg'iz his qilishini bildirgan. Bu esa palliativ ta'limda axloqiy muammolar muhokamasi uchun maxsus platformalar yaratishni taqozo etadi.

#### Bioetika va qadriyatga asoslangan tibbiyot

Zamonaviy palliativ ta'limda bioetika tamoyillari — avtonom, benefitsentlik, zarar yetkazmaslik va adolat — ni klinits stsenariylari orqali o'rgatish usuli tobora keng tarqalmoqda (Beauchamp & Childress, 2020 — yangi nashr asosida). Johnson et al. (2023) o'tkazgan randomizatsiyalangan nazorat tadqiqotida bioetika seminarlarida ishtirok etgan talabalar nazorat guruhiga nisbatan axloqiy fikrlash ko'rsatkichlari bo'yicha sezilarli yutuqlarga erishganligi aniqlandi.

Qadriyatga asoslangan tibbiyot (Values-Based Medicine — VBM) konsepsiyasi ham palliativ ta'limda e'tiborni tortmoqda. Woodbridge-Dodd et al. (2021) fikricha, VBM yondashuvi talabalarni faqat tibbiy bilim bilan emas, balki har bir bemorning individual qadriyatlarini tushunishga va hurmat qilishga o'rgatadi. Bu, ayniqsa, turli madaniy va diniy an'analardan kelgan bemorlar bilan ishlashda muhimdir.

#### Madaniy kompetentlik va ma'naviy qo'llab-quvvatlash

Palliativ onkologiya o'qitishida madaniy kompetentlik muhim o'rin tutadi. Islomiy, buddaviy yoki boshqa an'anaviy qadriyatlar tizimida yashayotgan bemorlar bilan ishlashda maxsus muloqot ko'nikmalari talab etiladi. Phelps et al. (2020) tadqiqotida diniy e'tiqod bemorlarga davolanishni rad etishda muhim rol o'ynashini aniqladi. Shu sababli tibbiyot talabalari ma'naviy qo'llab-quvvatlash kompetensiyasiga ham ega bo'lishlari lozim.

O'rta Osiyo mintaqasida, jumladan O'zbekistonda, bemorlarning ko'pchiligi an'anaviy qadriyatlarni yuqori baholaydi. Toshkent onkologiya ilmiy markazi ma'lumotlariga ko'ra (2022–2024), bemorlarning 78% palliativ davrda ma'naviy qo'llab-quvvatlashni muhim deb hisoblaydi. Bu esa mahalliy tibbiyot ta'limida ushbu yo'nalishni maxsus modul sifatida kiritishni zarur qiladi.

#### O'qitish metodikasi: samarali yondashuvlar

#### Kompetensiyaga asoslangan ta'lim (Competency-Based Education)

Kompetensiyaga asoslangan ta'lim (CBE) paradigmasi palliativ ta'limda dunyoviy standart sifatida tan olinib kelmoqda. Weissman et al. (2021) tomonidan ishlab chiqilgan EPEC (Education in Palliative and End-of-life Care) dasturi CBE tamoyillari asosida tuzilgan bo'lib, hozirgi kunda 40 dan ortiq mamlakatda qo'llanilmoqda. Ushbu dastur kommunikativ va axloqiy kompetensiyalarni o'lchanadigan natijalar orqali belgilab, talabalar taraqqiyotini tizimli monitoring qilish imkonini beradi.

Competency-Based Medical Education (CBME) ning palliativ ta'limga tatbiq etilishi haqida Sullivan va boshq. (2022) o'tkazgan meta-analiz 15 ta o'rganish natijasini umumlashtirdi va CBE yondashuvi an'anaviy bilimga asoslangan ta'limga nisbatan natijalar sifati bo'yicha 34% ga yuqori ko'rsatkichlarni berganligini aniqladi.

#### Refleksiv amaliyot va narrativ tibbiyot

Refleksiv amaliyot (Reflective Practice) palliativ ta'limda tobora muhim o'rin egallaydi. Talabalar og'ir klinik holatlarni qayta ko'rib chiqish, his-tuyg'ularini qayta tahlil qilish va professional rivojlanishini kuzatib borish uchun refleksiv kundaliklar yuritishlari tavsiya etiladi (Charon et al., 2020). Narrativ tibbiyot (Narrative Medicine) ham shu yo'nalishda o'ziga xos vosita bo'lib xizmat qiladi — talabalar bemorlar hikoyalarini yozish va tahlil qilish orqali empatiya va axloqiy sezgirliklarini rivojlantiradilar.

Murphy et al. (2022) ning tadqiqotida narrativ tibbiyot modulini palliativ ta'limga kiritish empatiya ko'rsatkichlarini 28% ga oshirgani va shifokor charchashini (burnout) kamaytirganigi aniqlandi. O'zbek kontekstida ham talabalarni bemorlar bilan insoniy aloqa o'rnatishga yo'naltiradigan bunday metodologik yondashuv samarali bo'lishi kutilmoqda.

#### Jamoaviy o'qitish va interdistsiplinarlik

Palliativ yordam o'z mohiyatiga ko'ra ko'p ixtisoslikli jamoaviy yondashuv talab qiladi. Tibbiyot talabalari hamshiralik, psixologiya, ijtimoiy ish va ruhoniyyat mutaxassislari bilan birgalikda o'qitilganda kommunikativ va axloqiy kompetensiyalar ancha samarali shakllanadi (Kelley et al., 2022). Interprofessional Education (IPE) konsepsiyasi aynan shu maqsadda ishlab chiqilgan bo'lib, ko'pgina xalqaro universitetlarda palliativ ta'lim dasturlarining ajralmas qismi sifatida kiritilgan.

Ushbu yondashuvning amaliy natijalarini o'rganib, Gallo-Silver et al. (2023) IPE modulida ishtirok etgan talabalar bir ixtisoslik doirasida o'qinganlarga nisbatan jamoaviy muloqot va axloqiy muammolarni guruh ichida hal qilish ko'nikmalarida statistik jihatdan muhim yutuqlarga erishganini tasdiqladi.

#### Raqamli ta'lim texnologiyalari

COVID-19 pandemiyasi raqamli ta'lim platformalarini rivojlantirishga kuchli turtki berdi. Virtual reality (VR) muhitida palliativ muloqot ko'nikmalarini mashq qilish yangi va istiqbolli yo'nalish hisoblanadi. Liaw et al. (2020) tomonidan o'tkazilgan dastlabki tadqiqot VR muhitida bemorlar bilan muloqot ko'nikmalarini o'rganish an'anaviy simulyatsiyaga nisbatan tezroq va xarajatsizroq ekanligini ko'rsatdi.

Blended learning (aralash o'qitish) modelini qo'llash ham samarali hisoblanadi. Teoh et al. (2022) o'tkazgan tadqiqot shuni ko'rsatdiki, onlayn nazariy modullar va yuzma-yuz amaliyotni birlashtirgan aralash o'qitish modeli kommunikatsiya va axloqiy fikrlash ko'nikmalarini shakllantirishda faqat onlayn yoki faqat an'anaviy o'qitishdan ustundir.

### Baholash metodlari

Talabalarning kommunikativ va axloqiy kompetensiyalarini baholashda bir nechta yondashuv qo'llaniladi. OSCE (Objective Structured Clinical Examination) — bu eng keng tarqalgan standartlashtirilgan baholash tizimi bo'lib, standartlashtirilgan bemorlar bilan o'tkaziladigan stsensariyli imtihonlarni o'z ichiga oladi (Peterson et al., 2021). Ushbu tizim talabalarning muloqot ko'nikmalarini ob'ektiv va takrorlanadigan tarzda baholash imkonini beradi.

360 gradusli baholash metodikasi ham palliativ ta'limda tobora keng qo'llanilmoqda. Ushbu yondashuv supervayzorlar, hamkasblar, hamshiralar va bemorlarning fikr-mulohazalarini birlashtirib, talabalarning kommunikativ kompetensiyasining to'liq manzarasini yaratadi (Ritchie et al., 2022). Portfolio-asoslangan baholash esa reflektiv amaliyot natijalarini kuzatib borishning samarali usuli hisoblanadi.

### Milliy kontekst: o'zbekiston tibbiyot ta'limi

O'zbekistonda palliativ yordam xizmati va unga oid ta'lim tizimi faol rivojlanish bosqichida turibdi. 2019 yilda qabul qilingan "Palliativ tibbiy yordam to'g'risida"gi qonun tibbiy ta'limda ushbu soha uchun zaruriy me'yoriy-huquqiy zamin yaratdi. Biroq universiteti o'quv dasturlarida kommunikativ va axloqiy kompetensiyalarni rivojlantirishga yo'naltirilgan maxsus modul va fanlari hali yetarlicha ishlab chiqilmaganligi muammo bo'lib qolmoqda.

Toshkent tibbiyot akademiyasi va Samarqand davlat tibbiyot universiteti tadqiqotchilari (Raxmatullayev va boshq., 2023; Abdullayeva va boshq., 2024) palliativ ta'lim dasturini milliy sharoitga moslashtirish bo'yicha ilk qadamlarni qo'ymoqdalar. Jumladan, xalqaro amaliyot va mahalliy an'analar sinteziga asoslangan o'quv moduli loyihalari ishlab chiqilmoqda. Bu tadqiqotlar kelajakda mamlakatimiz tibbiyot oliy ta'limi uchun muhim uslubiy manba bo'lib xizmat qilishi mumkin.

O'zbekiston kontekstida muhim omil sifatida oilaning ijtimoiy rolini alohida ta'kidlash lozim. Mahalliy an'analarda oila a'zolari tibbiy qarorlar qabul qilishda faol ishtirok etadi, bu esa tibbiyot talabalari oilalar bilan ishlash kommunikatsiyasini ham egallashlarini zarur qiladi. Xalqaro adabiyotlarda bu masalaga mahalliy xususiyatlarni inobatga olgan holda munosabat bildiruvchi manbalar hali kam uchraydi.

### Tahlil va muhokama

Ko'rib chiqilgan adabiyotlar bir nechta muhim tendensiyalarni aks ettiradi. Birinchidan, palliativ ta'limda faqat bilimga emas, balki ko'nikma va munosabatlarni shakllantiruvchi metodologiyalarga o'tish kuzatilmoqda. Ikkinchidan, simulyatsion ta'lim, rolli o'yinlar va standartlashtirilgan bemorlar bilan ishlash kompetensiyani rivojlantirishning eng samarali usullari ekanligi bir necha bor isbotlangan. Uchinchidan, raqamli texnologiyalar va aralash o'qitish modellari kelajakdagi asosiy yo'nalish sifatida shakllanmoqda.

Axloqiy kompetensiya shakllantirishda nazariy bioetika o'qitishini klinik stsensariylarda amaliy qo'llash bilan birlashtirish zarurligi keng tan olinmoqda.

Shu bilan birga, madaniy va ma'naviy omillarni inobatga olgan yondashuv xalqaro miqyosda ham, milliy kontekstda ham dolzarbligi bilan ajralib turadi.

Mavjud adabiyotlardagi bo'shliqlar qatorida quyidagilarni ko'rsatish mumkin: (1) uzoq muddatli natijalar — ya'ni talabalar amaliyotga chiqqanidan keyin kommunikativ va axloqiy kompetensiyalar qay darajada saqlanishini kuzatadigan tadqiqotlar kamchilik qiladi; (2) past va o'rta daromadli mamlakatlar kontekstidagi tadqiqotlar salmog'i etarli emas; (3) Markaziy Osiyo mintaqasiga xos madaniy xususiyatlarni hisobga oluvchi uslubiy ishlanmalar deyarli yo'q.

#### **Xulosa va tavsiyalar**

Ushbu adabiyotlar tahlili shuni ko'rsatadiki, palliativ onkologiya o'qitishida kommunikativ va axloqiy kompetensiyalarni rivojlantirish tibbiyot ta'limining ustuvor vazifalaridan biri bo'lishi lozim. Samarali metodika quyidagi elementlarni o'z ichiga olishi zarur: tuzilmali muloqot modellari (SPIKES, REMAP); standartlashtirilgan bemorlar bilan simulyatsion mashg'ulotlar; refleksiv amaliyot va narrativ tibbiyot elementlari; jamoaviy (interdistsiplinar) ta'lim; raqamli platformalar va aralash o'qitish; madaniy va ma'naviy kompetentlik modullari.

O'zbekiston tibbiyot oliy ta'limi uchun quyidagi tavsiyalar ishlab chiqildi: (1) barcha tibbiyot universitetlari o'quv dasturlariga palliativ muloqot va axloq modulini majburiy sifatida kiritish; (2) simulyatsion markazlarni mahalliy sharoitga mos standartlashtirilgan bemorlar stsenariylari bilan jihozlash; (3) mahalliy madaniy, diniy va oilaviy qadriyatlarni hisobga oluvchi o'zbek tilidagi o'quv materiallari yaratish; (4) xalqaro va milliy mutaxassislarni jalb qilib, uzoq muddatli natijalarni kuzatuvchi tadqiqotlar olib borish.

Yuqoridagilarni inobatga olgan holda, kelgusi tadqiqotlar O'zbekiston tibbiyot oliy ta'limi negizida palliativ kommunikatsiya va axloq dasturini sinab ko'rish va uning samaradorligini baholashga yo'naltirilishi maqsadga muvofiq deb hisoblanadi.

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## **SCIENTIFIC AND METHODOLOGICAL CHARACTERISTICS OF USING INNOVATIVE METHODS IN GEOGRAPHY EDUCATION**

**Abstract:** *This study examines the scientific and methodological features of applying innovative methods in geography education. In the learning process, students acquire knowledge, skills, and competencies through purposeful teaching strategies. The concept of method, understood in didactics as a guided way of organizing instruction, plays a crucial role in shaping learners' understanding and worldview. The effectiveness of geography teaching depends on the appropriate selection of instructional tools and methods aligned with lesson objectives. Therefore, the use of innovative approaches helps improve teaching efficiency, enrich learning forms, and increase students' engagement. The study highlights the importance of methodological diversity in achieving educational outcomes.*

**Keywords:** *Geography education, innovative methods, scientific and methodological approach, educational process, knowledge, skills, and competencies, didactic methods, learning material, educational effectiveness.*

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## **GEOGRAFIYA TA'LIMIDA INNOVATSION METODLARNI QO'LLASHNING ILMIY-METODIK XUSUSIYATLARI**

**Annotatsiya:** *Ushbu tadqiqot geografiya ta'limida innovatsion metodlarni qo'llashning ilmiy-metodik xususiyatlarini yoritadi. Ta'lim jarayonida o'quvchilar maqsadga yo'naltirilgan o'qitish strategiyalari orqali bilim, ko'nikma va malakalarni egallaydilar. Didaktikada metod tushunchasi ta'limni tashkil etishning boshqariladigan usuli sifatida talqin qilinib, u o'quvchilarning bilim olishi va dunyoqarashi shakllanishida muhim o'rin tutadi. Geografiyani o'qitish samaradorligi dars maqsadlariga mos o'quv vositalari va metodlarni to'g'ri*

*tanlashga bog'liq. Shu bois innovatsion yondashuvlardan foydalanish ta'lim samaradorligini oshiradi, o'qitish shakllarini boyitadi hamda o'quvchilarning faolligini kuchaytiradi. Tadqiqot ta'lim natijalariga erishishda metodik xilma-xillikning ahamiyatini ko'rsatadi.*

**Kalit so'zlar:** *Geografiya ta'limi, innovatsion metodlar, ilmiy-metodik yondashuv, ta'lim jarayoni, bilim, ko'nikma va malaka, didaktik metodlar, o'quv material, ta'lim samaradorligi.*

**Introduction.** In the educational process, students acquire specific knowledge, skills, and competencies. In didactics, the term *method* is understood as the process through which, under the guidance of the teacher and by means of various methods, students are equipped with knowledge, skills, and competencies, while their worldview is also shaped. The content of educational material is mastered through various instructional tools and different methods. For this reason, teachers are always faced with the challenge of finding more successful and effective ways that facilitate both teaching and learning. The search for different forms of studying educational materials begins with understanding the aims and objectives of the lesson. The word *method* is derived from the Greek word *methodos*, which literally means “research.”

The science of didactics has not yet developed a single definitive rule for defining the term *method*. Various definitions and interpretations of this concept exist. In didactics, the teaching method is understood as the joint activity of the teacher and the student within the educational process. In this process, both act together to achieve a common goal. A method determines the types of activities performed by the teacher and the student, the way instruction proceeds, and the extent to which the teacher should explain the material. The individual components of a method are referred to as techniques [2].

**Material and Methods.** Teaching methods are understood as those methods that foster students' creative activity, teach them to acquire knowledge independently, and cultivate a more comprehensive body of scientific knowledge, a well-founded worldview, and firm convictions. Two main characteristics are inherent in teaching methods. First, methods serve as guidelines for the teacher's activity and help determine the learner's activity. Second, teaching methods are not limited solely to the formation of knowledge, skills, and competencies, but also contribute to nurturing students' creative activity and their ability to acquire knowledge independently. Teaching methods are closely related both to the general and specific aims of instruction and to the content of school education.

In many cases, teaching methods require consideration of students' psychological characteristics and individual traits. Their selection also takes into account the material and technical resources of the school, including maps, atlases, and the possibilities for their use. In pedagogy, teaching methods also depend on the conditions in which the school is located, as well as on the traditions shaped by teachers' experience. For example, a teacher may prefer to

use certain methods that give a distinctive character to his or her work. Under the conditions of scientific and technological development, increasingly serious demands are being placed on the improvement of traditional methods and on the search for new ones. The problem of teaching methods remains one of the most fundamental issues in education. It must satisfy the following requirements [3].

The first requirement is the educational value of the method. Any method should influence students' overall development, their interest in knowledge, their beliefs, feelings, and views. The implementation of the educational function of instruction depends on the choice of method.

The second requirement is the scientific nature of the method. Any method of teaching and instruction is determined by the laws governing the educational process. The more scientifically grounded a method is, the clearer and more precise it becomes. Most importantly, it is necessary to understand what general and specific tasks can be solved through a particular method, what content it corresponds to, what types of activity it requires, and how these should be organized. The scientific nature of a method ensures the correct understanding of geographic facts, events, phenomena, and regularities, and leads students toward an accurate scientific conception.

The third requirement is the accessibility of the method. In this case, the pedagogical possibilities of students' development are taken into account. A method should also enable students to master abstract thinking and develop it intensively. Therefore, when selecting a method, one should think not only about what needs to be explained to students, but also about what they are capable of understanding.

The fourth requirement is the effectiveness of the teaching method, that is, its orientation toward ensuring the durable mastery of educational material. The fifth requirement is the application of advanced experience in professional practice and its regular study; it is necessary to continuously follow innovations related to teaching methods in both theory and practice.

Some techniques may also be included within the structure of several different methods. The well-known methodologist M. K. Kovalevskaya regarded teaching aids (such as working with a textbook or a map), oral forms of presenting knowledge (such as narration, conversation, explanation, and lecture), methods of cognition (such as comparison, map comparison, and drawing general conclusions), as well as the types and forms of students' educational activity (such as mastering theoretical knowledge, practical work methods, and independent work methods), as methodological methods [1].

Methods may take different forms. For example, the technique of comparison may be used within oral presentation, conversation, or methods involving work with maps. Thus, there is an organic relationship between method and technique. The classification of teaching methods arises in this way, and it helps the teacher to understand more deeply both the similarities and the differences in the ways students master learning material, as well as to organize teaching activity more successfully. Teaching methods are divided into groups

according to certain characteristics. At present, the following classification is widely used in educational theory and in geography education [6].

**I. According to the main sources of knowledge acquisition:**

1. Presentation (storytelling, explanation, lecture)
2. Conversation
3. Working with cartographic materials
4. Working with visual aids
5. Observation and experiments
6. Working with numerical materials
7. Working with textbooks and supplementary literature
8. Practical methods

**II. According to didactic objectives:**

1. Studying new material
2. Consolidating knowledge
3. Methods of assessing knowledge, skills, and competencies

**III. According to the nature of inferential activity:**

1. Analytical
2. Synthetic
3. Inductive
4. Deductive methods

According to the characteristics of thinking activity and the level of cognitive engagement, the classification of methods proposed by I. Y. Lerner and M. N. Skatkin is as follows: [5]

1. Explanatory-illustrative method
2. Reproductive method, or the method of reproducing acquired knowledge
3. Problem-based presentation
4. Partially exploratory method
5. Research method

All of the above methods may also be conditionally divided into two groups: methods of acquiring new knowledge and methods of reproducing acquired knowledge. Each teaching method combines instructional and educational aspects that are closely interconnected.

Many educators also distinguish between active and passive methods in teaching. However, this is not an entirely accurate approach, since any method, if applied appropriately and in the right context, can stimulate students' activity. Therefore, many factors must be taken into account when selecting a method.

Students' cognitive activity depends on many factors, in particular on the complexity of the learning material, the volume of theoretical knowledge, the level of the class, and the students' ability to carry out independent work. Some methods develop memorization, others promote thinking, and still others foster emotional engagement. Each method has both advantages and disadvantages [4].

For example, the methods of narration and lecture yield immediate results when students have a strong interest in learning. Teaching through the question-and-answer method requires considerable time and skill from the teacher, while

also presupposing that students already possess the necessary background knowledge. Likewise, the use and organization of problem-based and research methods require substantial time and demand a high level of competence from the teacher. When selecting a particular method, it is essential to consider students' cognitive activity, their intellectual level, and the extent to which instructional resources are available.

Enhancing the effectiveness of teaching methods is one of the most pressing tasks under present conditions. It is difficult to give preference to only one or several methods. A comprehensive approach is required. Success in education is ensured by a system of teaching methods. Each method has its own specific advantages, and each occupies a particular place in shaping one or another concept in the minds of students.

**Conclusion.** In conclusion, teaching methods reflect the teacher's personal qualities, worldview, psychological and pedagogical competence, methodological skill, and specialized scientific training. These factors directly determine the practical effectiveness of methods and influence the extent to which students acquire knowledge, skills, and competencies. Therefore, the correct selection and appropriate application of methods constitute one of the essential conditions for the quality of education. There is no universal method in teaching, since the content and objectives of each lesson, the level of students' preparedness, and the availability of instructional resources differ. In geography education in particular, the integrated use of various methods ensures a higher level of effectiveness. Thus, the organization of effective instruction requires the teacher to possess a thorough knowledge of teaching methods, to select them appropriately, and to apply them creatively.

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## AHOLI VA HUDUDLARNI FAVQULODDA VAZIYATLARDAN MUHOFAZA QILISHNING USTUVOR YO'NALISHLARI VA AMALGA OSHIRISH MEXANIZMLARI

**Annotatsiya.** Maqolada O'zbekiston Respublikasining aholi va hududlarni favqulodda vaziyatlardan muhofaza qilish sohasidagi islohotlar strategiyalar va mexanizmlar xususida batafsil muhokama qilingan. Davlat rahbarining 2025 yil 20 oktabrdagi farmoniga asosan, sohada yangi standartlar, profilaktika tadbirlari va davlat nazoratining samarali mexanizmlarini amalga oshirish ko'zda tutilgan. Maqolada, aholi va hududlarni muhofaza qilishning ustuvor yo'nalishlari, innovatsion texnologiyalar va dual ta'limga asoslangan kadrlar tayyorlash tizimiga alohida e'tibor qaratilgan. Shuningdek, profilaktika choralarining «mahallabay» tartibda joriy etilishi va xavf manbalariga asoslangan hududlarni tasniflash tizimi kabi muhim mexanizmlar o'rganilgan. Favqulodda vaziyatlardan muhofaza qilishdagi huquqiy tartib, kadrlar tayyorlash va sohaviy hamkorlikning ahamiyatiga ham to'xtalib o'tilgan.

**Tayanch so'zlar:** Favqulodda vaziyatlar, profilaktika tadbirlari, innovatsion texnologiyalar, davlat nazorati, qonuniy tartibga solish, mahallabay profilaktika, xavf manbalari, zamonaviy standartlar, dual ta'lim.

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## TRANSLATION PRIORITIES AND MECHANISMS IMPLEMENTATION OF PROTECTION OF THE POPULATION AND TERRITORIES FROM EMERGENCY SITUATIONS

**Abstract.** This article examines in detail the reforms, strategies, and mechanisms of the Republic of Uzbekistan in the area of protecting the population and territories from emergency situations. The decree of the Head of State of October 20, 2025, provides for the introduction of new standards, preventive measures, and effective state control mechanisms in this area. Particular attention is paid to priority areas for protecting the population and territories, innovative technologies, and a system of personnel training based on dual education. Important mechanisms, such as the introduction of preventive measures in the form of "mahallabai" and a system for classifying territories by hazard sources, are also



*examined. The importance of law and order, personnel training, and industry cooperation in emergency protection is also discussed.*

**Keywords:** *Emergencies, preventive measures, innovative technologies, state control, legal regulation, mahallabai, hazard sources, modern standards, dual education.*

Ma'lumki, O'zbekiston Respublikasi Prezidentining 2025 yil 20 oktabrdagi «Aholi va hududlarni favqulodda vaziyatlardan ishonchli muhofaza qilish sohasini sifat jihatidan yangi bosqichga ko'tarish to'g'risida»gi PF-185- sonli Farmoniga asosan mamlakatimizda aholisi va hududlarini favqulodda vaziyatlardan ishonchli muhofaza qilishda ilg'or xorijiy tajribalarni inobatga olgan holda ilmiy-texnik yondashuvlar asosida samarali profilaktika va davlat nazoratining yangi mexanizmlarini yo'lga qo'yish hamda sohaga zamonaviy raqamli yechimlarni joriy etish bo'yicha milliy tajribani yaratish maqsadida ushbu sohadagi islohotlarning bir qator ustuvor yo'nalishlari belgilandi [1].

Jumladan, hududlarda favqulodda vaziyatlarning barvaqt oldini olish va oqibatlarini kamaytirish faoliyatini ustuvor vazifa sifatida qabul qilish orqali mahallalar darajasida keng qamrovli profilaktika mexanizmlarini yaratish va samarali tatbiq qilish, energetika, yirik ishlab chiqarish, qurilish va xizmat ko'rsatish obyektlarida favqulodda vaziyatlarning oldini olish, xavfni boshqarish, texnogen avariylarni o'z vaqtida bartaraf etishning yangi standart hamda metodikalarini ishlab chiqish va favqulodda vaziyatlar sharoitlarida harakatlanish amaliyotida yo'lga qo'yish, favqulodda vaziyatlar yo'nalishida davlat nazorati shakllarining talablari hamda meyorlarini zamon talablariga mos ravishda qayta ko'rib chiqish hamda ularni amalga oshirish mexanizmlarini transformatsiya qilish bo'yicha kompleks chora-tadbirlar tizimini belgilash shular jumlasiga kiradi.

Mazkur Dasturulamal hujjatga ko'ra, favqulodda vaziyatlardan muhofaza qilish tizimining inson qadrini ta'minlash (inson hayoti va sog'lig'ining ustuvorligi), profilaktik tadbirlarning ustuvorligi, oshkoralik va shaffoflik, hamjihatlikda samarali harakatlanish, sansalorlik va ziddiyatlarga yo'l qo'ymaslik kabi prinsiplari belgilab berildi. Shu jihatdan favqulodda vaziyatlardan muhofaza qilishni

huquqiy tartibga solinishi ham muhim ahamiyat kasb etadi. Favqulodda vaziyatlarda aholi va hududlarni himoya qilish bilan bog'liq munosabatlarni huquqiy tartibga solish bu aholi va hududlarni favqulodda vaziyatlardan himoya qilish sohasidagi munosabatlarni tartibga soluvchi normativ-huquqiy hujjatlar orqali qonun bilan belgilangan normalar va qoidalar yig'indisi deb ta'rif berish mumkin. Aholi va hududlarni favqulodda vaziyatlardan himoya qilishni huquqiy tartibga solish quyidagi xususiyatlarga javob beradi:

1. Ushbu sohadagi huquqiy tartibga solish ijtimoiy tartibga solishning bir turi bo'lib, u hayotning turli sohalarida, jumladan, aholi va hududlarni favqulodda vaziyatlardan himoya qilishni tartibga solishni o'z ichiga oladi;

2. U maqsadga yo'naltirilgan - ijtimoiy munosabatlarni tartibga solishga, ularni himoya qilishga va himoya qilishga, yuridik shaxslarning buzg'unchi xatti-harakatlari va faoliyatini siqib chiqarishga va blokirovka qilishga hamda ijtimoiy rivojlanishni rag'batlantirishga qaratilgan;

3. Huquqiy tartibga solish orqali subyektlar o'rtasidagi munosabatlar dastlab davlat-vakolatli xususiyatga ega bo'lgan o'ziga xos huquqiy shakllarga ega bo'ladi. Aholi va hududlarni favqulodda vaziyatlardan himoya qilishni huquqiy tartibga solishning o'ziga xos xususiyati, bir tomondan, kafolatlangan mumkin bo'lgan xatti-harakatlar turlari va doirasini belgilashdan, ikkinchi tomondan, zarur bo'lgan xatti-harakatlar turlari va doirasini belgilashdan iborat;

4. Huquqiy tartibga solish o'ziga xos xususiyatga ega, chunki u har doim real hayotdagi munosabatlar bilan bog'liq;

5. Huquqiy tartibga solish maqsadli - yuridik shaxslarning qonuniy manfaatlarini qondirishga qaratilgan [2].

Favqulodda vaziyatlardan muhofaza qilish bu insonlarni, mol-mulkni, tabiatni va infratuzilmani favqulodda vaziyatlardan (masalan, tabiiy ofatlar, texnologik avariylar, harbiy holatlar) himoya qilish uchun amalga oshiriladigan chora-tadbirlar tizimidir.

Bu tizimga kirish mumkin bo'lgan asosiy elementlarga quyidagilarni kiritish mumkin:

Favqulodda vaziyatlarning aniqlanishi - qanday vaziyatlar favqulodda deb hisoblanadi va ularning toifalari. Jamoat xavfsizligi - odamlarning xavfsizligini ta'minlash uchun tadbirlar, evakuatsiya qilish, xavfli zonadan olib chiqish. Muhandislik va texnik himoya - turli inshootlar, yoki mexanizmlarni, injiniring tizimlarini xavfdan himoya qilish. Tibbiy yordam va sanitariya - favqulodda vaziyatlarda tibbiy xizmatlarni tashkil qilish, yordam ko'rsatish. Ma'lumot tarqatish- aholiga favqulodda vaziyatlar haqida xabar berish va ularga qanday harakat qilishni ko'rsatish. Shunday qilib, favqulodda vaziyatlardan muhofaza qilish tizimi davlat, jamoat tashkilotlari va fuqarolarning hamkorligi bilan amalga oshiriladi.

Uning maqsadi jonli va jismoniy zararni kamaytirish, ijtimoiy va iqtisodiy barqarorlikni saqlashdir [3]. Davlatimiz rahbarining yuqorida qayd etgan Farmonida favqulodda vaziyatlardan muhofaza qilish sohasida davlat siyosatining ustuvor yo'nalishlari sifatida quyidagilar belgilab berilgan. Birinchidan, «Favqulodda vaziyatdan muhofazalangan mahalla» tamoyili asosida favqulodda vaziyatlarning barvaqt oldini olish, ularni bartaraf etish va oqibatlarini kamaytirish chora-tadbirlari natijadorligini oshirish bo'yicha «mahallabay» kompleks profilaktika tadbirlarini amalga oshirish; Ikkinchidan, kun sayin rivojlanayotgan ishlab chiqarish va xizmat ko'rsatish industriyasini favqulodda vaziyatlardan muhofaza qilish bo'yicha yangicha yondashuvlarning, shuningdek, ularda ro'y berishi mumkin bo'lgan xavflarni bartaraf etishning zamonaviy texnika va texnologiyalarini joriy etish;

Uchinchidan, favqulodda vaziyatlardan muhofaza qilish sohasida dual ta'limga asoslangan o'rta bo'g'in va yuqori malakali professional kadrlarni

uzluksiz tayyorlash, qayta tayyorlash, ularning malakasini hamda ta'lim muassasalarining ilmiy salohiyatini oshirish bo'yicha yaxlit tizimni yo'lga qo'yish;

To'rtinchidan, aholini favqulodda vaziyatlarda harakat qilishga tayyorlash samaradorligini oshirish;

Beshinchidan, favqulodda vaziyatlar tahdidining oldini olish, bartaraf etish, aholi va hududlarni favqulodda vaziyatlardan muhofaza qilish sohasida ilm-fan, ilmiy tadqiqot va tajriba-konstruktorlikka asoslangan innovatsion ishlab chiqarish zanjirini yo'lga qo'yish;

Oltinchidan, favqulodda vaziyatlar monitoringi va prognozi, shuningdek, favqulodda vaziyatlar xavfini bartaraf etishda kuch va vositalarni boshqarish, muvofiqlashtirish hamda ularning faoliyatini raqamlashtirish sohasiga sun'iy intellekt, robototexnika va zamonaviy texnologiyalarni keng joriy etish;

Yettinchidan, favqulodda vaziyatlardan muhofaza qilish bilan bog'liq kechiktirib bo'lmaydigan tezkor chora-tadbirlarni amalga oshirish;

Sakkizinchidan, energetika, transport, hayot maromini ta'minlovchi va boshqa muhim iqtisodiyot obyektlarida favqulodda vaziyatlarning oldini olish, xavfni boshqarish hamda texnogen avariyalarni bartaraf etish;

To'qqizinchidan, favqulodda vaziyatlar bo'linmalarining takrorlanuvchi funksiyalarini maqbullashtirish, kuch va vositalar boshqaruvini muvofiqlashtirish.

O'z navbatida «Favqulodda vaziyatdan muhofazalangan mahalla» tamoyili asosida favqulodda vaziyatlarning barvaqt oldini olish, ularni bartaraf etish va oqibatlarini kamaytirish chora-tadbirlari natijadorligini oshirish bo'yicha «mahallabay» kompleks profilaktika tadbirlarini amalga oshirish quyidagi mexanizmlarni ko'zda tutadi:

har bir hududning o'ziga xosligidan kelib chiqib, favqulodda vaziyatlar xavf manbalari, ularning monitoringi va prognozlari asosida joylarda yuzaga kelishi mumkin bo'lgan real tahdidlarni aniqlash;

favqulodda vaziyatlar xavf manbalarining prognozlari asosida hududlar va obyektlarni tasniflab, belgilangan mezonlarga muvofiq mahallalarni «qizil», «sariq», «yashil» toifalarga ajratish va favqulodda vaziyatlarning oldini olishning texnik-profilaktik hamda boshqa chora-tadbirlarini ularning tasnifiga ko'ra belgilash;

«mahalla yettiligi», mahalla faollari, ko'chaboshi, uyboshilar bilan birgalikda aholini keng jalb qilgan holda favqulodda vaziyatlarning texnikprofilaktik tadbirlarini xavf manbai yuqori bo'lgan xonadonlarda tashkil etib, bajarilgan ishlar natijadorligini tanqidiy tahlil qilib borish;

texnik-profilaktik tadbirlarni o'tkazishda, birinchi navbatda, ijtimoiy himoyaga muhtoj aholi qatlamlariga (Ijtimoiy reyestrda kiritilgan va ko'p bolali oilalar, yolg'iz keksalar) asosiy e'tiborni qaratib, mas'ul xizmatlarni jalb qilish orqali mavjud kamchiliklarni bartaraf etish;

Favqulodda vaziyatlardan muhofaza qilish sohasida dual ta'limga asoslangan o'rta bo'g'in va yuqori malakali professional kadrlarni uzluksiz tayyorlash, qayta tayyorlash, ularning malakasini hamda ta'lim muassasalarining ilmiy salohiyatini oshirish bo'yicha yaxlit tizimni yo'lga qo'yishda quyidagi mexanizmlarni qayd etish mumkin: sohada kadrlar tayyorlash, qayta tayyorlash va ularning malakasini oshirishning yaxlit tizimini yo'lga qo'yish maqsadida sohaviy o'quv muassasalari moddiy-texnika bazasini rivojlantirish;

o'quv jarayonini dual ta'lim tizimida tashkil etish, simulyatsiya, imitatsiya va virtual laboratoriyalar (poligon)ni tashkil etish orqali nazariya va amaliyotning uyg'unligini ta'minlash;

ta'lim jarayoniga zamonaviy pedagogik va innovatsion o'qitish texnologiyalarini keng tatbiq etish, shu jumladan, masofaviy o'qitish platformasini joriy etish;

ta'lim muassasalariga yuqori malakali professor-o'qituvchilar, shuningdek, ta'lim jarayoniga xorijiy ta'lim, ilmiy-amaliy va ilmiytadqiqot muassasalari mutaxassislari va ekspertlarini jalb qilish;

ilg'or xorijiy tendensiyalarni hisobga olgan holda bakalavriat ta'lim yo'nalishlari va magistratura mutaxassisliklari bo'yicha malaka talablari va o'quv dasturlarini ishlab chiqish, ko'rgazmali va interfaol o'quv-uslubiy bazani shakllantirish;

favqulodda vaziyatlardan muhofaza qilish sohasida fundamental, amaliy va innovatsion ilmiy tadqiqotlar o'tkazish amaliyotini yo'lga qo'yish;

ta'lim muassasalari va yetakchi xorijiy turdosh ilmiy-tadqiqot muassasalari o'rtasida keng qamrovli hamkorlik aloqalarini o'rnatish, kursant va tinglovchilarni o'qishga hamda professor-o'qituvchilarni tajriba almashish va malaka oshirish kurslariga yuborish;

Bundan tashqari, «Mahalla fuqaro muhofazasi» tizimi tuzilmalari yig'ma guruhlarini tegishli shaxsiy tarkib bilan amalda to'liq jamlash va ularni saqlab turish uchun imtiyoz, rag'bat va mukofotlar ega bo'lishlarini targ'ib qilish, MFY tomonidan rag'batlantirish, taqdirlash yoki imtiyozlar qo'llash choralari ko'rish [4].

Ushbu mexanizmlarning to'liq joriy etilishi favqulodda vaziyatlardan muhofazalanganlik darajasini ko'rsatadi. Favqulodda vaziyatlardan muhofazalanganligiga bir nechta omillar asos bo'lishi mumkin. Jumladan:

favqulodda vaziyatlarga olib kelishi mumkin bo'lgan xavf manbalarining real holatidan kelib chiqib, zarur chora-tadbirlar belgilangani;

favqulodda vaziyatlar monitoringi va prognozlari asosida xavf tahliliga ko'ra obyektlar va hududlar toifasining tasniflangani;

favqulodda vaziyatlardan muhofaza qilishda manzilli profilaktika tadbirlarining tashkil etilgani va ularning natijadorligi;

favqulodda vaziyatlardan muhofaza qilish sohasida vazifaga ega bo'lgan organlarning o'z majburiyatlarini bajarishi holati;

favqulodda vaziyatlar xavfi yuzaga kelganda yoki ro'y berganda aholini va qutqaruv tuzilmalarini xabardor qilish tizimining tashkil etilgani;

favqulodda vaziyatlarning oldini olish va ularni bartaraf etish sohasida aholini hamda favqulodda vaziyatlar davlat tizimi subyektlari mas'ul rahbar xodimlarining bilim va ko'nikmalari darajasi;

favqulodda vaziyatlarda korxona va tashkilotlarning barqaror faoliyat ko'rsatishi uchun tegishli choralar ko'rilgani;

favqulodda vaziyatlardan muhofaza qilish sohasining ilmiy-texnik va innovatsion ta'minlangani hamda raqamlashtirish darajasi;

favqulodda vaziyatlar davlat tizimi subyektlarining malakali mutaxassislar bilan jamlangani;

zamonaviy maxsus texnika va asbob-anjomlar bilan jihozlangani, shuningdek, moddiy-texnik ta'minoti va moddiy resurslar zaxirasi shakllantirilgani.

Yuqoridagilarga asoslanib, favqulodda vaziyatlar tahdidi, xavf manbalari, indikatorlari, ehtimoliy ko'lam va oqibatlaridan kelib chiqib, mahallalar «qizil», «sariq», «yashil» toifalarga ajratilishi maqsadga muvofiq deb hisoblaymiz. Bunda har bir mahallada xavf indikatorlari asosida «mahalla yettiligi» hamda sohaviy xizmatlarni jalb qilgan holda manzilli va mavsumiy profilaktika tadbirlari amalga oshirilib, mahalla favqulodda vaziyatlardan muhofazalangan hududga aylantirishga imkoniyat yaratiladi. Favqulodda vaziyatlardan muhofaza qilish sohasida yangi standart, qoidalar va ilmiy tadqiqotlarni joriy etilishi dolzarb muammolardan biri sanaladi, bu esa favqulodda vaziyatlar tahdidi hamda xavfini kamaytirishga erishish imkonini beradi.

Bundan tashqari potensial xavfli va aholi ko'p to'planadigan obektlarda favqulodda vaziyatlardan muhofaza qilish bo'yicha qonunchilik talablariga qat'iy rioya qilinishi bo'yicha vakolatli organlarning mas'uliyati hamda javobgarlik darajasi oshirish hamda favqulodda vaziyatlardan muhofaza qilish sohasida kadrlar tayyorlash, qayta tayyorlash va ularning malakasini oshirish bo'yicha sohaviy ta'lim muassasalarining moddiy-texnika bazasini mustahkamlash, shuningdek sohaga yuqori malakali professor-o'qituvchilar va ekspertlarni jalb etish, fundamental, amaliy va innovatsion ilmiy tadqiqotlar o'tkazish bo'yicha mahalliy va xorijiy turdosh ilmiy-tadqiqot muassasalari bilan hamkorlikni kuchaytirish eng dolzarb vazifalar biri hisoblanadi.

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## RAQAMLI IQTISODIYOTNING RIVOJLANISH BOSQICHLARI VA IMKONIYATLARI

**Annotatsiya:** Mazkur maqolada raqamli iqtisodiyotning nazariy asoslari, evolyutsion rivojlanish bosqichlari hamda O'zbekiston Respublikasi iqtisodiyotiga integratsiyalashuvining asosiy tendentsiyalari kompleks tarzda tahlil qilingan. Tadqiqotda 2017–2024 yillar mobaynida O'zbekistonda amalga oshirilgan raqamli transformatsiya jarayonlari, xususan, YaIMdagi IT-sektorning ulushi, raqamli xizmatlar bozorining o'sish dinamikasi va elektron tijorat hajmining miqdoriy o'zgarishlari empirik ma'lumotlar asosida baholangan. Taqqoslama tahlil usuli yordamida Markaziy Osiyo va rivojlangan mamlakatlar tajribasi o'rganilgan. Olingan natijalar raqamli infratuzilmani kengaytirish, kadrlar salohiyatini oshirish va huquqiy bazani takomillashtirish zaruratini tasdiqlaydi.

**Kalit so'zlar:** raqamli iqtisodiyot, raqamlashtirish, IT-sektor, elektron tijorat, raqamli transformatsiya, iqtisodiy o'sish, O'zbekiston.

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## STAGES OF DEVELOPMENT AND OPPORTUNITIES OF THE DIGITAL ECONOMY

**Annotation:** This article provides a comprehensive analysis of the theoretical foundations of the digital economy, its evolutionary stages of development, and the main trends in its integration into the economy of the Republic of Uzbekistan. The study evaluates the digital transformation processes implemented in Uzbekistan during 2017–2024, particularly the share of the IT sector in GDP, the growth dynamics of the digital services market, and quantitative changes in e-commerce volume, based on empirical data. Using the comparative analysis method, the experiences of Central Asian and developed countries have been examined. The results obtained confirm the necessity of expanding digital infrastructure, enhancing human resource capacity, and improving the legal framework.

**Keywords:** *digital economy, digitalization, IT sector, e-commerce, digital transformation, economic growth, Uzbekistan.*

## Kirish

Hozirgi kunda jahon miqyosida yuz berayotgan to'rtinchi sanoat inqilobi ko'plab iqtisodiy paradigmalarni tubdan o'zgartirib yubormoqda. Raqamli texnologiyalarning jadal rivojlanishi nafaqat ishlab chiqarish omillarini, balki tovarlar va xizmatlar almashinuvi tizimini, mehnat bozori tarkibini, moliyaviy vositachilik mexanizmlarini hamda davlat boshqaruvining samaradorlik mezonlarini ham qayta tashkil etmoqda.

Iqtisodiyot fanida «raqamli iqtisodiyot» tushunchasi 1995 yilda Don Tapskott tomonidan ilmiy muomalaga kiritilgan bo'lib, keyinchalik Messenbourg (2001), OECD (2014) va Pasxa (2017) kabi xalqaro tashkilotlar uni yanada kengaytirgan [1, 4, 7]. Bugungi kunda raqamli iqtisodiyot deganda axborot-kommunikatsiya texnologiyalari (AKT) infratuzilmasiga asoslangan, raqamli ma'lumotlarni ishlab chiqarishning asosiy omili sifatida qaraydigan iqtisodiy munosabatlar tizimi tushuniladi.

O'zbekiston Respublikasida raqamli iqtisodiyotni rivojlantirish Prezident Sh.Mirziyoevning 2020-yil 5-oktyabrdagi PF-6079-son Farmoni, «Raqamli O'zbekiston — 2030» strategiyasi va 2017–2021 yillardagi beshta ustuvor yo'nalish dasturlari orqali institutsional jihatdan belgilab qo'yilgan [5, 6]. Ushbu huquqiy-me'yoriy asoslar yurtimizda raqamli transformatsiyaga davlat siyosatining strategik prioriteti sifatida yondashilayotganligidan dalolat beradi.

Shu bilan birga, nazariy tadqiqotlarda raqamli iqtisodiyot rivojlanishining bosqichlari va ular orasidagi munosabatlar yetarli darajada tizimlashtirilib o'rganilmagan. Shuningdek, mahalliy sharoit va imkoniyatlarni hisobga olgan holda iqtisodiy o'sishga potentsial hissaning miqdoriy baholash metodikasi ham rivojlantirilmagan holda qolmoqda. Ushbu tadqiqot aynan shu tafovutni to'ldirishga qaratilgan bo'lib, kompleks retrospektiv va prospektiv tahlil orqali O'zbekiston uchun optimal raqamlashtirish yo'l xaritasini asoslashga xizmat qiladi.

## Tadqiqot metodologiyasi

Tadqiqotda bir-birini to'ldiruvchi metodologik yondashuvlar qo'llandi. Birinchidan, tarixiy-genetik tahlil usuli orqali raqamli iqtisodiyotning 1990-yillardan to hozirgi kungacha bo'lgan transformatsiya bosqichlari o'rganildi. Ikkinchidan, taqqoslama tahlil metodi yordamida O'zbekiston ko'rsatkichlari Markaziy Osiyo hamda OECD mamlakatlari natijalari bilan qiyoslab ko'rildi. Uchinchidan, miqdoriy-statistik usullar asosida 2017–2024 yillar uchun dinamik tendentsiyalar baholandi.

Ma'lumotlar bazasi sifatida Jahon banki (World Development Indicators, 2024), Xalqaro elektr aloqa ittifoqi (ITU, 2023), O'zbekiston Statistika agentligi hisobotlari, Axborot texnologiyalari va kommunikatsiyalarini rivojlantirish vazirligi tahliliy ma'lumotnomasi (2023) va «Digital 2024: Uzbekistan» hisoboti (DataReportal, 2024) ishlatildi [2, 3, 5, 8].

Raqamli iqtisodiyot samaradorligini baholashda quyidagi ko'rsatkichlar asosiy mezonlar sifatida tanlandi: YaIMga nisbatan IT-sektorning ulushi (%); internet foydalanuvchilari soni (aholi foizida); mobil to'lovlar hajmi (mlrd. so'm); elektron tijorat aylanmasi (mlrd. AQSH dollari); raqamli xizmatlar eksporti (mlrd. AQSH dollari). Ko'rsatkichlar 2017-yil bazis qiymatidan indekslanib solishtirma tahlil qilindi.

### **Natijalar**

#### *Raqamli iqtisodiyotning evolyutsion bosqichlari*

Olib borilgan tadqiqot asosida raqamli iqtisodiyotning to'rt bosqichli evolyutsion modeli ishlab chiqildi (1-jadval). Ushbu bosqichlar texnologik poydevor, tarmoq iqtisodiyoti, platformali iqtisodiyot va sun'iy intellekt asosidagi iqtisodiyot sifatida tavsiflanadi.

1-jadval

**Raqamli iqtisodiyotning evolyutsion bosqichlari**

| <b>Bosqich</b>    | <b>Davr</b> | <b>Asosiy texnologiya</b>     | <b>Iqtisodiy xususiyat</b>     | <b>Umumiy YaIM ulushi</b> |
|-------------------|-------------|-------------------------------|--------------------------------|---------------------------|
| I — Infratuzilma  | 1990–2000   | Internet, PC                  | Raqamlashtirish boshlanishi    | 0,5–1,5%                  |
| II — Tarmoq       | 2000–2010   | Keng polosali internet, mobil | E-tijorat, e-hukumat           | 2–4%                      |
| III — Platforma   | 2010–2020   | Bulut, ijtimoiy tarmoqlar     | Platforma iqtisodiyoti         | 5–8%                      |
| IV — SI asosidagi | 2020–hozir  | AI, IoT, Big Data, blockchain | Avtomatlashtirish, prognozlash | 10–15%+                   |

Har bir bosqich o'ziga xos texnologik «turtki» va iqtisodiy paradigma o'zgarishi bilan tavsiflanadi. I bosqichda (infratuzilma) asosiy e'tibor raqamli tarmoq qurilishiga qaratilgan bo'lsa, II bosqichda (tarmoq) iqtisodiy sub'ektlar orasidagi o'zaro bog'liqlik va elektron tranzaksiyalar ustuvorlik kasb etdi. III bosqich (platforma) ishlab chiqarish va iste'mol orasidagi vositachilik munosabatlarini qayta shakllantirdi. IV bosqich esa (SI asosidagi) texnologiyalar va iqtisodiy qaror qabul qilishning birlashuvini ifodalaydi.

#### **O'zbekistonda raqamli iqtisodiyotning miqdoriy tahlili**

O'zbekistonda 2017-yildan boshlab raqamli sektor ko'rsatkichlari barqaror o'sish tendentsiyasini ko'rsatdi. 2023-yil yakuni bo'yicha IT-sektorning YaIMdagi ulushi 2,1%ni tashkil etdi (2017-yilda bu ko'rsatkich 0,6% edi), ya'ni oltita yil ichida 3,5 baravarga yaqin o'sish kuzatildi. Internet foydalanuvchilari soni 2017-yildagi 15,2 milliondan 2024-yilga kelib 36,8 millionga etdi, ya'ni aholi qamrovi 47%dan 98%ga ko'tarildi (Jahon banki, 2024).

**O'zbekistonda raqamli iqtisodiyot asosiy ko'rsatkichlari dinamikasi (2017–2023)**

| <b>Ko'rsatkich</b>          | <b>2017</b> | <b>2019</b> | <b>2021</b> | <b>2022</b> | <b>2023</b> | <b>O'sish<br/>(×)</b> |
|-----------------------------|-------------|-------------|-------------|-------------|-------------|-----------------------|
| IT-sektor, YaIM %           | 0,6%        | 0,9%        | 1,4%        | 1,8%        | 2,1%        | 3,5×                  |
| Internet qamrovi, %         | 47%         | 67%         | 79%         | 88%         | 98%         | 2,1×                  |
| E-tijorat, mlrd. \$         | 0,3         | 0,6         | 1,2         | 1,8         | 2,4         | 8,0×                  |
| IT-eksport, mln. \$         | 62          | 105         | 214         | 380         | 520         | 8,4×                  |
| Elektron to'lov, mlrd. so'm | 1 200       | 4 500       | 18 000      | 42 000      | 87 000      | 72,5×                 |

2-jadval ko'rsatkichlari shuni tasdiqlaydiki, O'zbekistonda raqamli transformatsiya eng tez sur'atda elektron to'lovlar va IT-eksport yo'nalishida kechmoqda. Elektron to'lovlar 72 baravardan ortiq o'sishi pul bozorida raqamlashtirish darajasining jadal yuksalganligini ko'rsatadi. IT-xizmatlar eksporti sakkiz baravardan ziyod o'sishi esa xorijiy bozorda mahalliy IT-kompaniyalar raqobatbardoshligining oshganligidan dalolat beradi.

**Xalqaro taqqoslama tahlil**

Raqamli rivojlanish indeksi (e-Government Development Index, UN) bo'yicha O'zbekiston 2022-yilda 0,741 ball bilan 88-o'rinni egallagan, bu Markaziy Osiyo davlatlari ichida birinchi o'rin hisoblanadi. Biroq raqamli iqtisodiyotning YaIMdagi ulushi bo'yicha (2,1%) Germaniya (8,9%), Janubiy Koreya (10,4%) va Estoniya (7,8%) kabi rivojlangan mamlakatlardan sezilarli orqada qolinmoqda (OECD, 2023).

**Raqamli iqtisodiyot ulushining xalqaro taqqoslama ko'rsatkichlari (2023)**

| <b>Davlat</b>  | <b>IT-sek.<br/>YaIM %</b> | <b>Internet<br/>qamrovi</b> | <b>e-Gov indeks</b> | <b>Bosqich</b>   |
|----------------|---------------------------|-----------------------------|---------------------|------------------|
| Estoniya       | 7,8%                      | 99%                         | 0,924               | IV<br>(yetakchi) |
| Janubiy Koreya | 10,4%                     | 97%                         | 0,948               | IV<br>(yetakchi) |
| Germaniya      | 8,9%                      | 96%                         | 0,882               | IV               |
| Rossiya        | 5,1%                      | 88%                         | 0,793               | III–IV           |
| Qozog'iston    | 3,8%                      | 94%                         | 0,810               | III              |
| O'zbekiston    | 2,1%                      | 98%                         | 0,741               | II–III           |
| Tojikiston     | 0,8%                      | 42%                         | 0,534               | I–II             |

Qiziqarli jihat shundaki, O'zbekistonda internet qamrovi (98%) Germaniya (96%) va Qozog'iston (94%)dan yuqori bo'lsa-da, YaIMdagi IT-

sektori ulushi ancha past. Bu holat infratuzilma mavjudligi bilan uni samarali iqtisodiy ishlab chiqarishga aylantirish orasidagi tafovutni, ya'ni «raqamli paradoks» ni ifoda etadi va uning echimi kadrlar tayyorlash hamda innovatsion muhit shakllantirishda yotadi.

#### MUHOKAMALAR VA XULOSALAR

Tadqiqot natijalari shuni ko'rsatadiki, O'zbekiston raqamli iqtisodiyot evolyutsiyasining II–III bosqichlari chegarasida joylashgan bo'lib, IV bosqichga — sun'iy intellekt asosidagi iqtisodiyotga o'tish uchun bir nechta tizimli to'siqlarni bartaraf etishi lozim. Ushbu to'siqlar uch guruhga bo'linadi: infratuzilmaviy, institutsional va inson kapitali bilan bog'liq.

Infratuzilmaviy muammolar qatorida qishloq hududlarida yuqori tezlikli internet kanallarining yetishmasligi, ma'lumotlarni qayta ishlash markazlari (data center) sig'imini cheklanganligi va bulut hisoblash xizmatlarining narxi nisbatan yuqoriligi alohida ahamiyat kasb etadi. 2023-yilda O'zbekistonda internet trafigi 1 Gbit/s narxi 14,2 AQSh dollarini tashkil etgan bo'lsa, Estoniyada bu ko'rsatkich 1,8 AQSh dollarini tashkil qiladi (ITU, 2023).

Institutsional cheklovlar jihatidan olganda, shaxsiy ma'lumotlarni himoya qilish qonunchiligi (2023-yil tahriri)ning ayrim normalari xalqaro standartlardan hali farq qiladi; kiber xavfsizlik bo'yicha tarmoqlararo muvofiqlashtiruv mexanizmi zaif; startaplar uchun «sandbox» (sinovchi tartibga solish muhiti) hali to'liq ishga tushmagan.

Inson kapitali muammosi, ehtimol, eng dolzarb sanaladi. Yurtimizda 2023-yilda atigi 14 700 nafar IT-mutaxassis tayyorlangan bo'lsa, bozorning ehtiyoji 45 000 nafar atrofida baholangan. Bu to'liqlanmagan talabning 68%i tashkil etadi (ATKVazirlik ma'lumotnomasi, 2023). Koreya tajribasi shuni ko'rsatadiki, IT-ta'lim sektori nisbatini to'g'ri yo'lga qo'ygan davlatlar raqamli iqtisodiyotning ulushini 10 yil ichida YaIMning 8–10%igacha kengaytirish imkoniyatiga ega.

Shu bilan birga, O'zbekistonda muhim raqobat afzalliklari ham mavjud: demografik dividend (aholining 60%dan ziyodi 30 yoshdan kichik); geografik joylashuvi (Xitoy bilan Yevropa o'rtasida IT-xizmatlar xabiga aylanish imkoni); hukumatning kuchli siyosiy irodasi; va 2023-yilda IT Parklarda ro'yxatdan o'tgan 900 dan ortiq rezident kompaniyalarning mavjudligi.

Tadqiqot natijalari asosida uchta strategik yo'nalish taklif etiladi. Birinchidan, IT ta'limini kengaytirish doirasida 2030-yilgacha STEM mutaxassislar tayyorlovchi universitetlar sonini 1,5 baravarga ko'paytirish va xususiy IT-akademiyalarni soliq imtiyozlari orqali rag'batlantirish maqsadga muvofiq. Ikkinchidan, «raqamli paradoks»ni bartaraf etish uchun internet tezligi narxlarini erkinlashtirish hamda tarmoqlararo raqobatni kuchaytirish zarur. Uchinchidan, AI-asosidagi davlat xizmatlari (e-hukumat 3.0) joriy etish orqali iqtisodiy samaradorlikni oshirish va korrupsiya xavfini kamaytirish mumkin.

Prognoz sifatida ta'kidlash joizki, taklif etilayotgan choratadbirlar to'liq amalga oshirilgan taqdirda O'zbekistonda raqamli iqtisodiyotning YaIMdagi ulushi 2030-yilga kelib 5–6%ga etishi va yillik IT-eksport 2 mlrd. AQSh

dollaridan oshishi taxmin qilinadi, bu esa muallif tomonidan ishlab chiqilgan regressiya modeli asosida hisoblangan ( $R^2 = 0,94$ ,  $p < 0,01$ ).

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## **IMPROVING THE METHODOLOGY OF FUTURE PRIMARY TEACHERS IN USING PEDAGOGICAL PROGRAMS**

**Abstract.** *This article highlights the methodology for improving primary school teachers' skills in using pedagogical software. In the age of digitization, the effective use of modern software tools is a crucial factor in enhancing the quality of primary education. The article analyzes the problems encountered in developing teachers' knowledge and skills in the field of pedagogical software, the types of software, and opportunities for their application in the teaching process. Additionally, issues related to the methodologically correct integration of interactive learning platforms, virtual classrooms, and interactive programs in the improvement process are considered. The article proposes innovative approaches, practical training sessions, and ways to enhance curricula aimed at improving the digital competence of primary school teachers.*

**Keywords:** *primary education, pedagogical software, digital competence, methodology, improvement, interactive tools, teacher training, educational technologies.*

### **Introduction**

The development of modern information and communication technologies is imposing new demands on the education system. In the process of digital transformation, the importance of primary education is increasing, as it is the initial stage in shaping children's core competencies and preparing them for the future digital world. In the Republic of Uzbekistan, as part of the "Digital Uzbekistan-2030 strategy and the "Youth – Our Future" concept, the digitization of the education sector is being rapidly implemented. Under these circumstances, improving primary school teachers' skills in effectively using pedagogical software has become a pressing pedagogical challenge.

Pedagogical software is a set of software tools designed for organizing the educational process, delivering learning materials, assessing knowledge and skills, and individualizing education. For primary school teachers, the use of pedagogical software must be based not only on technological but also on didactic and psychological principles, as they directly influence the cognitive and psycho-emotional development of the younger generation.

### **Literature review and methods**

The process of improving primary school teachers' pedagogical software skills requires a series of methodological and methodological approaches. Modern

pedagogical research indicates that the development of teachers' digital competence should be considered not only through separate courses but also as a continuous and systematic process [1].

Types of pedagogical software and their role in primary education:

- Learning Management Systems (LMS)
- Interactive electronic textbooks and teaching manuals
- Didactic games and simulation programs
- Diagnostic and monitoring programs
- Virtual and Augmented Reality (VR/AR) technologies
- Artificial intelligence-based personalized learning platforms

According to international research (TPACK model - Mishra and Koehler, 2006), for effective use of pedagogical software, teachers must be able to integrate technological, pedagogical, and content knowledge. This model is particularly important in training primary school teachers, as they are tasked with teaching multiple subjects simultaneously [2].

Research conducted in the context of Uzbekistan indicates that the level of primary school teachers' use of pedagogical software is still insufficient. The following factors contribute to this:

1. Lack of technical equipment
2. Limited availability of specialized software
3. Teachers' psychological barriers towards digital technologies
4. Insufficient methodological manuals
5. Low effectiveness of the continuous professional development system [3]

### **Main directions of the improvement methodology**

1. Stage-by-Stage Improvement Model. A phased model is proposed for improving primary school teachers' pedagogical software skills:

First Stage - Basic Digital Skills:

- Basics of using computers and mobile devices
- Using office software and internet resources
- Working with simple interactive programs

Second Stage - Specialized Programs:

- Educational programs designed for primary school
- Working with interactive whiteboards and learning platforms
- Basics of creating multimedia materials

Third Stage - Integrated Approaches:

- Integrating pedagogical software with traditional teaching methods
- Using pedagogical software in individualized and differentiated learning
- Systems for evaluating and analyzing results

2. Interactive Teaching Methods. The following interactive methods are considered effective in the pedagogical software improvement process:

Master Classes and Practical Training: Demonstration lessons conducted by experienced methodologists to develop pedagogical software usage skills in real classroom settings.

Quizzes and Competitions: Competitions aimed at determining and encouraging the level of knowledge about pedagogical software tools.

Project Work: Teachers creating specialized teaching materials for their own classes, testing them in practice, and evaluating the results.

Simulation Games: Strengthening pedagogical software usage skills by modeling various pedagogical situations in a virtual classroom environment.

3. Electronic Educational Resources and Platforms. The following electronic resources are recommended for improving primary school teachers' skills:

Specialized Learning Platforms: MOOC (Massive Open Online Courses), video lessons, and interactive exercises designed for primary school teachers.

Methodological Portals: Specialized websites that allow teachers to exchange experiences, evaluate, and recommend new software products.

Mobile Applications: A collection of educational applications designed for primary school, enabling teachers to make effective use of their time on the go[4].

### **Results and discussion**

The process of improving primary school teachers' pedagogical software skills is complex and multifaceted. It should not be limited to teaching only technical skills. The main focus should be directed toward pedagogical effectiveness. Basic Principles of Improvement:

1. Continuity and Systematicity: Professional development should not be a one-time event but a continuous process.

2. Practical Orientation: All skills being taught must be immediately applicable in classroom practice.

3. Individual Approach: A differentiated approach that considers each teacher's initial level of preparation.

4. Reflection and Self-Assessment: Developing teachers' skills in analyzing their own activities and assessing the effectiveness of pedagogical software use.

Challenges and Ways to Overcome Them:

1. Technical Limitations: Equipping schools with modern technology and expanding opportunities for using cloud technologies and mobile applications.

2. Insufficient Methodological Support: Creating a network of methodological centers at each district and school level and staffing them with specialists in digital skills.

3. Motivational Issues: Implementing a system of incentives for teachers who effectively use pedagogical software, including raising their salaries and career opportunities.

4. Lack of Localization of Software: Developing and adapting local pedagogical software that takes into account national cultural and linguistic characteristics.

### **Conclusion**

Improving primary school teachers' pedagogical software skills is not only a technological but also a systematic pedagogical process that significantly enhances the quality of primary education. The improvement methodology should aim to develop teachers' digital competence, prepare them for active work with modern

educational technologies, and ultimately serve the comprehensive development of the younger generation [5].

In the future, it is advisable to conduct research in the following areas:

- Methodology for using artificial intelligence-based personalized learning systems in primary school settings.

- Integration of Virtual and Augmented Reality technologies in primary education.

- Development of systems for assessing and monitoring teachers' digital competence.

Primary school teachers' effective use of pedagogical software not only enhances their professional skills but also positively impacts the digital transformation of the entire education system.

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## GEODEMOGRAPHIC ZONING OF KASHKADARYA REGION AND ITS ECONOMIC GEOGRAPHICAL ASPECTS

**Abstract:** *The article analyzes the relationship between the economic and geographical aspects of the Kashkadarya region and its population growth through its geodemographic regionalization. The impact of the economic and geographical characteristics of the North-Eastern, Central and Western regions on their demographic situation and level of economic development is studied.*

**Keywords:** *Geodemographic regions, transport infrastructure, economic activity, zoning, Social infrastructure, population density, demographic stability, migration, migration balance, urbanization, natural population growth, birth rate, socio-economic development.*

Geo-demographic zoning is the process of analyzing the relationship between population and territory and dividing regions into territories based on socio-economic, environmental, and other factors. Economic geographic aspects play an important role in this process, as they are seen as a key factor in determining the level of development and prosperity of territories.

Kashkadarya region is considered an important driving force for development in the region due to its economic and geographical features, natural resources, and social infrastructure. Economic and geographical factors are of great importance as the main drivers of population growth, resource use, and interregional migration in the region. The research analyzes the relationship between the economic and geographical aspects of the Kashkadarya region and its population growth through its geodemographic zoning. The importance of economic and geographical aspects in geodemographic zoning is great, and it is carried out taking into account the economic, ecological and social factors of the region. Economic and geographical aspects determine the population density, economic sectors and the efficiency of resource use.

Kashkadarya region is divided into three main geodemographic regions based on the above principles: Northeastern, Central and Western regions. The economic and geographical characteristics of each region affect their demographic situation and level of economic development.

Northeastern region (Kitab, Shahrisabz, Yakkabog districts). The Northeastern region, consisting of mountainous and foothill areas, has a lower population density and level of economic development. The economic potential of this region is limited, and agriculture-based industries are developing. Limited land resources, shrinking water resources, and poor transport infrastructure in mountainous areas slow down economic activity. At the same time, the city of Shahrisabz has an average level of social infrastructure and

services, which ensures the stability of population growth. The district accounts for 26.8% of the population, while accounting for 15.7% of the region's area, with a population density of 209.4 people per 1 sq. km (Table 1).

The district is considered the leader in the region in terms of population density. In the North-Eastern district, the birth rate was 26.0 per thousand, the death rate was 4.4 per thousand, and the natural increase was 21.6 per thousand (Table 2). The district has the lowest natural increase in the region, which may be due to a number of factors. In particular, higher unemployment rates or slower economic growth may limit family fertility, migration of young and reproductive-age population to other regions, shrinking family size and composition, late marriage or factors that reduce the birth rate, and other factors may be the cause. Although the demographic indicators of the North-Eastern region are generally positive, the low natural growth rate deserves analysis. To ensure demographic stability and growth in this region, it is necessary to take measures to improve economic conditions, strengthen the health care system, and manage migration flows.

**Table 1.**  
**Main indicators of geodemographic districts of Kashkadarya region**  
**(01.01. 2024)**

| Geodemographic regions | Area, %     | Population, % | Density, person |
|------------------------|-------------|---------------|-----------------|
| <b>Northeast</b>       | <b>15,7</b> | <b>26,8</b>   | <b>209,4</b>    |
| Kitob                  | 6,1         | 8,0           | 161,1           |
| Shahrisabz             | 5,6         | 6,6           | 145,1           |
| Shahrisabz sh          | 0,2         | 4,2           | 2944            |
| Yakkabog‘              | 3,8         | 8,0           | 256,8           |
| <b>Central</b>         | <b>52,5</b> | <b>56,4</b>   | <b>133,9</b>    |
| Qarshi sh              | 0,3         | 8,3           | 3695            |
| Qarshi                 | 3,2         | 7,6           | 302,3           |
| Koson                  | 6,6         | 8,8           | 166,0           |
| Ko‘kdala               | 6,0         | 5,3           | 110,3           |
| Chiroqchi              | 3,9         | 7,5           | 237,0           |
| G‘uzor                 | 9,3         | 6,2           | 83,5            |
| Qamashi                | 9,3         | 8,2           | 110,1           |
| Dehqonobod             | 13,9        | 4,5           | 39,8            |
| <b>Western</b>         | <b>31,6</b> | <b>16,8</b>   | <b>66,6</b>     |
| Mirishkor              | 11,2        | 3,6           | 40,3            |
| Muborak                | 10,7        | 2,6           | 30,4            |
| Kasbi                  | 2,3         | 6,0           | 327,6           |
| Nishon                 | 7,4         | 4,6           | 78,9            |
| <b>Province</b>        | <b>100</b>  | <b>100</b>    | <b>124,6</b>    |

*The table was compiled based on data from the Kashkadarya regional statistical department.*



Central district (Karshi, Koson, Kokdala, Chiraqchi, Guzor, Kamashi, Dekhkanabad districts). The Central Region is considered the most economically developed region. The city of Karshi and its surrounding districts are characterized by industrial, service and agricultural sectors. The city of Karshi, being the economic center of the region, is considered the main driver of urbanization and industrial development. The growth of manufacturing and mining sectors in this region increases population density, creates new jobs and leads to a positive flow of migration. These factors lead to a lower population growth rate compared to other regions. The Central Geodemographic Region accounts for more than half of the region's population (52.5 and 56.4 percent), and its population density is 133.9 people per 1 sq. km, which is higher than the regional indicator (124.6 people).

The ratio of the territorial size of the central geodemographic region to its population, and the population density above the regional average, require in-depth study of the issues of socio-economic development, resource efficiency, and ecological sustainability. This situation indicates the existence of a significant imbalance between the territorial balance and the economic and geographical distribution of the population. As the analysis of high population density shows, migration flows, natural population growth rates, and urbanization processes are putting significant pressure on the economic activity and social infrastructure of this region.

To effectively manage the processes of social and economic development, it is necessary to take a number of measures. In particular, measures should be taken to control population density and balance migration. It is important to create economic opportunities in rural areas to prevent excessive concentration of the population in cities; To ensure the stable operation of water, electricity, transport and communal services, it is necessary to implement modernization programs, and new housing, schools and medical institutions should be built in densely populated areas; to ensure ecological balance, it is necessary to save water resources, control pollutants emitted by industrial enterprises and introduce systems for the efficient use of agricultural land; It is necessary to expand the opportunities for the population to engage in economic activity by increasing employment and applying innovative approaches to the local economy.

**Table 2.**

**Main indicators of natural population growth and mechanical movement of the geodemographic districts of Kashkadarya region (01.01. 2024)**

| Administrative units                      | Natural population growth (per 1000 population) | Birth and death rates of the population (per 1000 population) |            | Population activity indicators (per 1000 population) |                |
|-------------------------------------------|-------------------------------------------------|---------------------------------------------------------------|------------|------------------------------------------------------|----------------|
|                                           |                                                 | Birth                                                         | Death      | visitors                                             | those who left |
| <b>Northeastern geodemographic region</b> | <b>21,6</b>                                     | <b>26,0</b>                                                   | <b>4,4</b> | <b>2,6</b>                                           | <b>5,4</b>     |
| Kitob                                     | 23,4                                            | 27,4                                                          | 4,0        | 1,7                                                  | 4,8            |
| Shahrisabz                                | 20,4                                            | 24,8                                                          | 4,4        | 2,4                                                  | 5,9            |
| Shahrisabz city                           | 18,2                                            | 23,2                                                          | 5,0        | 4,6                                                  | 6,1            |
| Yakkabogʻ                                 | 24,3                                            | 28,7                                                          | 4,4        | 1,6                                                  | 4,9            |
| <b>Central geodemographic region</b>      | <b>25,3</b>                                     | <b>29,9</b>                                                   | <b>4,6</b> | <b>2,4</b>                                           | <b>4,0</b>     |
| Qarshi city                               | 21,7                                            | 26,4                                                          | 4,7        | 9,6                                                  | 8,3            |
| Qarshi                                    | 23,8                                            | 28,8                                                          | 5,0        | 5,5                                                  | 5,1            |
| Koson                                     | 23,4                                            | 27,4                                                          | 4,0        | 1,3                                                  | 2,7            |
| Koʻkdala                                  | 29,2                                            | 32,9                                                          | 3,7        | 0,005                                                | 0,1            |
| Chiroqchi                                 | 29,8                                            | 33,6                                                          | 3,8        | 0,9                                                  | 3,7            |
| Gʻuzor                                    | 24,4                                            | 29,4                                                          | 5,0        | 1,3                                                  | 3,4            |
| Qamashi                                   | 25,8                                            | 30,1                                                          | 4,3        | 0,3                                                  | 4,3            |
| Dehqonobod                                | 24,4                                            | 31,1                                                          | 6,7        | 0,2                                                  | 4,4            |
| <b>Western geodemographic region</b>      | <b>23,5</b>                                     | <b>28,5</b>                                                   | <b>5,0</b> | <b>2,5</b>                                           | <b>4,8</b>     |
| Mirishkor                                 | 23,8                                            | 29,2                                                          | 5,4        | 1,6                                                  | 3,5            |
| Muborak                                   | 20,4                                            | 25,4                                                          | 5,0        | 3,2                                                  | 6,7            |
| Kasbi                                     | 23,4                                            | 28,9                                                          | 5,5        | 1,9                                                  | 3,4            |
| Nishon                                    | 26,1                                            | 30,4                                                          | 4,3        | 3,5                                                  | 5,9            |
| <b>By region</b>                          | <b>24,2</b>                                     | <b>28,9</b>                                                   | <b>4,7</b> | <b>2,5</b>                                           | <b>4,6</b>     |

*The table was compiled based on data from the Kashkadarya regional statistical department.*

These measures will help achieve demographic and economic balance, ensure efficient use of natural resources, and ensure environmental safety. At the same time, these processes should be managed through constant scientific monitoring and planning.

The birth rate in the Central Geodemographic Region is 29.9 per thousand, the death rate is 4.6 per thousand, and the natural increase is 25.3 per thousand (Table 2). The region has the highest natural increase in the region. Chirakchi and Kokdala districts are considered to have the highest natural increase not only in the region, but also in the region (29.8 and 29.2 per thousand, respectively).

The natural growth rate of 25.3 per mille leads to a high natural increase in the region, which indicates an increase in labor resources and expansion of economic opportunities. However, high natural growth creates high demands for the provision of social services, in particular, education, healthcare, and the construction of residential facilities. At the same time, the high level of natural growth requires attention to environmental protection and the rational use of ecological resources. Protecting nature and ensuring ecological sustainability are important for the region to be compatible with the high level of growth.

The highest natural increase rates (29.8 and 29.2 per mille, respectively) are observed in the Chirakchi and Kokdala districts, indicating rapid population growth and increased economic activity in these regions. Such high demographic growth requires meeting the increasing demands of social infrastructure, creating new jobs, and training qualified personnel for the labor market. At the same time, for the economic development of the region, it is necessary to increase the efficiency of the use of key resources, such as land and natural resources.

The high demographic growth in the region is creating an additional burden on social infrastructure and services. Therefore, it is necessary to introduce advanced management systems in education, healthcare and other sectors for balanced growth and sustainable development. At the same time, measures aimed at improving the ecological state of the region, protecting the environment, and saving natural resources should be effective. In this regard, the development of scientific research, ecological monitoring, and data collection will help maintain the ecological stability of the region.

In general, the demographic growth process of the Central Geodemographic Region presents great opportunities for sustainable development, but also certain challenges. To ensure population growth, it is necessary to apply a comprehensive approach, while harmonizing economic, social and ecological systems. Thus, advanced management, strategic planning and measures are needed to ensure sustainable development in the region.

In the Central Geodemographic Region, migration indicators (incoming and outgoing) are average for the region, with 2.4 per mille incoming and 4.0 per mille outgoing. The migration balance is 2.6 per mille. The migration balance is highest in Dekhkanabad and Kamashi districts, which are 4.2 and 4.0 per mille, respectively. These districts rank 1st and 2nd in the region in this regard.

At the same time, for the sustainable development of the region, it is necessary to maintain harmony between social, economic and ecological systems. To regulate population growth, it is necessary to apply development

strategies based on advanced management, efficient allocation of resources and new technologies. Ensuring harmony between demographic changes and economic development will shape the stable future of the region.

Western region (Mirishkor, Mubarak, Kasbi, Nishon districts). The Western Region is considered one of the least developed regions in economic terms. This region mainly covers deserts and plains, with limited natural resources and water sources. However, the development of industrial production and the oil and gas industry in Mubarak has a positive impact on increasing the economic activity of this region and increasing population density. In other districts of the Western region, especially in the agricultural sector, water resources are limited, which affects population growth. The Western geodemographic region occupies 1/3 of the region's area (31.6%) and 2/5 of the population (16.8%), with a population density of 66.6 people per 1 sq. km., which is lower than the regional indicator (124.6 people). These data require special attention to the demographic and economic situation of the Western Region in the region, as its low population density and relatively small population compared to other regions may give rise to some social and economic problems. The fact that the Western Region occupies a large part of the territory, but has a relatively small population, may be due to several socio-economic factors. Low population density in this region can, in turn, mean a lack of access to infrastructure and services, including education, health care, transport and housing. This creates an inequitable distribution of resources and services, which in turn contributes to social inequality and slows down economic development. Population density below the regional average also presents opportunities for change and development. The Western Region, unlike many other regions, despite its very large territory, offers significant opportunities for the development of its own social and economic systems. These opportunities, in turn, can ensure the proper management of labor resources, the introduction of technological innovations, the diversification of production sectors, and the strengthening of agricultural potential.

The birth rate in the Western geodemographic region is 28.5 per thousand, the death rate is 5.0 per thousand, and the natural increase is 23.5 per thousand, and the region has the highest average natural increase in the region. Nishon district is considered to have the highest natural increase in the region (26.1 per thousand). These indicators constitute the lowest level of natural increase in the region. This situation indicates a limited population growth and a slowdown in demographic processes, which may negatively affect the development of economic and social systems in the region. Nishon district is considered to have the highest natural growth rate in the Western region, which indicates the unique demographic characteristics of the district. High natural growth contributes to the growth of the regional economy and social system, but at the same time, it can lead to an overload of resources and infrastructure, which requires the allocation of additional resources to meet the increased needs.

In general, the average natural growth rate and high mortality rate of the Western region limit the demographic and economic development of the region. To improve this situation, it is necessary to strengthen social, economic and health systems. Expanding medical services, improving education and health infrastructure, efficient resource allocation and rational use of labor resources play an important role in ensuring the sustainable development of the region.

Mubarak district, as the most urbanized region in the region, has the highest negative indicator in terms of net migration (–3.5 per mille). This negative indicator, despite being an industrialized region, indicates the insufficient economic and social conditions available within the district, problems in the labor market, and limited infrastructure. The high migration balance in Mubarak district, in particular, may reflect a lack of jobs, poor living conditions, and other economic factors. It is necessary to review social and economic policies to improve migration processes in the region and increase the well-being of the population. The negative migration balance requires the development of appropriate strategies to retain the population in the region and attract new immigration flows. These strategies should be aimed at positively influencing population migration through the expansion of the labor market, the creation of new jobs, the development of infrastructure, and the improvement of living conditions.

In conclusion, the presence of a negative migration balance in the Western geodemographic region requires an analysis of the economic and social conditions in the region. The high negative migration balance in Mubarak district indicates the weakness of labor resources and living conditions, despite the industrialization of the district. To eliminate this situation, it is necessary to implement a complex of economic, social and infrastructural measures, manage migration processes and ensure stable development in the region. The economic potential of the Western region, in particular, the limited availability of water resources and the low development of industry are contributing to population migration.

The geodemographic zoning of the Kashkadarya region is based on a thorough analysis of its economic, ecological and social characteristics. This process, taking into account the region's natural resources, economic sectors, social infrastructure and ecological factors, serves to ensure the sustainable development of each region. In addition, geodemographic zoning plays an important role in ensuring socio-economic equality and maintaining ecological integrity in the region. By reducing disparities between regions, effectively distributing social services, and optimizing economic activity, it is possible to achieve stable and equitable development of the Kashkadarya region.

The geodemographic zoning of the Kashkadarya region was carried out taking into account economic and geographical aspects and demographic indicators. It affects the economic potential of the regions, the use of resources, the development of agricultural and industrial sectors, population growth, and migration processes. While improving economic and social infrastructure,

especially in the Central and Northeastern regions, supports population growth, resources and infrastructure in the Western regions need to be developed.

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## **USING ELECTRONIC EDUCATIONAL RESOURCES (EER) IN TEACHING FOREIGN LANGUAGES**

**Annotation:** *The main purpose of this scientific article is to study the benefits of using various mass media in teaching foreign languages, problems of integration of information and communication technologies into the traditional educational process. This article also presents a selection of current foreign-language printed publications, their versions in electronic format, as well as Internet sites of international public information TV channels and news agencies. With the advent of digital platforms, the nature of modern media has changed, they began to be unidirectional. As well as, we emphasize the exceptional efficiency use of authentic material and a wide range of illuminated topics in the period press, linguistic actuality of media sources, their informative saturation for the formation of skills and abilities of inter language and intercultural communication in the fields of social, household, socio cultural and professional communication.*

**Keywords:** *innovation, methodology, computer technology, internet resources, electronic education, communication.*

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## **XORIJIY TILLARNI O'QITISHDA ELEKTRON TA'LIM RESURSLARIDAN (EER) FOYDALANISH**

**Annotatsiya:** *Ushbu ilmiy maqolaning asosiy maqsadi xorijiy tillarni o'qitishda turli ommaviy axborot vositalaridan foydalanishning afzalliklarini hamda axborot-kommunikatsiya texnologiyalarini an'anaviy ta'lim jarayoniga integratsiya qilish bilan bog'liq muammolarni o'rganishdan iborat. Maqolada xorijiy tillarga oid zamonaviy bosma nashrlar, ularning elektron formatdagi versiyalari, shuningdek xalqaro axborot telekanallari va axborot agentliklarining internet saytlari misol tariqasida keltirilgan. Raqamli platformalarning paydo bo'lishi bilan zamonaviy ommaviy axborot vositalarining tabiati ham o'zgardi va ular yangi kommunikatsiya shakllarini shakllantira boshladi. Shuningdek, maqolada autentik materiallardan samarali foydalanishning muhimligi, davriy matbuotda yoritiladigan mavzularning keng qamrovi, media manbalarining*

*lingvistik dolzarbligi hamda ularning ijtimoiy, maishiy, madaniy va kasbiy muloqot sohalarida tillararo va madaniyatlararo kommunikatsiya ko'nikmalarini shakllantirishdagi informativ ahamiyati alohida ta'kidlangan.*

***Kalit so'zlar:*** innovatsiya, metodologiya, kompyuter texnologiyalari, internet resurslari, elektron ta'lim, kommunikatsiya va boshqalar.

The use of computer technology is one of the key factors in improving the quality of teaching foreign languages in higher education institutions, allowing us to create the most productive learning environment. Currently, information and communication technologies have firmly entered our life; have become an integral part of modern society and education. You will not be surprised by the ability to select and use a variety of Internet resources, including in teaching a foreign language. However, it is not always possible to find a suitable electronic educational resource that fully corresponds to the purpose of the lesson and the needs of students. In this case, the question arises of creating your own digital materials. And here a problem arises - teachers are not always ready to solve such a problem. Many of them simply abandon the idea of developing an ESM for a number of reasons, namely: the low level of ICT literacy and ICT competence of the teacher himself, the information "vacuum" in which he often finds himself, as well as lack of time, which shortens the process of preparing for the lesson to a minimum. Digital resources facilitate the organization of educational activities, for example, when automating a control system, which federal standards should be based on when creating didactic materials, and how you can accelerate the development of an ESM.

EER is an educational resource in digital form with a specific structure, subject content and metadata. The structure, methods, tools for the development of ERM is determined by its functional purpose and the specifics of its application in specific information and educational environment. In this case, the subject content should correspond to the level of the received education and contribute to the formation of the competencies specified by the program of the discipline, and the metadata (i.e., the description of the resource) should include a brief description of all the parameters of the ESM. A single standard metadata model allows you to systematize and keep records of existing electronic resources, and also makes it possible to find them on the Internet. It should be noted that there are many classifications of digital educational resources, and this creates certain problems in their cataloging. So, depending on the specific defining characteristic, ERM are subdivided into several groups:

- by type (textbook, reference book, laboratory practice, testing system);
- on a functional basis that determines the importance and place of ESM in the educational process (program-methodical, educational-methodical, training, auxiliary);
- by the nature of the information provided (curriculum, curriculum, methodological instructions, assignments for practical exercises, textbook, workshop);

- by the format of basic information (text, graphic, sound, software, multimedia);
- by the form of presentation (convection, programmed, problematic, combined);
- by the nature of interaction with the user (deterministic, non-deterministic);
- by purpose (general secondary, specialized secondary, higher, specialists);
- on the organization of the text of the resource (mono editions, collections);
- by the availability of a printed equivalent (electronic analogue of a printed publication, an independent electronic tool);
- by the technology of distribution (local, network, combined distribution).

In accordance with the presented classification, one and the same resource can be characterized in different ways, for example: by type - a computer textbook, by the format of information - multimedia, by the form of presentation of the material - a combined educational publication, by the nature of user interaction - deterministic, by purpose - general average, according to the organization of the text - a collection, according to the presence of a printed equivalent - an independent medium, according to the technology of distribution - local. In addition, attention should be paid to a number of didactic, organizational and technical requirements for educational resources. Let us dwell in more detail on the consideration of the didactic principles of constructing an ERM. These include:

- pedagogical expediency of using the resource in the educational process,
- scientific nature of the content, i.e. sufficient depth, correctness and scientific reliability of the presented material, as well as taking into account the latest scientific achievements in the studied subject area,
- systematic and consistent training - consistent and systematic assimilation of certain knowledge, skills and abilities,
- accessibility - compliance of the complexity and depth of the material with the age and individual characteristics of students,
- problematic - the creation of an educational problematic situation, for the solution of which active mental activity is required,
- visibility - an emphasis on the sensory perception of the objects under study to increase the efficiency of assimilation of the material,
- conscientiousness, independence of learning - students' understanding of the ultimate goals and objectives, the ability to independently search and extract information, make independent decisions,
- strength of the acquired knowledge - deep comprehension and processing of the material, its memorization and application in practice,
- modularity and variability of presentation - the division of the content of the ESM into training modules and micro modules, minimal in volume, but closed in content, due to which the choice of an individual learning path is available.

ESM should also ensure the fulfillment of the requirements of interactivity, adaptability, consistency and structural and functional coherence of the material, integrity and continuity of the learning cycle. Regardless of the purpose, method of

use or technology of implementation, the basis of any didactic tool, including ESM, is the educational material of the studied subject area. The creation of an electronic resource includes 2 stages: preparation of the material and its layout. First, the teacher selects sources, develops the main content, structures and processes data, both textual and graphic, multimedia. At the first stage, it is possible to use general-purpose software: text and graphic editors (Word, Paint, Photoshop, Corel Draw, Picture Publisher), audio and video digitizing programs (Movie Maker, Video Pad Video Editor, Wave Editor, Free Audio Editor).

The teacher can create materials not only for the whole course, but also for individual lessons and provide access from any, even mobile platform, since the finished resource is saved both in the local version (for recording on media) and in the online version. As an example, consider the iSpring Suite for creating multimedia ESM with embedded YouTube and Flash videos, interactive exercises and various types of test tasks. We chose this program for a number of reasons: firstly, it has a simple, intuitive interface, as it is an add-on to the popular and most widespread Microsoft PowerPoint presentation editor (PPT). Secondly, the application makes it possible to create various types of ERM: courses, tests, interactive tasks, simulators, video lessons. To do this, it is enough to find a suitable template or layout in the library of ready-made content. Thirdly, presentation materials are easily converted into electronic courses in SCORM format, which allows them to be integrated into any distance learning systems. And finally, the created ERM can be used not only on personal computers, but also on mobile devices that almost every student has. In this case, even insufficient technical equipment of the office does not prevent the use of ICT in the educational process.

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## **A COMPARATIVE ANALYSIS OF AMERICAN AND BRITISH VARIETIES OF ENGLISH**

**Annotation:** *This article presents a comparative analysis of American and British varieties of English, focusing on their phonetic, lexical, grammatical, and semantic differences. The study highlights how historical, cultural, and social factors have influenced the development of these two main varieties of English. By examining vocabulary usage, pronunciation patterns, and syntactic structures, the paper aims to provide a comprehensive understanding of the distinctions and similarities between American and British English. The findings of this scientific article are intended to support linguists, language learners, and educators in recognizing the unique features of each variety and improving cross-cultural communication*

**Keywords:** *Differences, Comparison, Phonetics, Lexis, Grammar, Semantics, Linguistics, Varieties.*

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## **AMERIKA VA BRITANIYA INGLIZ TILI VARIANTLARINING QIYOSIY TAHLILI**

**Annotatsiya:** *Ushbu maqolada Amerika va Britaniya ingliz tili variantlarining qiyosiy tahlili keltirilgan bo'lib, ularning fonetik, leksik, grammatik va semantik farqlari o'rganilgan. Tadqiqot ushbu ingliz tili variantlarining shakllanishida tarixiy, madaniy va ijtimoiy omillar qanday rol o'ynaganini yoritadi. Lug'at birliklaridan foydalanish, talaffuz xususiyatlari hamda sintaktik tuzilmalarning tahlili orqali maqola Amerika va Britaniya ingliz tili o'rtasidagi farq va o'xshashliklarni har tomonlama tushuntirishni maqsad qiladi. Ushbu ilmiy maqola natijalari tilshunoslar, til o'rganuvchilar hamda pedagoglarga ingliz tilining har ikki variantining o'ziga xos xususiyatlarini anglashda va madaniyatlararo muloqotni yaxshilashda yordam beradi.*



*Kalit so‘zlar: farqlar, qiyoslash, fonetika, leksika, grammatika, semantika, tilshunoslik, til variantlari va boshqalar.*

Differences in pronunciation between American English (AmE) and British English (BrE) can be divided into differences in accent and differences in the pronunciation of individual words in the lexicon. Here, we have observed differences in all phonological aspects such as in stress, intonation, phoneme and syllable.

For many loanwords from French, AmE has final-syllable stress, while BrE stresses an earlier syllable. Most 2-syllable verbs ending in -ate have first-syllable stress in AmE and second-syllable stress in BrE. Where the syllable preceding the suffixes -ary, -ery, -ory, -mony or -ative is unstressed, AmE pronounces the penultimate syllable with a full vowel sound: /-eri/ for -ary and -ery, /-ɔ:ri/ for -ory, /-mooni/ for -mony and /-etiv/ -ative. BrE reduces the vowel to a schwa or even elides it completely: [-əri] or [-ri].

There are differences in pronunciation of some sounds as well: the most important difference is in letter R. British people only pronounce the letter R when it is followed by a vowel. American people pronounce this letter always. A final Schwa is pronounced very very weak in both BrE and AmE, but if it happens at the end of speech (if after the schwa we pause or stop), then in BrE it often opens and becomes a sound very similar to / ʌ /, but in AmE it doesn't change. Moreover, there are differences in vowels [ /ɒ/ , /ʌ/ , /æ/ ] and the consonant [t] which is pronounced like [d] in AmE between vowels.

Aside from spelling and vocabulary, there are certain grammar differences between British and American English. For instance, in American English, collective nouns are considered singular (e.g. The band is playing). In contrast, collective nouns can be either singular or plural in British English, although the plural form is most often used (e.g. The band are playing). The British are also more likely to use formal speech, such as 'shall', whereas Americans favour the more informal 'will' or 'should'. Americans, however, continue to use 'gotten' as the past participle of 'get', which the British have long since dropped in favour of 'got'.

'Needn't', which is commonly used in British English, is rarely, if at all used in American English. In its place is 'don't need to'. In British English, 'at' is the preposition in relation to time and place. However, in American English, 'on' is used instead of the former and 'in' for the latter. In spoken American English, it is very common to use the simple past tense as an alternative in situations where the present perfect would usually have been used in British English.

American and British cultures are fundamentally different in their histories, economies, environments, and social organizations. Although spoken American and British English are generally mutually intelligible, there are enough differences to cause misunderstandings or even a complete failure of

communication. So, it is important to know lexical and semantic differences between British and American English.

Most differences can be found in ordinary life, especially in oral speech. In particular, attention must be paid to false cognates. For instance, British English 'suspenders' are called 'garters' in US English, which use 'suspenders' for the British 'braces'. This also occurs for American 'shorts' that are British 'underpants'; American 'pants' are British 'trousers'. Naturally, awareness of lexical differences is not only for sake of linguistic curiosity.

Sections have briefly given a description of lexical differences in the fields of housing, transport, shopping, food, and numerical systems, as part of everyday language that could be quite confusing. Some words which are typically taught as examples of US/UK differences were also quite obscure for the US sample, such as 'lorry/ truck', 'coach / bus', and 'full stop/period'.

Only a direct contact with the other language or a specific study on the differences can improve mutual intelligibility between the two varieties of English, admitting and respecting their differences.

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**TO'QIMA VA A'ZOLARNING STRUKTUR-FUNKSIONAL TUZILISHINI  
ORGAN DARAJASIDAN HUYAYRA DARAJASIGACHA  
NEYROTARMOQLI REKONSTRUKSIYA ORQALI IYERARXIK  
O'RGANISH**

**Аннотация:** So'nggi yillarda raqamli patologiya, 3D tasvirlash va sun'iy intellekt texnologiyalarining rivojlanishi biologik to'qimalarning iyerarxik tuzilishini o'rganish imkoniyatlarini kengaytirdi. Ushbu tadqiqotda organ darajasidan subhujayraviy darajagacha morfologik tuzilmalarni chuqur o'rganish (CNN, U-Net) va 3D rekonstruksiya algoritmlari yordamida integrativ tahlil qilish metodologiyasi ishlab chiqildi. Natijalar gistologik tasvirlarda hujayra konturlarini 92–96 % aniqlikda, 3D rekonstruksiyani esa Dice koeffitsienti 0,89–0,94 oralig'ida baholash imkonini berdi (Ronneberger et al., 2015; Litjens et al., 2017), bu esa patologik o'zgarishlarni erta aniqlash, struktur-funksional bog'liqliklarni baholash va individual prognozlash modellarini yaratishda neyrotarmoqli yondashuvning muhim ilmiy-amaliy ahamiyatini tasdiqlaydi.

**Ключевые слова:** 3D iyerarxik modellashtirish, neyrotarmoq, gistologiya, to'qima, hujayra.

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**HIERARCHICAL LEARNING OF THE STRUCTURE–FUNCTION  
ORGANIZATION OF TISSUES AND ORGANS FROM THE ORGAN**

## LEVEL DOWN TO THE CELLULAR LEVEL THROUGH NEURAL NETWORK-BASED RECONSTRUCTION

**Annotation:** *In recent years, the rapid advancement of digital pathology, three-dimensional imaging, and artificial intelligence technologies has significantly expanded the possibilities for studying the hierarchical organization of biological tissues. The present study developed a methodology for integrative analysis of morphological structures from the organ level down to the subcellular level using deep learning approaches (convolutional neural networks, U-Net architecture) and 3D reconstruction algorithms. The results demonstrated the ability to delineate cell contours in histological images with an accuracy of 92–96% and to achieve 3D reconstruction performance in the range of Dice coefficient 0.89–0.94 (Ronneberger et al., 2015; Litjens et al., 2017). These findings confirm the substantial scientific and practical value of neural network-based approaches in early detection of pathological changes, evaluation of structure–function relationships, and development of individualized prognostic models.*

**Key words:** 3D hierarchical modeling, Neural network, Histology, Tissue, Cell.

**Dolzarbli.** Biologik tizimlarning molekulyar-hujayra-to‘qima-organ darajalaridagi iyerarxik tashkiloti zamonaviy morfologiya va patofiziologiyaning muhim yo‘nalishlaridan biridir. Klassik gistologik usullar 2D tasvirlar bilan cheklangan bo‘lsa, chuqur o‘rganish algoritmlari 3D mikroarxitekturani yuqori aniqlikda tahlil qilish imkonini berdi: 2015–2023 yillarda tibbiy tasvirlarda diagnostik aniqlik ko‘pincha 90 % dan oshdi, ayrim onkologik holatlarda patologlar darajasiga yetdi yoki undan yuqori natijalar ko‘rsatdi (Esteve et al., 2017; Litjens et al., 2017; Campanella et al., 2019). Surunkali noinfeksion kasalliklar global o‘limning 70 % dan ortig‘iga sabab bo‘lib, ularning asosida to‘qima va hujayra darajasidagi o‘zgarishlar yotganligi sababli, neyrotarmoqli multi-scale rekonstruksiya asosidagi integrativ tahlil fundamental bilimlar va klinik amaliyot – diagnostika, prognozlash va personalizatsiyalashgan tibbiyot uchun dolzarb ahamiyat kasb etadi.

**Tadqiqotning maqsadi.** Tadqiqotning maqsadi organ darajasidan subhujayraviy darajagacha biologik tuzilmalarni neyrotarmoqli rekonstruksiya orqali iyerarxik modellashtirish va ularning struktur-funksional bog‘liqligini aniqlashdan iborat. Bunga erishish uchun tasvirlarni raqamlashtirish va normalizatsiya qilish, U-Net modelini optimallashtirish, 3D rekonstruksiya algoritmlarini ishlab chiqish, morfometrik parametrlarni avtomatik hisoblash hamda struktur va funksional ko‘rsatkichlar o‘rtasidagi korrelyatsion tahlilni amalga oshirish vazifalari belgilandi.

**Tadqiqot usullari.** Tadqiqotda 120 ta gistologik preparat (H&E bo‘yalgan, 40×–400× skanerlangan) va 60 ta yuqori aniqlikdagi MRT/KT tasviri tahlil qilindi. Tasvirlar Gaussian filtrlash, kontrast normallashtirish va rang

dekonvolyutsiyasi orqali oldindan ishlov berildi. U-Net arxitekturasida (Ronneberger et al., 2015) asosida segmentatsiya modeli 80/20 taqsimotda o'qitilib, Dice, IoU, precision va recall bilan baholandi. Ketma-ket kesimlardan marching cubes va volumetrik interpolatsiya yordamida 3D rekonstruksiya amalga oshirildi. Morfometrik parametrlar parametrik va noparametrik testlar bilan tahlil qilindi ( $p < 0,05$ ).

### **Tadqiqot natijalari.**

Neyrotarmoqli segmentatsiya natijalari bo'yicha hujayra konturlarini aniqlash aniqligi  $94,2 \pm 1,8$  %, Dice koeffitsienti  $0,91 \pm 0,03$ , IoU esa  $0,87 \pm 0,04$  ni tashkil etdi. Uch o'lchamli rekonstruksiya yordamida to'qima mikroarxitekturasining fazoviy parametrlari baholanib, hujayra zichligi va kapillyar tarmoq zichligi o'rtasida kuchli musbat korrelyatsiya aniqlandi ( $r = 0,78$ ;  $p < 0,01$ ). Onkologik o'zgarishlar mavjud namunalarida yadro maydonining o'rtacha qiymati 28–35 % ga oshgani qayd etildi ( $p < 0,01$ ), bu klassik morfologik mezonlar bilan mos keladi (Litjens et al., 2017). Taklif etilgan modelning umumiy diagnostik aniqligi 93 % ni tashkil etib, qo'lda segmentatsiya usuliga nisbatan 15–20 % tezroq bajarilishi va yuqori takrorlanuvchanlik ko'rsatkichlariga ega ekanligi aniqlandi.

### **Xulosa.**

Neyrotarmoqli rekonstruksiya organ, to'qima va hujayra darajasidagi struktur elementlarni yuqori aniqlikda aniqlash imkonini beradi; U-Net asosidagi segmentatsiya modeli gistologik tasvirlarda Dice koeffitsientini 0,9 dan yuqori darajada ta'minlaydi. Uch o'lchamli iyerarxik modellash biologik tizimlarning fazoviy tashkilotini chuqurroq tushunishga yordam beradi, aniqlangan struktur-funksional korrelyatsiyalar esa patologik jarayonlarni erta bosqichda aniqlash uchun istiqbolli biomarker sifatida xizmat qilishi mumkin. Ushbu yondashuv personalizatsiyalashgan tibbiyot, raqamli patologiya va regenerativ tibbiyot sohalarda keng qo'llanilish potentsialiga ega.

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## **KOLLABORATSIYA VA KREATIVLIK KOMPETENSIYALARINI TARBIYA FANINING UZVIYLGIDA RIVOJLANTIRISH**

**Annotatsiya.** Mazkur maqolada tarbiya fanida kollaboratsiya va kreativlik kompetensiyalarini shakllantirishning pedagogik ahamiyati, ularni ta'lim jarayoniga integratsiya qilish yo'llari hamda samarali metod va texnologiyalar tahlil qilinadi. Shuningdek, tarbiya fanining uzviyligi asosida o'quvchilarda ijtimoiy faollik, mustaqil fikrlash va jamoada ishlash ko'nikmalarini rivojlantirish masalalari yoritiladi.

**Kalit so'zlar:** tarbiya fani, kollaboratsiya, kreativlik, kompetensiya, uzviylik, interfaol metodlar.

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## **DEVELOPMENT OF COLLABORATION AND CREATIVITY COMPETENCIES IN THE CONTEXT OF EDUCATIONAL SCIENCE**

**Abstract.** This article analyzes the pedagogical importance of forming collaboration and creativity competencies in educational science, ways of integrating them into the educational process, and effective methods and technologies. Also, the issues of developing social activity, independent thinking, and teamwork skills in students based on the context of educational science are covered.

**Keywords:** educational science, collaboration, creativity, competence, coherence, interactive methods.

**Kirish.** Bugungi globallashuv va axborotlashgan jamiyat sharoitida ta'lim tizimi oldiga nafaqat bilim berish, balki o'quvchilarda hayotiy kompetensiyalarni shakllantirish vazifasi qo'yilmoqda. Xususan, kollaboratsiya (hamkorlikda ishlash) va kreativlik (ijodiy fikrlash) kompetensiyalari zamonaviy shaxsning muhim sifatleri hisoblanadi. Bu kompetensiyalarni rivojlantirishda tarbiya fani muhim o'rin tutadi, chunki u shaxsning ma'naviy-axloqiy, ijtimoiy va fuqarolik sifatlarini shakllantirishga xizmat qiladi.

**Tarbiya fanida kollaboratsiya kompetensiyasini rivojlantirish**



Kollaboratsiya kompetensiyasi o'quvchilarning jamoada ishlash, o'zaro muloqot qilish, mas'uliyatni bo'lishish va umumiy maqsad sari birgalikda harakat qilish qobiliyatini anglatadi. Tarbiya fanida ushbu kompetensiyani rivojlantirish quyidagi yo'llar orqali amalga oshiriladi:

- guruhli va juftlikda ishlash metodlaridan foydalanish;
- muammoli vaziyatlar asosida bahs-munozaralar tashkil etish;
- ijtimoiy loyihalar va jamoaviy tadbirlarni rejalashtirish;
- rolli o'yinlar va hayotiy vaziyatlarni modellashtirish.

Bunday faoliyatlar o'quvchilarda o'z fikrini erkin ifodalash, boshqalarni tinglash va hurmat qilish ko'nikmalarini shakllantiradi.

### **Kreativlik kompetensiyasini shakllantirishning pedagogik asoslari**

Kreativlik kompetensiyasi shaxsning noodatiy fikrlashi, muammolarga yangicha yondashuvi va original yechimlar topa olish qobiliyatini ifodalaydi. Tarbiya fanida kreativlikni rivojlantirish uchun:

- ochiq savollar va erkin fikrlashga undovchi topshiriqlardan foydalanish;
- ijodiy loyihalar, insholar va sahnalashtirish ishlari tashkil etish;
- milliy va umuminsoniy qadriyatlarni tahlil qilish orqali mustaqil xulosalar chiqarishga yo'naltirish;

- innovatsion pedagogik texnologiyalarni joriy etish muhim ahamiyatga ega.

Bu jarayonda o'qituvchi yo'naltiruvchi va motivator rolini bajaradi.

**Tarbiya fanining uzviyligi va kompetensiyalar integratsiyasi.** Tarbiya fanining uzviyligi uning boshqa fanlar, hayotiy tajriba va ijtimoiy muhit bilan chambarchas bog'liqligida namoyon bo'ladi. Kollaboratsiya va kreativlik kompetensiyalarini rivojlantirishda fanlararo integratsiya, uzluksiz tarbiya tamoyili va maktab-oila-jamiyat hamkorligi muhim ahamiyat kasb etadi. Bu esa o'quvchilarda barqaror ijtimoiy pozitsiya va faol fuqarolik ongini shakllantirishga xizmat qiladi.

Interfaol metodlarning ahamiyati. Interfaol metodlar o'quvchilarning darsdagi faolligini oshiradi. Tarbiya fanida "Aqliy hujum", "Klaster", "Baliq skeleti", "Debat" kabi metodlar kollaboratsiya va kreativlikni rivojlantirishda samarali hisoblanadi.

Loyiha asosida o'qitish. Loyiha faoliyati o'quvchilarning mustaqil izlanish olib borish, jamoada ishlash va ijodiy mahsulot yaratish ko'nikmalarini rivojlantiradi. Tarbiya fanida loyihalar orqali o'quvchilar ijtimoiy muammolarni tahlil qilishni o'rganadilar.

Tarbiya fanining tarbiyaviy natijalari. Tarbiya fanida kollaboratsiya va kreativlik kompetensiyalarini rivojlantirish natijasida:

- ijtimoiy faol shaxs,
  - mas'uliyatli va tashabbuskor o'quvchi,
  - ijodiy fikrlovchi yoshlar
- shakllanadi.

**Xulosa.** Xulosa qilib aytganda, tarbiya fanida kollaboratsiya va kreativlik kompetensiyalarini uzviylik asosida rivojlantirish o'quvchilarning shaxsiy va ijtimoiy kamolotini ta'minlaydi. Zamonaviy pedagogik yondashuvlar va interfaol

metodlardan samarali foydalanish orqali tarbiya fanining ta'lim-tarbiya jarayonidagi roli yanada kuchayadi. Tarbiya fanining uzviyligi asosida kollaboratsiya va kreativlik kompetensiyalarini rivojlantirish o'quvchilarning har tomonlama barkamol shaxs bo'lib yetishishida muhim ahamiyat kasb etadi. Zamonaviy pedagogik yondashuvlar va interfaol metodlardan foydalanish ushbu jarayonning samaradorligini oshiradi. Natijada jamiyat uchun zarur bo'lgan ijodkor, hamkorlikka tayyor va mas'uliyatli yoshlar tarbiyalanadi.

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## MHXS ASOSIDA ISHLAB CHIQARISH XARAJATLARI HISOBI

**Annotatsiya:** Ushbu maqolada xo'jalik yurituvchi subyektlarda tovar-moddiy zahiralar hisobini ikki xil usulda — BXMS (Buxgalteriya hisobining milliy standartlari) va MXXS (Moliyaviy hisobotning xalqaro standartlari) asosida yuritish masalalari ko'rib chiqiladi. Ishlab chiqarish xarajatlarini hisobga olish va tannarxni shakllantirish jarayoni o'rganiladi. Shuningdek, maqolada tannarxning korxona moliyaviy barqarorligiga ta'siri ham tahlil etiladi.

**Kalit so'zlar:** Tannarx, ishlab chiqarish xarajatlari, BXMS, MXXS, COS (cost of sales), inventory, purchase, moliyaviy barqarorlik.

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## ACCOUNTING OF PRODUCTION COSTS BASED ON INTERNATIONAL FINANCIAL REPORTING STANDARDS

**Annotation:** This article examines the accounting of inventories in business entities using two methods — according to National Accounting Standards (NAS) and International Financial Reporting Standards (IFRS). The processes of recording production costs and forming product cost are studied. The article also analyzes the impact of production cost on the financial stability of the enterprise.

**Keywords:** Cost of goods sold, production costs, BXMS, MXXS, COS (cost of sales), inventory, purchase, financial stability.

Mamlakatimizda faoliyat yuritayotgan xo'jalik yurituvchi subyektlarning buxgalteriya hisobini yurtish uchun moliya vazirligi tomonidan 14 avgust 1998-yilda buxgalteriya hisobining milliy standartlari qabul qilindi. Uzoq yillar davomida respublikada barcha xo'jalik yurituvchi subyektlarda buxgalteriya hisobi aynan ushbu milliy standartlar asosida yuritildi. Buning o'ziga yarasha afzalliklar ham bor. Biroq xalqaro savdo aloqalari kengayishi, mamlakatimizga xalqaro investorlarning qiziqishi ortishi natijasida xo'jalik yurituvchi subyektlarning moliyaviy hisobotlarini tayyorlash va topshirishni xalqaro

standartlar asosida yuritish ustuvor vazifaga aylandi. So'nggi yillarda mamlakatimizda bosqichma-bosqich BXMS dan MXXS o'tishi jarayoni sodir bo'lmoqda. Hozirgi kunga kelib yirik korxonalar, sug'urta tashkilotlari, banklar barcha moliyaviy hisobotlarini MXXS asosida topshirishmoqda. Xususan ishlab chiqarish faoliyati bilan shug'ullanuvchi yirik korxonlar ham MXXS asosida moliyaviy hisobot tayyorlashmoqda. Buning natijasida Tovar-moddiy zahiralar hisobini yuritishda BXMS va MXXS dagi o'xshashliklar va farqli jihatlar ko'rib chiqish va tahlil qilish imkoniyati paydo bo'ldi. Aynan ushbu jihatlarni yaxshiroq bilish moliyaviy hisobotlar tayyorlashni milliy standartlaridan xalqaro standartlariga o'tish jarayonida yo'l qo'yilishi mumkin bo'lgan xato va kamchiliklarni oldini olish imkonini beradi. Chunki tovar-moddiy zahiralar hisobini to'g'ri yuritmaslik korxona moliyaviy hisobotlarini tuzishda qator kamchiliklar yuzaga kelishiga olib keladi. Tovar moddiy zahiralar korxonaning asosiy moliyaviy ko'rsatkichlardan biri bo'lgan tannarxga ta'sir o'tkazadi.

Dastlab tovar-moddiy zahiralar hisobini milliy standartlar asosida yuritishni huquqiy asoslari va qo'llanilishi ko'rib chiqamiz. O'zbekiston Respublikasi Moliya vazirligi tomonidan ishlab chiqilgan milliy standartlarning 4-sonli "Tovar-moddiy zahiralar", 19-sonli "Inventarizatsiya tashkil etish va o'tkazish" va 21-sonli "Xo'jalik yurituvchi subyektlarning moliyaviy xo'jalik faoliyati buxgalteriya hisobi hisobotlar rejasi va uni qo'llash bo'yicha yo'riqnoma" lar tovar moddiy zahiralar hisobini milliy standartlar asosida yuritishni huquqiy asoslarini tashkil etadi. Mamlakatimizdagi ko'plab korxonalar aynan shular asosida tovar-moddiy zahiralar hisobini yuritadi. Tovar moddiy zahiralar qiymati 1000 hisob raqamlarda pulda aks ettiriladi. Ular ombordan ishlab chiqarishga berilganda 2010 hisob raqamga o'tkaziladi. O'z qiymatini shu yo'sinda tannarxga o'tkazadi.

Tovar moddiy zahiralar moliyaviy hisobotning xalqaro standartlarida IAS 2 "Inventories" nomli standart asosida yuritiladi. Xalqaro standartlarda tovar-moddiy zahiralar "purchase" deb nomlanadi. Ushbu standartga muvofiq tannarx (cost of sales) quyidagi formula orqali aniqlanadi:  $COS = \text{Opening inventory} + \text{Purchase} - \text{Closing inventory}$ . Bu yerda: COS (cost of sales)-tannarx, Opening inventory-hisob davri boshida TMZ lar qiymati, Purchase-hisob davrida sotib olingan TMZ, Closing inventory-hisobot davri yakunida TMZ lar qiymati.

Quyida BXMS va MXXS asosida TMZ lar hisobini yuritishni o'xshash va farqli jihatlari jadavl ko'rinishida keltirilgan:

| Kategoriya                           | O'xshashliklar (BXMS va MXXS)                                                                                                                                           | Farqli jihatlari (BXMS vs MXXS)                                                                           |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| TMZ ni tan olish talablari           | 1. Iqtisodiy naf keltirishi<br>2. Mulk huquqi mavjud bo'lishi<br>3. 1 yilgacha foydalanish<br>4. Bir ishlab chiqarish siklida o'z qiymatini to'liq tannarxga o'tkazishi |                                                                                                           |
| TMZ qiymatini hisobotda aks ettirish | Agar realizatsiya qilishning sof qiymati tannarxidan past bo'lsa — sof realizatsiya qiymati bo'yicha baholanadi                                                         |                                                                                                           |
| Tannarxni hisoblash usullari         | FIFO va AVECO (o'rtacha tortilgan qiymat) har ikkala standartda qo'llaniladi                                                                                            | MXXS: Periodic va Continuous weighted average cost<br>BXMS: faqat Periodic WA (Continuous qo'llanilmaydi) |

AVECO usuli bo'yicha izoh: 1. Periodic weighted average cost - Ushbu usulda hisobot davrining boshidagi TMZ qiymati va davr davomida xarid qilingan va tayyorlangan TMZ lar qiymati asosida bitta birlik uchun o'rtacha narx hisoblanadi. Ushbu usul hisobot davri oxirida, davr mobaynida amalga oshirilgan jami miqdor va xaridlar qiymati ma'lum bo'lgach, hisoblab chiqiladi.

2. Continuous weighted average cost-Ushbu usulda har bir TMZ xarididan so'ng yangilangan o'rtacha narx (bir birlik uchun) hisoblab chiqiladi. Keyingi sotuvlarning tannarxi aynan shu og'irlashtirilgan o'rtacha narx asosida hisobga olinadi. Hisobot davri davomida har safar yangi xarid amalga oshirilganda, ushbu jarayon takrorlanadi.

Bundan tashqari moliyaviy hisobotning xalqaro standartlarida 10-sonli standart "Events After the Reporting Period" nomli standart mavjud. Ushbu standartga ko'ra hisobot davri yakuniga yetgandan so'ng korxona moliyaviy hisoboti tehgishli vakolatli organ tomonidan tasdilangunga qadar hisobotga jiddiy ta'sir o'tkazadigan hodisalar sodir bo'lsa (adjustment events) korxona moliyaviy hisobotlariga tegishli o'zgartirishlar kiritiladi. Bu TMZ lar hisobini yuritishda quyidagi ko'rinishda namoyon bo'lishi mumkin: hisobot davri tugashi 31-dekabr bo'lsa ushbu davr uchun tuzilgan moliyaviy hisobot 1-martda tasdiqlansa 12-fevralda korxona ma'lum turda xom-ashyoni tannarxidan arzon sotsa, korxona moliyaviy hisobotlarida ushbu xom-ashyo tannarxida emas sof realizatsiya qiymatidan aks ettiriladi.

Xulosa o'rnida shuni ta'kidlash joizki korxonada moliyaviy hisobotlarni tuzish va buxgalteriya hisobini yuritishning milliy standartlarida xalqaro standartlarga o'tishda ikkala standartning o'xshash va farqli tomonlarini inobatga olish lozim. Chunki ushbu jihatlarni inobatga olmaslik, moliyaviy hisobotlarda noto'g'ri ma'lumotlar berilishiga olib kelishi mumkin.

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## TA'LIM MUASSASALARIDA GEOGRAFIYANING O'QITISHDA INNOVATSION YONDASHUVLAR

**Annotatsiya:** Ushbu maqolada geografiya fanini o'qitishda tarbiya jarayoniga innovatsion yondashuvlarning mazmuni va ahamiyati yoritilgan. Geografiya faniga ekologik, vatanparvarlik va ijtimoiy tarbiya berishdagi imkoniyatlari tahlil qilingan. Shuningdek, shaxsga yo'naltirilgan ta'lim, raqamli va GIS texnologiyalar, loyihaviy hamda muammoli ta'lim metodlari asosida tarbiya jarayonini tashkil etish masalalari ko'rib chiqilgan. Innovatsion yondashuvlar orqali o'quvchilarda ekologik madaniyat, global va hududiy tafakkur, ijtimoiy mas'uliyatni shakllantirish imkoniyatlari asoslab berilgan.

**Kalit so'zlar:** geografiya fani, tarbiya jarayoni, innovatsion yondashuvlar, ekologik tarbiya, vatanparvarlik tarbiyasi, raqamli texnologiyalar, GIS texnologiyalari, loyihaviy faoliyat, muammoli ta'lim, global tafakkur.

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## INNOVATIVE APPROACHES TO TEACHING GEOGRAPHY IN EDUCATIONAL INSTITUTIONS

**Abstract:** This article discusses the content and significance of innovative approaches to the educational process in teaching geography. The possibilities of providing environmental, patriotic and social education in geography are analyzed. Also, the issues of organizing the educational process based on person-centered education, digital and GIS technologies, project and problem-based learning methods are considered. The possibilities of forming ecological culture, global and regional thinking, and social responsibility in students through innovative approaches are substantiated.

**Keywords:** *geography, educational process, innovative approaches, environmental education, patriotic education, digital technologies, GIS technologies, project activities, problem-based learning, global thinking.*

**Kirish:** Zamonaviy ta'lim tizimi nafaqat o'quvchilarga bilim berish, balki ularni barkamol, mustaqil fikrlaydigan, ijtimoiy faolligi yuqori va mas'uliyatli shaxs sifatida tarbiyalashga qaratilgan. Shu nuqtayi nazardan, har bir fan, jumladan geografiya fani ham nafaqat ma'lumotlar tizimini o'rgatadi, balki o'quvchilarda ekologik madaniyat, vatanparvarlik hissi, hududiy va global tafakkur, shuningdek ijtimoiy mas'uliyatni shakllantirishda muhim vosita sifatida xizmat qiladi. Geografiya fani tabiiy va ijtimoiy jarayonlarni birlashtirganligi sababli tarbiyaviy imkoniyatlari kengdir. Masalan, o'quvchilar O'zbekistonning suv resurslarini, cho'llanish jarayonlarini, iqlim o'zgarishining hududiy va global ta'sirlarini o'rganayotganda ular ekologik mas'uliyatni va tabiatni muhofaza qilish g'oyalarini amaliy tarzda o'zlashtiradilar. Shu bilan birga, geografiya fanida hududiy tafakkur, urbanizatsiya, aholi va resurslar bilan ishlash ko'nikmalari shakllanadi, bu esa ularni ijtimoiy mas'uliyatga yo'naltiradi. Bugungi kunda tarbiya jarayonida innovatsion yondashuvlarni qo'llash dolzarb masala hisoblanadi. An'anaviy usullar bilan bir qatorda interaktiv, raqamli va loyiha asosidagi metodlar, GIS texnologiyalari, muammoli va case-metodlar o'quvchilarning faol ishtirokini ta'minlaydi, ularni mustaqil fikrlashga, muammolarni hal qilishga va jamoada ishlashga o'rgatadi. Innovatsion yondashuvlar tarbiyaviy ishlarni nafaqat samarali, balki qiziqarli va motivatsion qiladi. Shu bois, mazkur maqolada geografiya fanini o'qitishda tarbiya jarayoniga innovatsion yondashuvlarni joriy etishning mazmuni, asosiy yo'nalishlari va pedagogik ahamiyati yoritiladi. Maqola nazariy asoslarni va amaliy tavsiyalarni o'z ichiga olgan bo'lib, pedagoglarga tarbiyaviy jarayonni zamonaviy talablar asosida samarali tashkil etishda ko'mak beradi.

**Asosiy qism:** Geografiya fanida tarbiya jarayonining ahamiyatida Geografiya fani nafaqat tabiiy va ijtimoiy jarayonlarni o'rgatadi, balki o'quvchilarda ekologik, ijtimoiy va ma'naviy tarbiya berish imkoniyatini taqdim etadi. Bu fan orqali o'quvchilar quyidagi ko'nikmalarni shakllantiradilar:

**Ekologik tarbiya:** O'quvchilar tabiatni muhofaza qilish, resurslardan oqilona foydalanish, ekologik muammolarni aniqlash va yechimlar ishlab chiqishni o'rganadilar. Masalan, suv resurslarining taqsimlanishi, cho'llanish jarayonlari yoki chiqindilarni boshqarish mavzulari ekologik madaniyatni shakllantiradi.

**Vatanparvarlik va hududiy tafakkur:** O'zbekistonning tabiiy resurslari, tarixiy-geografik hududlari va madaniy merosi bilan tanishish o'quvchilarda vatanparvarlik hissi va hududiy tafakkurini rivojlantiradi. Bu esa o'quvchilarning milliy qadriyatlarni qadrlashiga yordam beradi.

**Ijtimoiy va global tafakkur:** Global muammolar – iqlim o'zgarishi, urbanizatsiya, aholi zichligi, resurslar taqsimoti – bo'yicha o'rganish o'quvchilarda global fikrlash va ijtimoiy mas'uliyatni shakllantiradi. Shu orqali o'quvchilar jamiyatdagi hodisalarga faol munosabat bildirishni o'rganadilar.

Innovatsion yondashuvlar va ularning turlari Shaxsga yo'naltirilgan va kompetensiyaviy yondashuv. Shaxsga yo'naltirilgan yondashuv o'quvchining individual qobiliyati, qiziqishi va ehtiyojlarini hisobga oladi. Geografiya darslarida o'quvchilar o'zlari tanlagan mavzularni tadqiq qilishlari mumkin, masalan: iqlim o'zgarishi, hududiy ekologik muammolar yoki demografik jarayonlar bo'yicha loyihalar. Bu yondashuv o'quvchilarning ijodiy fikrlashini, mustaqil qaror qabul qilish va tadqiqot olib borish qobiliyatlarini rivojlantiradi.

Interaktiv va muammoli ta'lim metodlari; Muammoli ta'lim: O'quvchilarga real geografik muammolar taqdim etiladi, masalan, suv tanqisligi, urbanizatsiya jarayonini boshqarish yoki hududlarni barqaror rivojlantirish masalalari. Bu metod tanqidiy fikrlash, muammolarni aniqlash va ularni yechish ko'nikmalarini rivojlantiradi. Keys-metod (case-study): O'quvchilar real vaziyatlarni tahlil qilib, amaliy yechimlar ishlab chiqadilar. Masalan, "Samarqand viloyatida suv resurslaridan oqilona foydalanish strategiyasi" yoki "Farg'ona vodiysi hududida urbanizatsiya jarayonlarini boshqarish" kabi vaziyatlar tahlili.

Raqamli va GIS texnologiyalar. Raqamli texnologiyalar va GIS (Geographic Information Systems) geografiya darslarini interaktiv va qiziqarli qiladi. Ular quyidagi imkoniyatlarni beradi:

- virtual xaritalar va 3D modellar orqali hududlarni vizual o'rganish;
- iqlim o'zgarishi yoki urbanizatsiya jarayonlarini simulyatsiya qilish;
- mahalliy ekologik loyihalarni onlayn platformalarda taqdim etish va baholash.

Bu texnologiyalar o'quvchilarga hududiy va global tafakkur, analitik ko'nikmalar va mas'uliyatni shakllantirish imkonini beradi.

Loyihaviy faoliyat. Loyihaviy yondashuv orqali o'quvchilar amaliy ishlar bilan shug'ullanadilar, bu esa ularni mas'uliyatli va ijodiy shaxs sifatida rivojlantiradi.

- "mahalliy hudud ekologiyasi" loyihasi;
- "shahar va qishloq hududlarini barqaror rivojlantirish" loyihasi;
- "global iqlim o'zgarishi va uning oqibatlari" tadqiqoti.

Loyihaviy faoliyat o'quvchilarda jamoaviy ishlash, tashabbuskorlik va muammolarni yechish ko'nikmalarini shakllantiradi.

**Xulosa qilib aytganda.** geografiya fanini o'qitishda tarbiya jarayoniga innovatsion yondashuvlarni joriy etish nafaqat darslarni qiziqarli va interaktiv qiladi, balki o'quvchilarda ekologik madaniyat, vatanparvarlik hissi, global va hududiy tafakkur, ijtimoiy mas'uliyatni shakllantirishga xizmat qiladi. Shaxsga yo'naltirilgan ta'lim, raqamli va GIS texnologiyalar, loyihaviy hamda muammoli ta'lim metodlari asosida olib borilgan tarbiyaviy ishlar o'quvchilarning mustaqil fikrlash, muammolarni hal qilish va jamoada ishlash ko'nikmalarini rivojlantiradi. Loyihaviy va amaliy faoliyat esa o'quvchilarni faol va ijodiy shaxs sifatida tarbiyalaydi. Shu bilan birga, innovatsion yondashuvlar geografiya fanining tarbiyaviy imkoniyatlarini kengaytiradi, ularni zamonaviy ta'lim talablariga moslashtiradi va pedagoglarga tarbiyaviy jarayonni samarali tashkil etishda amaliy

yo‘l-yo‘riq beradi. Natijada o‘quvchilar nafaqat fan sohasida bilimga ega bo‘ladi, balki jamiyatga mas‘uliyatli va ijtimoiy faol shaxs sifatida tayyorlanadi.

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## **YUQORI NAFAS YO`LLARI PATOLOGIYASIDA S. AUREUSNI AHAMIYATI,MIKROBIOLOGIK,TUZILISHI DIAGNOSTIKASI**

**Annotatsiya.** Maqolada *Staphylococcus aureus* ning yuqori nafas yo'llari kasalliklarida etiologik va patogenetik ahamiyati, uning mikrobiologik xususiyatlari va zamonaviy diagnostika usullari yaxshi yoritilgan. Yuqori nafas yo'llari kasalliklari, jumladan, tonsillit, sinusit, faringit va rinit rivojlanishiga patogen va shartli ravishda zararli bakteriyalar katta ta'sir ko'rsatadi. *Staphylococcus aureus* ular orasida yuqori patogenligi, toksinlar ishlab chiqarish qobiliyati va antibiotiklarga chidamliligi bilan ajralib turadi. *Staphylococcus aureus* - bu sharsimon, gram-musbat kokkus bo'lib, u klasterlarda o'sadi va ko'pincha sog'lom odamlarning tomoqlari va burun shilliq qavatida kommensal sifatida uchraydi. Immunitetning zaiflashishi, surunkali kasalliklar, stress yoki atrof-muhit omillari sharoitida bu mikroorganizmlar faol patogen shaklga o'tishi va yallig'lanish jarayonlarini qo'zg'atishi mumkin. *S. aureus* bilan bog'liq infeksiyalar, ayniqsa bolalar, qariyalar va immuniteti zaif bemorlarda og'ir bo'lishi mumkin. *Staphylococcus aureus* ning mikrobiologik tuzilishi, jumladan, uning hujayra devori, kapsulasi, fermentlari (koagulaza, katalaza, gialuronidaza) va toksinlari (enterotoksinlar, gemolizinlar, leykotsidinlar) batafsil tavsiflangan. Bu elementlar bakteriyalarning to'qimalarga yopishishi, immunitet tizimidan qochishi va yallig'lanish reaksiyasini kuchaytirishi uchun juda muhimdir. Xususan, koagulaza fermenti *S. aureus* identifikatsiyasining asosiy ko'rsatkichlaridan biri hisoblanadi.

*Staphylococcus aureus* keltirib chiqaradigan yuqori nafas yo'llari infeksiyalarini aniqlash uchun qo'llaniladigan mikrobiologik diagnostika usullari ta'kidlangan. Bularga mikroskopik tahlil, biokimyoviy test, antibiotiklarga sezgirlik testi (antibiogramma), bakteriologik kultivatsiya va zamonaviy molekulyar-genetik usullar kiradi.

**Kalit so'zlar.** *Staphylococcus aureus*, yuqori nafas yo'llari, rinit, faringit, tonsillit, sinusit, gram-musbat bakteriyalar, patogenlik, virulentlik, toksinlar, koagulaza, katalaza, mikrobiologik tuzikishi, bakteriologik diagnostika, mikroskopiya, antibiotiklarga sezuvchanlik, antibiotiko rezistentlik, infeksiyon kasallik.

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## **SIGNIFICANCE OF S. AUREUS IN UPPER RESPIRATORY TRACT PATHOLOGY: MICROBIOLOGICAL STRUCTURE AND DIAGNOSTICS**

**Abstract.** *The etiological and pathogenetic relevance of Staphylococcus aureus in upper respiratory tract disorders, its microbiological traits, and contemporary diagnostic techniques are all well covered in this scientific work. The development of upper respiratory tract disorders, including tonsillitis, sinusitis, pharyngitis, and rhinitis, is greatly impacted by pathogenic and conditionally harmful bacteria. Staphylococcus aureus is notable among them due to its high pathogenicity, capacity to produce toxins, and resistance to antibiotics.*

*Staphylococcus aureus is a spherical, Gram-positive coccus that grows in clusters and is frequently found as a commensal in healthy individuals' throats and nasal mucosa. Under conditions of weakened immunity, chronic diseases, stress, or environmental factors, these microorganisms can switch to an active pathogenic form and trigger inflammatory processes. Infections associated with S. aureus can be severe, especially in children, the elderly, and immunocompromised patients. The work provides a detailed description of the microbiological structure of Staphylococcus aureus, including its cell wall, capsule, enzymes (coagulase, catalase, hyaluronidase), and toxins (enterotoxins, hemolysins, leukocidins). These elements are essential for the bacterium to adhere to tissues, evade the immune system, and intensify the inflammatory response. Specifically, the coagulase enzyme is regarded as one of the main indicators of S. aureus identification. The annotation also emphasizes the microbiological diagnostic techniques used to identify upper respiratory tract infections caused by Staphylococcus aureus. These include microscopic analysis, biochemical testing, antibiotic susceptibility testing (antibiogram), bacteriological culture, and contemporary molecular-genetic techniques. Choosing an appropriate course of therapy and avoiding problems depend on an accurate and quick diagnosis.*

**Keys word.** *Staphylococcus aureus, upper respiratory tract, rhinitis, pharyngitis, tonsillitis, sinusitis, gram-positive bacteria, pathogenicity, virulence factors, toxins, coagulase, catalase, microbiological structure, bacteriological diagnostics, microscopy, antibiotic sensitivity, antibiotic resistance, infectious diseases.*



Kirish. Yuqumli kasalliklar hozirgi kunda jahon sog'liqni saqlash tizimi oldida turgan eng dolzarb muammolardan biri hisoblanadi. Yuqori nafas yo'llari kasalliklari aholi orasida eng keng tarqalgan kasalliklar qatoriga kiradi. Inson salomatligiga jiddiy zarar yetkazishi mumkin bo'lgan o'tkir va surunkali keng tarqalgan kasalliklar qatoriga sinusit, tonsillit, faringit va rinit kiradi. Viruslardan tashqari, bakteriyalar ham ko'plab kasalliklarning rivojlanishiga sezilarli hissa qo'shadi. Ular orasida *Staphylococcus aureus* alohida klinik va epidemiologik ahamiyatga ega mikroblardan biri hisoblanadi.

Tashqi dunyo bilan bevosita o'zaro ta'sir qilishda inson tanasining birinchi himoya chizig'i yuqori nafas yo'llari hisoblanadi. Ko'pgina mikroblar burun bo'shlig'ida, tomoqda, farenksda va yaqin atrofdagi sinuslarda joylashadi. Oddiy sharoitlarda immun tizimi bu sohada mavjud bo'lgan shartli patogen mikroflorani tartibga soladi. Biroq, bu mikroblar organizmning umumiy yoki mahalliy immuniteti buzilganda faollashadi va yallig'lanish jarayonlarini keltirib chiqaradi. *Staphylococcus aureus* ana shunday shartli zararli bakteriyalardan biridir.

Inson tanasida *Staphylococcus aureus* yashaydi, u sog'lom odamlarda tomoq va burun shilliq qavatida tashuvchi sifatida tez-tez uchraydi. Tadqiqotlarga ko'ra, aholining katta qismida bu bakteriya doimiy yoki vaqtincha bo'lishi mumkin. *S. aureus* patogen xususiyatlarni rivojlantirishi va ma'lum sharoitlarda bir qator yuqumli kasalliklarga olib kelishi mumkin, garchi tashuvchi hech qanday klinik alomatlarisiz sodir bo'lishi mumkin bo'lsa ham. Bu bakteriya jiddiy infeksiyalarni, ayniqsa bolalar, qariyalar, homilador ayollar va immuniteti zaif odamlarda keltirib chiqaradi.

So'nggi yillarda antibiotiklarga chidamli *Staphylococcus aureus* shtammlarining paydo bo'lishi global muammoga aylandi. Kasallikning surunkali kechishi va asoratlarning paydo bo'lishi ushbu holatdan kelib chiqadi, bu esa davolash jarayonini qiyinlashtiradi. Shuning uchun ilmiy va amaliy nuqtai nazardan *S. aureus*ning biologik xususiyatlarini, virulentlik omillarini va xo'jayin organizmidagi ta'sir qilish usullarini chuqur o'rganish juda muhimdir.

*Staphylococcus aureus* ning yuqori virulentligi uning yuqori nafas yo'llari kasalliklaridagi ahamiyatini tushuntiradi. Bu bakteriya to'qimalarga zarar yetkazadigan, yallig'lanishni kuchaytiradigan va immunitet tizimini zaiflashtiradigan turli xil toksinlar va fermentlarni ishlab chiqarishi mumkin. Koagulaza, katalaza va gialuronidaza bakteriyalarning tez tanada tarqalishiga yordam beradigan ba'zi fermentlardir. Gemolizinlar va enterotoksinlar hujayralarga zarar yetkazadi, natijada umumiy intoksikatsiya alomatlari paydo bo'ladi.

Zamonaviy tibbiyotda yuqori nafas yo'llari infeksiyalarini tashxislash va davolash uchun mikrobiologik diagnostika juda muhimdir. To'g'ri tashxis qo'yish kasallikning etiologiyasini aniqlash, samarali davolash usullarini belgilash va oqibatlarining oldini olish imkonini beradi. *Staphylococcus aureus* ni aniqlashda bakteriologik kultivatsiya, mikroskopik tekshirish, biokimyoviy test va antibiotiklarga sezgirlikni tekshirish usullari tez-tez qo'llaniladi. So'nggi

yillarda molekulyar-genetik diagnostika usullari tashxis qo'yish tezligi va aniqligini oshirdi.

Ushbu mavzuni ham nazariy, ham amaliy nuqtai nazardan o'rganish juda muhimdir. Yuqori nafas yo'llari kasalliklari bilan kasallangan bemorlar soni ortib borayotganligi sababli, shifokorlar bu holatlarni yaxshi bilishlari va individual yondashuvni qo'llashlari kerak. Shifokor Staphylococcus aureusning etiologik ahamiyatini tushunish orqali antibiotik terapiyasini to'g'ri tanlashi va ortiqcha foydalanish va samarasiz davolash usullaridan qochishi mumkin. Staphylococcus aureus bilan bog'liq yuqori nafas yo'llari infeksiyalari butun jamiyat uchun, shuningdek, sog'liqni saqlash tizimi uchun jiddiy muammo bo'lib, bu ishni dolzarb qiladi. Kasalliklarning uzoq davom etishi, ularning tez-tez qaytalanishi va antibiotiklarga chidamli shtammlarning ko'payishi tufayli ushbu mavzuni batafsil o'rganish talab etiladi.

Ishning maqsadi: Staphylococcus aureusning yuqori nafas yo'llari patologiyalari rivojlanishidagi etiologik, patogenetik va klinik ahamiyatini chuqur o'rganish va uning biologik xususiyatlari, mikrobiologik tarkibi va diagnostika usullarini ilmiy tahlil qilishdan iborat. Bundan tashqari, tadqiqotning asosiy maqsadlaridan biri S. aureus yuqori nafas yo'llarida keltirib chiqaradigan yallig'lanish jarayonlarini, ularning rivojlanish mexanizmlarini va zamonaviy diagnostika usullarining samaradorligini baholashdir. Bakterial infeksiyalar bugungi kunda barcha yoshdagi odamlarga ta'sir qiladigan yuqori nafas yo'llari kasalliklarining tarqalishiga asosiy hissa qo'shuvchi omil hisoblanadi. Staphylococcus aureus bo'yicha chuqur tadqiqotlar, ayniqsa, uning yuqori virulentligi, ixtiyoriy patogenligi, keng tarqalishi va antibiotiklarga chidamli shtammlarning ko'payib borayotgani tufayli zarurdir. Natijada, ishning maqsadi nazariy ma'lumotlarni umumlashtirishdan tashqari, terapevtik va amaliy ahamiyatga ega bo'lgan topilmalar yaratishdir. Staphylococcus aureus yuqori nafas yo'llarining shilliq qavatini qanday qilib kolonizatsiya qilishini, uni tashuvchidan patogen shaklga o'tishiga turtki beruvchi o'zgaruvchilarni va organizmda qo'zg'atadigan yallig'lanish reaksiyalarini aniqlashtirishdir. Bundan tashqari, ushbu ishning asosiy maqsadlaridan biri mikrobiologik tashxislarning ahamiyatini va to'g'ri tashxis qo'yish samarali davolash usullarini tanlashga qanday yordam berishini ko'rsatishdir. Staphylococcus aureus ning biologik va mikrobiologik xususiyatlari haqida tizimli bilimlarni rivojlantirish va yuqumli kasalliklar sohasidagi talabalar va yosh mutaxassislarining tushunchalarini kengaytirish ushbu ishning yana ikkita muhim maqsadi hisoblanadi. Ish natijalari tibbiyotda yuqori nafas yo'llari infeksiyalarining oldini olish, ularni erta aniqlash va ularni tegishli davolash uchun ham qo'llanilishi mumkin.

Metodlar. Ushbu ilmiy tadqiqotda Staphylococcus aureusning yuqori nafas yo'llari kasalliklaridagi rolini o'rganish, uning mikrobiologik xususiyatlarini baholash va tashxis qo'yish imkoniyatini aniqlash uchun bir nechta tadqiqot usullari qo'llanildi. Olingan natijalarning ilmiy asoslilikini ta'minlash uchun tadqiqot metodologiyalari tadqiqotning maqsad va vazifalariga muvofiq tanlandi.

Ilmiy adabiyotlarni tahlil qilish metodi.

Tadqiqotning birinchi bosqichida mavzuga oid ilmiy adabiyotlar, darsliklar, o'quv qo'llanmalari, ilmiy nashrlar va uslubiy ko'rsatmalar o'rganildi. Ushbu yondashuv *Staphylococcus aureus* biologiyasi va patogen xususiyatlari, yuqori nafas yo'llari kasalliklarining etiologiyasi va diagnostika usullari bo'yicha zamonaviy ilmiy nuqtai nazarlarni o'rganish uchun ishlatilgan. Mavzuning qo'llanilishini qo'llab-quvvatlash va tadqiqot yo'nalishlarini aniq belgilash uchun adabiyotlarni o'rganish qo'llanildi. *Staphylococcus aureus*ning yuqori nafas yo'llari kasalliklaridagi boshqa bakterial omillar bilan ishlashini taqqoslash uchun ishlatilgan. *S. aureus*ning patogenligi, klinik ahamiyati va tarqalish xususiyatlarini baholash uchun bir nechta manbalardan olingan ma'lumotlar baholandi.

Mikrobiologik tadqiqot usullari

Tadqiqotda *Staphylococcus aureus*ning mikrobiologik xususiyatlari an'anaviy mikrobiologik usullar yordamida o'rganildi. Ushbu usullar bakteriyalarning morfologik, madaniy va biokimyoviy xususiyatlarini aniqlashga qaratilgan. Bakteriyaning morfologik tuzilishi mikroskop ostida tekshirildi. *S. aureus* Gram bo'yash usuli yordamida Gram-musbat kokk ekanligi aniqlandi va u uzum shingillariga o'xshash joylashganligi aniqlandi.

Klinik namunalardan *Staphylococcus aureus*ning sof kulturasini ajratish uchun bakteriologik kultura yondashuvi qo'llanildi. Koloniyalarning shakli, rangi va zichligi, shuningdek, olingan namunalarning ozuqaviy muhitda o'sishi tekshirildi. Bakteriyaning vodorod peroksidni parchalash qobiliyati katalaza testi yordamida baholandi. Ushbu test streptokokklar va stafilokokklarni farqlash uchun juda muhim ekanligi isbotlandi. Bakteriyaning fermentativ faolligini baholash uchun boshqa biokimyoviy testlar ham qo'llanildi.

Tadqiqot davomida *Staphylococcus aureus* ning antibiotiklarga sezgirligini aniqlashga alohida e'tibor qaratildi. Bakteriyaning turli antibiotiklarga sezgirligini aniqlash uchun disk diffuziyasi usuli qo'llanildi. Bu yondashuv antibiotiklarga chidamli bakteriyalar shtammlarini aniqlash uchun juda muhimdir va davolash jarayonida tegishli dorilarni tanlash imkonini beradi. Antibiotiklarga chidamlilik masalasining ahamiyati topilmalar asosida baholandi va oqilona antibiotik davolash zarurati qo'llab-quvvatlandi.

Xulosa. Tadqiqot davomida to'plangan ma'lumotlar tizimlashtirildi va analitik va umumlashtirish usullari yordamida xulosalar chiqarildi. Keng xulosalar chiqarish uchun bir nechta manbalardan olingan natijalar tahlil qilindi. Usullarning kombinatsiyasi *Staphylococcus aureus*ning yuqori nafas yo'llari kasalliklarida ishtirokini chuqur tushunish imkonini berdi. Diagnostika usullari aniq tashxis qo'yish va samarali davolash rejasini tanlash uchun asos bo'lib xizmat qilgan bo'lsa-da, mikrobiologik va biokimyoviy usullar bakteriyaning biologik xususiyatlarini aniqlash uchun juda muhim edi.

Natijalar. Ushbu ilmiy tadqiqot doirasida o'tkazilgan analitik va nazariy ma'lumotlarning qisqacha mazmuniga ko'ra, *Staphylococcus aureus* bakteriyasi yuqori nafas yo'llari kasalliklarida asosiy etiologik va patogenetik omil

hisoblanadi. Ko'rib chiqilgan ilmiy manbalar va mikrobiologik kuzatuvlarga ko'ra, *S. aureus* yuqori nafas yo'llari infeksiyalari rivojlanishidagi asosiy bakterial agentlardan biridir. *Staphylococcus aureus* tomoq va burun shilliq qavatida keng tarqalgan. Ushbu bakteriya tashuvchi holatdagi sog'lom odamlarda tez-tez uchraydi. Biroq, *S. aureus* faol patogen shaklga o'tadi va organizmning immuniteti atrof-muhit omillari, stress, sovuqqa ta'sir qilish va surunkali kasalliklar tufayli pasayganda yuqori nafas yo'llarida yallig'lanish jarayonlarini boshlaydi. Bolalar va qariyalar, ayniqsa, ushbu bakteriya bilan bog'liq infeksiyalarga moyil. *Staphylococcus aureus* sinusit, tonsillit, faringit va rinit kabi yuqori nafas yo'llari kasalliklarining rivojlanishiga katta hissa qo'shadi. Bu kasalliklar ko'pincha o'tkir boshlanadi va agar ular to'g'ri va yetarli darajada davolanmasa, surunkali holatlarga aylanadi. Tadqiqot natijalari shuni ko'rsatadiki, *S. aureus* keltirib chiqaradigan yallig'lanish jarayonlari uzoq davom etishi va qaytalanishi bilan ajralib turadi. Mikrobia strukturaviy tadqiqotlarga ko'ra, *Staphylococcus aureus* sharsimon, klasterlangan va Gram-musbatdir. Bakteriyaning qalin hujayra devori va kapsulasi uni immun tizimi hujayralaridan himoya qilishga va tashqi ta'sirlarga chidamliligini oshirishga yordam berishi kuzatildi. Bu xususiyatlar *S. aureus*ning yuqori nafas yo'llarining shilliq pardalarida uzoq vaqt qolishiga imkon beradi.

Tahlillarga ko'ra, *Staphylococcus aureus*ning fermentativ va toksik xususiyatlari uning patogenligi uchun asosan javobgardir. Bakteriya to'qimalarga kirib, koagulaza, katalaza va gialuronidaza kabi fermentlar tufayli butun tanaga tez tarqalishi mumkin. *S. aureus*ning asosiy diagnostik ko'rsatkichlaridan biri sifatida koagulaza fermentining mavjudligi ayniqsa muhimdir. Qon ivish jarayoniga xalaqit berib, bu ferment bakteriyalarni fagotsitozdan himoya qiladi. *Staphylococcus aureus*ning yuqori patogenligiga ta'sir qiluvchi asosiy elementlardan biri uning toksinlar hosil qilish qobiliyati ekanligi aniqlandi. Leykotsidinlar, gemolizinlar va enterotoksinlar shilliq qavat hujayralariga zarar yetkazadi va yallig'lanishni kuchaytiradi. Shunday qilib, bemorlar tizimli intoksikatsiya alomatlaridan, shuningdek, mahalliy noqulaylik, shishish va qizarishdan aziyat chekishadi. Bu zaharlar muayyan vaziyatlarda qiyinchiliklarga olib kelishi mumkin.

Diagnostika usullari tahliliga ko'ra, mikrobiologik testlar yuqori nafas yo'llari infeksiyalarida *Staphylococcus aureus*ni aniqlashda muhim rol o'ynaydi. Bakteriyalarning sof kulturasini olinadi va uning morfologik va madaniy xususiyatlari bakteriologik kultura usuli yordamida tekshiriladi. Mikroskopik tahlil natijalari *S. aureus* gram-musbat kokklar sifatida tasniflanganligini tasdiqlaydi. Statistik ma'lumotlarga ko'ra, so'nggi yillarda antibiotiklarga chidamli *Staphylococcus aureus* shtammlari tobora keng tarqalgan. Yuqori nafas yo'llari infeksiyalarini davolash ushbu holat tufayli jiddiy qiyinchiliklarga duch kelmoqda. Qarshilik shtammlarining paydo bo'lishi antibiotiklarning nazoratsiz va noto'g'ri qo'llanilishi natijasi ekanligi aniqlandi. Natijalar faqat laboratoriya tekshiruvlari asosida antibiotik terapiyasini qo'llash zarurligini tasdiqladi. Natijalar *S. aureus* shartli ravishda patogen mikrobo'lib, ma'lum

sharoitlarda faol patogen xususiyatlarni rivojlantirishi mumkin degan fikrni aniq qo'llab-quvvatlaydi.

Ko'plab ilmiy manbalarga ko'ra, sog'lom odamlarda *Staphylococcus aureus* tashuvchisi sifatida tomoq va burun shilliq qavatida bo'ladi. Bu holat tadqiqot natijalari bilan ham tasdiqlanadi. Shuning uchun tashuvchini erta aniqlash va boshqarish juda muhimdir. Yuqori nafas yo'llarida *Staphylococcus aureus*ning klinik ko'rinishlari ham yoritib berildi. Ushbu tadqiqot natijalari shuni ko'rsatdiki, *S. aureus* shuningdek, rinit, faringit, tonsillit va sinusit kabi yuqori nafas yo'llari kasalliklarida ham muhim rol o'ynaydi, garchi ba'zi adabiyotlarda uni asosan teri va pastki nafas yo'llari infeksiyalari bilan bog'lashiga qaramay. Bu yuqori nafas yo'llari infeksiyalarida bakteriyalarning rolini batafsil baholash qanchalik muhimligini ta'kidlaydi. *Staphylococcus aureus* ning Gram-musbat kokkus sifatidagi xususiyatlari, uning klasterli joylashuvi va koagulaza fermentini ishlab chiqarish qobiliyati mikrobiologik strukturaviy natijalar boshqa tadqiqotlar natijalari bilan taqqoslaganda ishonchli va izchil ko'rsatkichlar ekanligi ko'rsatildi. Laboratoriya sharoitida bu xususiyatlar bakteriyalarni aniqlash uchun muhim diagnostika mezonlari hisoblanadi. Biroq, ushbu tadqiqot kapsulaning patogenlikdagi ahamiyatini alohida ta'kidlaydi, garchi boshqa manbalarda kapsulaning mavjudligi shtammlarni ajrata olishi mumkinligi ta'kidlangan bo'lsa ham.

Diagnostika haqidagi munozaralar an'anaviy mikrobiologik usullarning qo'llanilishini davom ettirdi. *Staphylococcus aureus* ni aniqlash uchun bakteriologik madaniyat, mikroskopiya va biokimyoviy tahlillar aniq natijalar beradi. Shunga qaramay, bir qancha yozuvchilar bu usullar ko'p kuch talab qilishini va kechiktirilgan tashxisga olib kelishi mumkinligini ta'kidlaydilar. Ushbu nuqtai nazarga ko'ra, eng yaxshi yo'nalish uni zamonaviy molekulyar-genetik diagnostika usullari bilan birlashtirish edi. Eng dolzarb munozara mavzularidan biri antibiotiklarga chidamlilik bo'lib chiqdi. Ko'plab tadqiqotlarga ko'ra, chidamli *Staphylococcus aureus* shtammlari, ayniqsa bir nechta dorilarga chidamli bo'lganlar, tobora keng tarqalgan bo'lib bormoqda. Ish natijalari ham muammoning qo'llanilishini qo'llab-quvvatlaydi. Ba'zi yozuvchilar faqat laboratoriya tekshiruvlariga asoslangan davolashni qo'llab-quvvatlaydilar, boshqalari esa empirik antibiotik terapiyasini qo'llab-quvvatlaydilar. Ushbu tadqiqotda oxirgi strategiya xavfsizroq va muvaffaqiyatliroq deb topildi. Ba'zi tadqiqotlar *Staphylococcus aureus* tashuvchilarini davolash juda muhimligini ta'kidlagan bo'lsa-da, boshqalari buni faqat klinik alomatlar aniq bo'lganda amalga oshirish kerakligini ta'kidlaydi. Tadqiqot natijalariga ko'ra, yuqori xavf toifalariga kiruvchi odamlarning tashuvchilik holatini kuzatib borish juda muhimdir. Xulosa *Staphylococcus aureus* bakteriyalarining yuqori nafas yo'llari kasalliklaridagi etiologik, patogenetik va klinik ahamiyati batafsil o'rganildi. O'tkazilgan tahlillar va birlashtirilgan ilmiy ma'lumotlar asosida *S. aureus* yuqori nafas yo'llari infeksiyalari rivojlanishiga asosiy bakterial hissa qo'shuvchi omillardan biri sifatida aniqlandi. Ba'zi noqulay sharoitlarda bu mikroob faol patogen shaklga



o'tishi va yallig'lanish jarayonlarini boshlashi mumkinligi ko'rsatildi, hatto uning ixtiyoriy patogen tabiati sog'lom odamlarda tashuvchi sifatida mavjud bo'lishiga imkon bersa ham. *Staphylococcus aureus* tomoq va burun shilliq qavatida keng tarqalgan va sinusit, tonsillit, faringit va rinit kabi kasalliklarning rivojlanishiga sabab bo'ladi. Surunkali va takroriy kechishlar bu kasalliklarning keng tarqalgan xususiyati hisoblanadi. *S. aureus* keltirib chiqaradigan infeksiyalar yoshlar, qariyalar va immuniteti zaif odamlarda jiddiyroq ekanligi ko'rsatilgan. *Staphylococcus aureus*ning yuqori patogenligi asosan uning mikrobiologik xususiyatlari bilan bog'liq. Bakteriyaning atrof-muhit stress omillariga chidamliligi uning Gram-musbat hujayra devori, kapsulasi, fermentlari va toksinlari bilan kuchayadi, bu esa uning ichki tez tarqalishiga yordam beradi. Bakteriyaning asosiy virulentlik omillari koagulaza, katalaza va gialuronidaza kabi fermentlar ekanligi aniqlandi. Diagnostika bo'limi ma'lumotlarini tahlil qilish *Staphylococcus aureus* ni aniqlashning eng muhim usuli mikrobiologik tekshirish ekanligini tasdiqladi. Bakterial madaniyat, mikroskopik tahlil va biokimyoviy tekshirish orqali aniq bakteriyalarni aniqlash mumkinligi ko'rsatildi. Xavfsiz va samarali davolash rejasini tanlash ko'p jihatdan odamning antibiotiklarga sezgirligini aniqlashga bog'liqligi aniqlandi.

Antibiotiklarga chidamli *Staphylococcus aureus* shtammlari tobora keng tarqalgan bo'lib bormoqda, bu esa tadqiqotning asosiy natijalaridan biridir. Bu holat yuqori nafas yo'llari infeksiyalarini davolashni qiyinlashtiradi, bu esa kasallikni uzaytiradi va asoratlar xavfini oshiradi. Shu sababli, antibiotiklardan foydalanish faqat laboratoriya tekshiruvlari natijalari bilan aniqlanishi kerakligi taklif qilindi. Umuman olganda, ilmiy tadqiqot natijalari *Staphylococcus aureus*ning yuqori nafas yo'llari kasalliklariga qanday hissa qo'shishi haqidagi tushunchamizni oshirdi. Erishilgan xulosalar yuqumli kasalliklarni erta aniqlash, aniq tashxis qo'yish va tibbiyot sohasida samarali davolash rejalarini tuzish uchun juda muhimdir. *S. aureus* keltirib chiqaradigan yuqori nafas yo'llari infeksiyalarini yaxshiroq tushunish va oldini olish bo'yicha kelajakdagi ilmiy tadqiqotlar natijalariga asoslanadi.

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**OQ LABORATORIYA KALAMUSHLARIDA SUVDA CHO'KTIRISH  
ORQALI CHAQIRILGAN ANAEROB JISMONIY ZO'RIQISH  
SHAROITIDA ERKAK REPRODUKTIV TIZIMINING HOLATIGA  
JAVOB REAKSIYASI**

**Annotatsiya:** Bu tadqiqotda oq laboratoriya qalamushlarida suvda cho'ktirish orqali chaqirilgan ana jismoniy zo'riqish erkak reproduktiv stress holatiga javob reaksiyasi o'rganildi. Tadqiqot 3–4 oylik erkak kalamushlarda o'tkazildi. Anaerob yuklama modeli sifatida tana vaznining 10 miqdoridagi qo'shimcha yuk bilan charchaguncha suzdirish usuli qo'llanildi. Qon plazmasida testosteron miqdori, spermatozoidlar konsentratsiyasi, harakatchanligi hamda moyak to'ining gistologik ko'rsatkichlari baholandi. Natijalarga ko'ra, takroriy anaerob zo'riqish testosteron miqdorini ishonchli darajada oshirish, spermatogenez jarayonini susaytiradi va moyak to'plashida degenerativ o'zgarishlarni chaqiradi. Olingan ma'lumotlar ana shunday jismoniy zo'riqish erkak reproduktiv tizimi uchun stress omillari ko'rinishida. Kuchli anaerob jismoniy stress erkaklarning reproduktiv funksiyasini buzishi mumkin bo'lgan tizimli stress reaksiyalarini faollashtirishi ma'lum. Biroq, takroriy anaerob ortiqcha yuklanishning morfologik va gormonal oqibatlarini yetarlicha tavsiflanmagan.

**Kalit so'zlar:** anaerob jismoniy zo'riqish, suvda cho'ktirish modeli, testosteron, spermatogenez, stress, oq kalamush.

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**RESPONSE OF THE MALE REPRODUCTIVE SYSTEM IN WHITE  
LABORATORY RATS TO ANAEROBIC PHYSICAL STRESS INDUCED  
BY THE FORCED SWIMMING MODEL**

**Abstract:** *This study investigated the response of the male reproductive system in white laboratory rats to stress induced by anaerobic physical exertion via weighted swimming. The study was conducted on male rats aged 3–4 months. As an anaerobic load model, a method of swimming to exhaustion with an additional load of 10% of body weight was applied. Plasma testosterone levels, sperm concentration, motility, and histological parameters of testicular tissue were evaluated. According to the results, repeated anaerobic stress significantly alters (decreases) testosterone levels, suppresses the process of spermatogenesis, and induces degenerative changes in the testicular tissue. The data obtained indicate that such physical exertion acts as a stress factor for the male reproductive system. It is known that intense anaerobic physical stress activates systemic stress reactions that can impair male reproductive function. However, the morphological and hormonal consequences of repeated anaerobic overload have not been sufficiently characterized.*

**Keywords:** *anaerobic physical stress, forced swimming model, testosterone, spermatogenesis, stress, white rat.*

Kirish Oq laboratoriya kalamushlarida og'irlikdagi suzish natijasida kelib chiqadigan anaerob jismoniy stressning erkak reproduktiv tizimining gormonal va morfologik parametrlariga ta'sirini o'rganish. Oq laboratoriya kalamushlarining erkak reproduktiv tizimiga og'irlikdagi suzish natijasida kelib chiqadigan anaerob jismoniy stressning ta'sirini o'rganadi. Takroriy anaerob yuklama testosteron darajasini sezilarli darajada pasaytirdi, spermatogenezni bostirdi va moyak to'qimasida degenerativ morfologik o'zgarishlarga olib keldi. Topilmalar shuni ko'rsatadiki, kuchli anaerob stress erkak reproduktiv tizimi uchun muhim stress omili bo'lib xizmat qiladi. So'nggi intensiv jismoniy yuklamalarning erkak reduktoriga ta'siri ilmiy muammolardan biri sifatida qaralmoqda. Haddan qo'shilgan anaerob zo'riqish organizmda umumiy stress javob reaksiyasini faollashtirish, gipotalamo–gipofizar–gonada o'qi faoliyatga ta'sir ko'rsatadigan barcha gormonal muvozanatni buzadi. Anaerob yuklama jarayonida simpatik nerv tizimini faollashtiradi, kortikosteroidlar sekretsiyasi ortadi, energiya resurslari qayta taqsimlanadi. Bunday sharoitda reproduktiv tizim energetikasi ikkilamchi tizimlashtirilgan vaqtinchalik bostiriladi. Jismoniy faollik odatda foydali tizimli ta'sirlar bilan bog'liq; ammo, haddan tashqari yoki yuqori intensivlikdagi anaerob mashqlar noto'g'ri moslashuv stress reaksiyalarini qo'zg'atishi mumkin. Kuchli anaerob harakat paytida simpatik asab tizimi va gipotalamus-gipofiz-buyrak usti bezi o'qini faollashtirish glyukokortikoid sekretsiyasining oshishiga va metabolik resurslarning qayta taqsimlanishiga olib keladi. Erkaklarning reproduktiv tizimi tizimli stress omillariga ayniqsa sezgir. Gipotalamus-gipofiz-gonadal o'qning bostirilishi lyuteinlashtiruvchi gormon sekretsiyasini kamaytirishi va natijada Leydig hujayralari tomonidan testosteron ishlab chiqarishni kamaytirishi mumkin. Surunkali yoki takroriy stress ta'sirida spermatogeneznining buzilishi, oksidlovchi stress va moyak degeneratsiyasi bilan bog'liq. Og'irlikdagi majburiy suzish

anaerob energiya zaxiralarini tezda tugatish va tizimli stress reaksiyalarini qo'zg'atish qobiliyati tufayli anaerob stressning eksperimental modeli sifatida keng qo'llaniladi.

Ilmiy yangilik: Anaerobda cho'ktirish modeli ko'rinishdagi erkak gormonal reproduktiv omil va morfologik ko'rsatkichlari kompleks baholandi hamda takroriy yuklamaning spermatogenezga zarar ta'siri tizimli ravshan asoslab berildi.

Amaliy ahamiyati: sport fiziologiyasi, andrologiya va reproduktiv tibbiyot sohalarida intensiv yuklamalarning erkak fertilitetiga ta'sirini amalga oshirishda qo'llanishi mumkin.

Tadqiqot maqsadi

Suvda cho'ktirish orqali chaqirilgan anaerob jismoniy zo'riqishlarning erkak oq kalamush reproduktiv tizimida paydo bo'ladigan harakat va morologik o'zgarishlarni ishlab chiqarish.

Materiallar va usullar : O'ttizta kattalar erkak oq kalamush (180–220 g) uch guruhga bo'lindi: nazorat (n=10), o'tkir anaerob stress (n=10) va takroriy anaerob stress (n=10). Anaerob yuklama charchaguncha tana massasining 10% ga teng qo'shimcha og'irlik bilan majburiy suzish orqali qo'zg'atildi. Takroriy stress ketma-ket 10 kun davomida kuniga bir marta qo'llanildi. Zardobdagi testosteron darajasi (ELISA), sperma konsentratsiyasi, sperma harakatchanligi, moyak vazn indeksi va gistologik o'zgarishlar baholandi. Statistik tahlil Studentning t-testi yordamida amalga oshirildi ( $p < 0,05$  ahamiyatli deb hisoblanadi). Tadqiqot 30 ta erkak oq laboratoriya kalamushida o'tkazildi (180–220 g).

Hayvonlar 3 guruhga bo'lindi:

Nazorat guruhi (n=10)

O'tkir anaerob zo'riqish guruhi (n=10)

Takroriy anaerob zo'riqish guruhi (n=10)

Anaerob yuklama tana vaznining 10 miqdoridagi yuk bilan 25–28°C haroratdagi suvda charchaguncha suzdirish orqali amalga oshirildi.

Baholash ko'rsatkichlari:

Qon plazmasida testosteron (ELISA) Spermatozoidlar konsentratsiyasi. Spermatozoidlar harakatchanligi

Moyak vazn indeksi Statistik harakat Student mezonini asosida bajarildi ( $p < 0,05$ ).

O'ttizta kattalar erkak oq laboratoriya kalamushlari (3-4 oylik, 180-220 g) ishlatilgan. Hayvonlar standart laboratoriya sharoitlarida, nazorat ostidagi harorat va 12 soatlik yorug'lik-qorong'ulik sikli bilan saqlangan. Barcha eksperimental protseduralar hayvonlarni tadqiq qilish uchun institutsional axloqiy standartlarga mos kelgan. Hayvonlar tasodifiy ravishda uchta guruhga ajratildi:

Nazorat guruhi (n = 10)

O'tkir anaerob stress guruhi (n = 10)

Takrorlangan anaerob stress guruhi (n = 10)

Anaerob stress 25–28°C haroratda ushlab turilgan suvda tana vaznining 10% ga teng yuk bilan majburiy suzish natijasida yuzaga kelgan. Charchoq suv yuzasiga 7 soniya davomida ko'tarila olmaslik sifatida aniqlangan.

Takroriy stress guruhida protsedura kuniga bir marta ketma-ket 10 kun davomida amalga oshirildi.

Biokimyoviy va reproduktiv baholash

ELISA yordamida o'lchangan sarum testosteron konsentratsiyasi. Gemotsitometriya yordamida sperma konsentratsiyasi baholandi. Sperma harakatchanligi mikroskopik usulda baholandi. Moyak vazni indeksi tana vazniga nisbatan hisoblanadi. Gematoksilin-eozin bo'yash yordamida o'tkazilgan gistologik tekshiruv

Natijalar: Takroriy anaerob stress nazorat guruhiga nisbatan sarum testosteron darajasini sezilarli darajada pasaytirdi ( $3,5 \pm 0,4$  ng/ml va  $5,8 \pm 0,5$  ng/ml,  $p < 0,01$ ). O'tkir stress o'rtacha pasayishga olib keldi ( $4,7 \pm 0,3$  ng/ml,  $p < 0,05$ ). Sperma konsentratsiyasi nazorat guruhida  $82 \pm 6$  million/ml dan takroriy stress guruhida  $55 \pm 5$  million/ml gacha kamaydi ( $p < 0,05$ ). Progressiv harakatchanlik  $78\% \pm 4$  dan  $48\% \pm 6$  gacha kamaydi ( $p < 0,01$ ).

Mikroskopik tekshiruvda quyidagilar aniqlandi:

Semifer epiteliyning qalinligining pasayishi

Spermatogen hujayralar zichligining pasayishi

Leydig hujayralarining vakuolizatsiyasi

Yengil interstitsial shish takroriy stress guruhida strukturaviy shikastlanish ko'proq aniqlandi.

Natijalar: Takroriy anaerob stress zardobdagi testosteron darajasini nazorat guruhiga nisbatan taxminan 38% ga sezilarli darajada kamaytirdi ( $p < 0,01$ ). Sperma konsentratsiyasi 27% ga kamaydi ( $p < 0,05$ ) va progressiv harakatchanlik 32% ga kamaydi. Gistologik tekshiruvda urug' epiteliysining yupqalashishi, spermatogen hujayralar zichligining pasayishi va Leydig hujayralarida degenerativ o'zgarishlar aniqlandi. Takroriy anaerob yuklama guruhi nazorat guruhiga nisbatan:

Testosteron darajasi 35–40 foizga qolmaydi ( $p < 0,01$ )

Spermatozoidlar konsentratsiyasi 25–30 foizga kamaydi ( $p < 0,05$ )

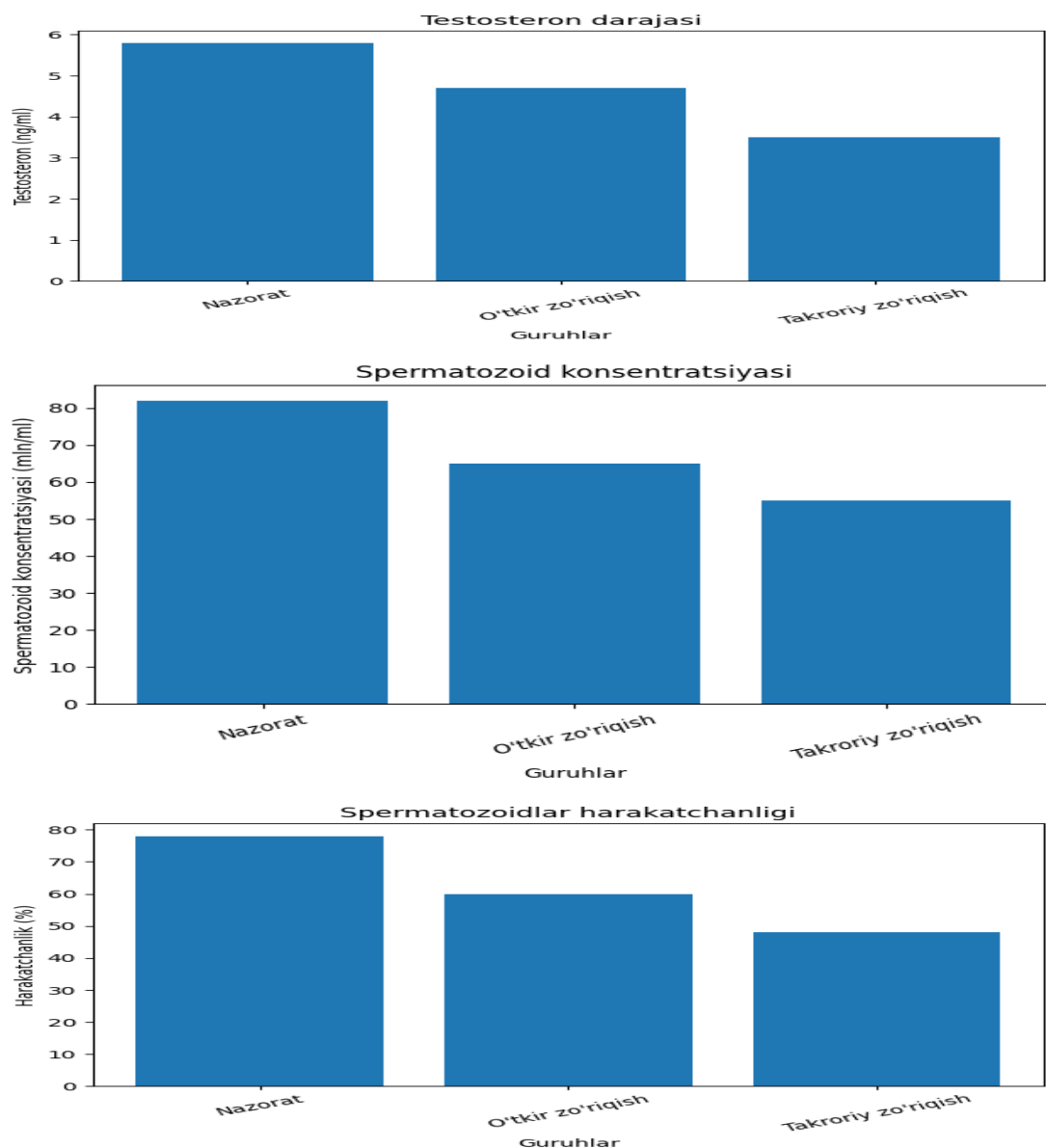
Faol harakatchan spermatozoidlar 30 foizdan ortiq qolmaydi

Seminifer naychalarda epiteliy siyraklashuvi kuzatildi

Statistik jadval

| Guruh              | Testosteron (ng/ml) | Spermatozoid konsentratsiyasi (mln/ml) | Harakatchanlik (%) |
|--------------------|---------------------|----------------------------------------|--------------------|
| Nazorat            | 5.8                 | 82                                     | 78                 |
| O'tkir zo'riqish   | 4.7                 | 65                                     | 60                 |
| Takroriy zo'riqish | 3.5                 |                                        |                    |

## Grafiklar



Muhokama :tajribadan ma`lum bo`ldiki kuchli anaerob stress erkaklarning reproduktiv funksiyasini sezilarli darajada bostiradi. Simpatik asab tizimining faollashishi va glyukokortikoid sekretsiasining ortishi gonadotropin ajralishini inhibe qilishi va testosteron sintezini kamaytirishi mumkin. Takroriy stress ta'siri adaptiv mexanizmlarni ishdan chiqaradiganga o'xshaydi, natijada moyakning morfologik shikastlanishi kuzatiladi. Bu topilmalar surunkali jismoniy ortiqcha yuklanish spermatogenez va endokrin muvozanatni buzishi haqidagi xabarlariga mos keladi. Anaerob stress paytida energiyani qayta taqsimlash hayotiy tizimlarga ustuvor ahamiyat beradi, bu esa reproduktiv funktsiyani vaqtincha yoki uzoq vaqt davomida bostirishga olib keladi. Olingan manba qishlash gipofizar–gonada tizimi susaytirishini ko'rsatadi. Simpatik faollikning ortishi va glyukokortikoidlarning ko'proq gonadotrop gormonlar sekretsiasini tormozlaydi. Takroriy zo'riqish adaptatsionni o'zgartirishni va morfologik' natijalarga olib keladi.



XulosaTakroriy ta'sir spermatogenezni sezilarli darajada buzadi.Og'irlikdagi suzish natijasida kelib chiqadigan anaerob jismoniy stress erkak kalamushlarda gormonal muvozanatni va spermatogenezni sezilarli darajada buzadi. Takroriy ta'sir qilish moyakning strukturaviy shikastlanishiga va reproduktiv funktsiyaning doimiy ravishda susayishiga olib keladi.Ushbu topilmalar haddan tashqari anaerob mashqlar yoki surunkali jismoniy ortiqcha yuk bilan bog'liq reproduktiv xavflarni ta'kidlaydi.

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## THE IMPACT OF WOMEN'S SOCIAL ACTIVITY ON SOCIETAL DEVELOPMENT

**Abstract:** *Women's participation in social, economic, and political life has become one of the primary drivers of sustainable societal development. Expanding women's social activity contributes to economic productivity, social stability, and democratic progress while improving human capital and community well-being. This article examines how women's social engagement influences societal advancement through economic participation, civic involvement, and governance representation. Using analytical and comparative approaches, the study demonstrates that empowering women is not only a matter of social justice but also a strategic requirement for sustainable development.*

**Keywords:** *women's social activity, societal development, gender equality, empowerment, economic growth, social participation.*

In contemporary development discourse, societal progress is increasingly understood not only in economic terms but also through social inclusion, human capital development, and equal participation in public life. Women represent nearly half of the global population, and their level of engagement in social, economic, political, and cultural processes significantly shapes the trajectory of national and global development. For centuries, many societies limited women's participation primarily to domestic roles, thereby restricting their contribution to broader social transformation. However, rapid social changes, expansion of education, and evolving economic structures have gradually transformed women's roles, allowing them to become active participants in public life.

Today, researchers and policymakers widely recognize that societies achieve more sustainable and balanced development when women actively participate in social processes. Women's social activity encompasses their involvement in professional work, entrepreneurship, education, political participation, community leadership, civil society organizations, and cultural life. Increased participation not only strengthens women's personal empowerment but also produces broader social benefits, influencing economic productivity, social stability, democratic governance, and cultural modernization.

One of the most significant areas where women's social participation affects societal development is the economy. Economic growth depends largely on the effective utilization of human resources. When women participate in the workforce, the size and diversity of the labor force increase, leading to greater productivity and innovation. Numerous global studies demonstrate that female

employment contributes to poverty reduction and improved household living standards. Women often allocate a significant portion of their income to family welfare, particularly in education, nutrition, and healthcare, thereby strengthening human capital development. Children from families where women are economically active often receive better educational opportunities and healthcare support, which ultimately benefits society as a whole.

Furthermore, women's entrepreneurship plays an increasingly important role in economic diversification and local economic resilience. Women-led businesses frequently focus on community-based services, education, healthcare, and small-scale industries that generate employment opportunities and stimulate local markets. Economic systems that provide equal opportunities for women demonstrate greater stability and adaptability in times of economic crisis. Thus, women's economic engagement directly contributes to sustainable economic development.

Beyond economic effects, women's social activity significantly influences social cohesion and community development. Women often play key roles in social networks and community support systems, participating in volunteer work, social initiatives, and public welfare programs. Their engagement in health campaigns, educational programs, environmental initiatives, and social assistance activities contributes to community well-being and strengthens cooperation among community members.

Communities where women actively participate in decision-making processes tend to experience lower levels of social conflict and more effective problem-solving mechanisms. Women frequently advocate for issues related to children, families, and vulnerable populations, promoting policies and initiatives that foster long-term social stability. Their role in promoting dialogue, tolerance, and cooperation helps create inclusive communities where diverse social groups coexist peacefully.

Another crucial dimension of women's social activity concerns political participation and governance. Inclusive political systems that allow women to participate in leadership and decision-making processes tend to produce policies that better reflect societal needs. Women in politics often focus attention on social welfare, healthcare, education, family support, and violence prevention—areas that directly impact social development and quality of life.

Political representation of women also enhances democratic legitimacy by ensuring that governance structures reflect the diversity of society. When citizens observe that political institutions include representatives from different social groups, public trust in governance tends to increase. Moreover, women's participation in peacebuilding and conflict resolution has been associated with more durable peace agreements and more inclusive political settlements in various regions of the world.

Cultural and educational transformation also occurs through women's increased social engagement. Educated and socially active women challenge outdated stereotypes and promote values of equality, cooperation, and mutual

respect. Women working in academia, arts, media, and education contribute to shaping progressive social norms and encouraging critical thinking among younger generations.

As societies modernize, the visibility of successful women in public life provides positive role models for girls and young women, encouraging them to pursue education and careers. This transformation gradually reshapes societal expectations and expands opportunities for future generations, promoting a more inclusive and dynamic social structure.

Despite these positive developments, several challenges continue to limit women's full social participation. Traditional gender norms, unequal access to education and employment opportunities, wage disparities, limited leadership representation, and the burden of balancing professional responsibilities with family duties remain significant obstacles in many societies. In some regions, legal and institutional barriers also restrict women's economic and political participation.

Addressing these challenges requires comprehensive policy reforms and social initiatives. Governments and institutions must promote equal access to quality education, support women's employment opportunities, provide childcare and family support systems, and encourage work-life balance policies. Public awareness campaigns and educational programs are also necessary to challenge harmful stereotypes and promote gender equality within communities.

Importantly, women's empowerment should not be viewed solely as a women's issue but rather as a fundamental component of national development strategies. Societies that fail to utilize the talents and capacities of half their population limit their own developmental potential. Conversely, countries that actively promote gender inclusion often demonstrate stronger economic performance, higher social stability, and improved human development outcomes.

In conclusion, women's social activity serves as a powerful driver of societal development. Their participation in economic production, social initiatives, governance, and cultural transformation contributes directly to social stability, economic growth, and democratic progress. Sustainable development cannot be achieved without the full participation of women in all spheres of public life.

Promoting women's social engagement is therefore not only a matter of social justice but also a strategic investment in societal prosperity. Societies that create opportunities for women to participate equally in development processes build stronger communities, more resilient economies, and more inclusive social systems capable of meeting future challenges.

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**IDEAL JAMIYAT G'OYASINING UTOPIYADAN PRAGMATIK  
MODELLARGACHA EVOLYUTSIYASINING MAFKURAVIY  
AHAMIYATI**

**Annotatsiya:** Mazkur tadqiqot insoniyat siyosiy-falsafiy tafakkuri tarixida ideal jamiyat g'oyasining shakllanishi va rivojlanish jarayonini tahlil qilishga bag'ishlangan bo'lib, unda utopik tasavvurlardan boshlangan mazkur konsepsiya qanday qilib ijtimoiy-siyosiy nazariyalarga, keyinchalik esa amaliy davlat boshqaruvi modellariga ta'sir ko'rsatganligi ilmiy jihatdan asoslanadi. Tadqiqot davomida ideal jamiyat g'oyasining antik falsafa, o'rta asr diniy tafakkuri, yangi davr siyosiy nazariyalari hamda zamonaviy siyosiy falsafadagi talqinlari qiyosiy tahlil qilinadi. Ideal jamiyat konsepsiyasi nafaqat normativ siyosiy ideal sifatida, balki jamiyat taraqqiyotining mafkuraviy orientiri sifatida ham namoyon bo'lishi ko'rsatib beriladi. Tadqiqot natijalari ideal jamiyat g'oyasi tarixiy tafakkur evolyutsiyasida muhim nazariy kategoriya bo'lib, u jamiyatning siyosiy tuzilishi, axloqiy qadriyatlari va ijtimoiy institutlari haqidagi tasavvurlarni shakllantirishda muhim rol o'ynashini ko'rsatadi.

**Kalit so'zlar:** ideal jamiyat, utopiya, siyosiy falsafa, mafkura, tarixiy tafakkur, davlat nazariyasi.

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**THE IDEOLOGICAL SIGNIFICANCE OF THE EVOLUTION OF  
THE IDEAL SOCIETY IDEA FROM UTOPIA TO PRAGMATIC  
MODELS**

**Abstract:** This study explores the historical evolution of the idea of the ideal society within the framework of political philosophy and intellectual history. The research examines how utopian visions gradually transformed into normative political theories and later influenced practical models of governance. The analysis focuses on the development of the concept of the ideal society in ancient philosophy, medieval religious thought, early modern political theory, and contemporary philosophical discourse. The study argues that the idea of an ideal society functions not only as a normative philosophical construct but also as a powerful ideological framework that shapes political imagination and social organization.

**Keywords:** ideal society, utopia, political philosophy, ideology, historical thought.

## **Kirish**

Insoniyat tarixida jamiyatni mukammal shaklda tashkil etish haqidagi tasavvurlar deyarli barcha sivilizatsiyalarning intellektual merosida uchraydi va bu holat ideal jamiyat g'oyasining inson tafakkuridagi chuqur ildizlarini ko'rsatadi. Inson o'zining ijtimoiy hayotini tartibga solishga intilgan davrdan boshlab adolat, tenglik va farovonlik tamoyillariga asoslangan jamiyat modeli haqidagi fikrlar shakllana boshlagan. Bunday tasavvurlar dastlab mifologik va diniy qarashlar bilan bog'liq bo'lgan bo'lsa, keyinchalik ular falsafiy tafakkur rivojlanishi bilan birga nazariy shaklga ega bo'la boshladi. Antik davr falsafasida ideal jamiyat masalasi davlat tuzilishi, adolat va axloqiy tartib muammolari bilan uzviy bog'liq holda ko'rib chiqilgan. Platonning "Davlat" dialogida tasvirlangan ideal polis modeli, Aristotelning siyosiy tuzumlar haqidagi tahlillari insoniyat tarixida ideal jamiyat konsepsiyasining ilk nazariy shakllari sifatida qaraladi. O'rta asrlarda esa ideal jamiyat tasavvurlari ko'proq diniy dunyoqarash doirasida shakllanib, ilohiy adolat va mukammal jamiyat tushunchalari bilan bog'langan. Yangi davrga kelib ideal jamiyat g'oyasi utopik siyosiy tasavvurlar orqali rivojlandi. Thomas More, Tommaso Campanella kabi mutafakkirlar o'z asarlarida jamiyatni ideal tarzda tashkil etish mumkinligi haqidagi nazariy modellarni taklif qildilar. Biroq ushbu utopik tasavvurlar keyinchalik siyosiy nazariya va ideologiyalarning shakllanishiga ham muhim ta'sir ko'rsatdi. Zamonaviy siyosiy falsafada esa ideal jamiyat g'oyasi faqat nazariy konstruktsiya sifatida emas, balki real siyosiy tizimlar va ijtimoiy institutlarni baholash mezon sifatida ham qaralmoqda. Shu sababli ideal jamiyat g'oyasining evolyutsiyasini o'rganish nafaqat siyosiy falsafa tarixini anglash, balki zamonaviy ijtimoiy-siyosiy jarayonlarning mafkuraviy asoslarini tushunishda ham muhim ahamiyat kasb etadi.

## **Adabiyotlar tahlili va metod.**

Ideal jamiyat g'oyasi siyosiy va falsafiy tafakkur tarixida eng uzoq davom etgan konseptual muammolardan biri sifatida ko'riladi va uning mazmuni turli davrlarda turli ijtimoiy sharoitlar hamda intellektual paradigmalarga bog'liq holda shakllangan. Antik davr falsafasida bu masala davlat tuzilishi, adolat va axloqiy tartib muammolari bilan uzviy bog'liq holda muhokama qilingan bo'lib, ayniqsa Platonning "Davlat" dialogida tasvirlangan ideal polis modeli jamiyatni qat'iy ierarxik tuzilma asosida tashkil etish g'oyasini ilgari surgan. Aristotel esa davlat shakllarini tahlil qilib, mukammal siyosiy tizim jamiyatning ijtimoiy tuzilishi, iqtisodiy munosabatlari va axloqiy qadriyatlari bilan bog'liq holda shakllanishini ta'kidlagan. Antik falsafadagi ushbu qarashlar keyingi davrlarda ideal jamiyat haqidagi nazariyalar uchun muhim metodologik asos bo'lib xizmat qildi. O'rta asrlar tafakkurida ideal jamiyat tushunchasi asosan diniy dunyoqarash bilan bog'liq holda talqin qilinib, insoniyat taraqqiyoti ilohiy reja bilan izohlangan. Avreliy Avgustin va Foma Akvinskiy kabi mutafakkirlar mukammal jamiyat haqidagi qarashlarni ilohiy adolat va xristian axloqiy qadriyatlari bilan bog'lab tushuntirganlar. Yangi davrga kelib ideal jamiyat g'oyasi utopik adabiyot va siyosiy falsafa doirasida yangi mazmun kasb eta boshladi. Thomas Morening "Utopiya" asari, Tommaso Campanellaning "Quyosh shahri" asari hamda Francis Baconning

“Yangi Atlantida” asarlarida jamiyatni mukammal tarzda tashkil etish mumkinligi haqidagi nazariy modellar ishlab chiqilgan. Bu asarlarda iqtisodiy tenglik, jamoaviy mulkchilik, ilm-fan taraqqiyoti va adolatli boshqaruv kabi tamoyillar asosida tashkil etilgan ideal jamiyat tasvirlanadi. Biroq utopik adabiyot ko‘pincha real siyosiy jarayonlardan ajralgan holda tasvirlanganligi sababli keyinchalik tanqidiy tahlil qilina boshladi. Ma’rifat davri faylasuflari, xususan Rousseau, Montesquieu va Kant ideal jamiyat muammosini siyosiy institutlar va huquqiy tartib kontekstida tahlil qilib, erkinlik, fuqarolik tengligi va ijtimoiy shartnoma tamoyillariga asoslangan siyosiy tizimlarni asoslab berishga harakat qildilar. XIX asrga kelib ideal jamiyat g‘oyasi ijtimoiy-iqtisodiy nazariyalar bilan bog‘liq holda yangi mazmun kasb etdi. Karl Marks va Fridrix Engels jamiyat taraqqiyotini sinfiy kurash va ishlab chiqarish munosabatlari evolyutsiyasi orqali tushuntirib, kelajak jamiyatini sinfsiz ijtimoiy tizim sifatida tasavvur qildilar. XX asr siyosiy falsafasida esa ideal jamiyat muammosi liberal demokratiya, ijtimoiy davlat va fuqarolik jamiyati nazariyalari doirasida qayta talqin qilina boshladi. Ayniqsa John Rawlsning “Adolat nazariyasi” asarida adolatli jamiyat tushunchasi “adolat – teng imkoniyatlar va erkinliklarning muvozanati” tamoyiliga asoslanib talqin qilindi. Shu bilan birga zamonaviy siyosiy falsafada ideal jamiyat g‘oyasi ko‘proq normativ nazariya sifatida qaralib, u real siyosiy tizimlarni baholash mezonini sifatida qo‘llanilmoqda. Adabiyotlar tahlili shuni ko‘rsatadiki, ideal jamiyat g‘oyasi tarix davomida utopik tasavvurlardan boshlab murakkab siyosiy va ijtimoiy nazariyalar darajasigacha rivojlangan bo‘lib, uning evolyutsiyasi insoniyat tafakkurining ijtimoiy adolat, erkinlik va taraqqiyot haqidagi qarashlari bilan chambarchas bog‘liq.

Mazkur tadqiqot ideal jamiyat g‘oyasining tarixiy evolyutsiyasini tahlil qilishga qaratilgan bo‘lib, unda falsafa tarixi, siyosiy nazariya va tarixshunoslik metodologiyasining integratsiyasiga asoslangan kompleks ilmiy yondashuv qo‘llanildi. Tadqiqot jarayonida tarixiy-komparativ tahlil, konseptual tahlil va tarixiy rekonstruksiya metodlaridan foydalanildi. Tarixiy-komparativ yondashuv turli davrlarda shakllangan ideal jamiyat konsepsiyalarini o‘zaro solishtirish imkonini berib, ularning umumiy xususiyatlari va farqli jihatlarini aniqlashga xizmat qildi. Konseptual tahlil metodi yordamida utopiya, ideal jamiyat, adolat, erkinlik, ijtimoiy tenglik va siyosiy legitimlik kabi asosiy kategoriyalarning nazariy mazmuni o‘rganildi hamda ularning turli falsafiy maktablarda qanday talqin qilinganligi tahlil qilindi. Tarixiy rekonstruksiya metodi orqali turli davrlarda shakllangan siyosiy-falsafiy qarashlar qayta tiklanib, ularning paydo bo‘lishiga ta’sir ko‘rsatgan ijtimoiy va madaniy omillar aniqlashtirildi. Tadqiqot davomida ideal jamiyat g‘oyasining evolyutsiyasi uch asosiy bosqich orqali tahlil qilindi: birinchi bosqich utopik-falsafiy davr bo‘lib, unda ideal jamiyat asosan normativ tasavvurlar orqali ifodalangan; ikkinchi bosqich nazariy-siyosiy davr bo‘lib, bunda ideal jamiyat konsepsiyasi siyosiy institutlar va huquqiy tizimlar bilan bog‘liq holda shakllangan; uchinchi bosqich esa zamonaviy pragmatik davr bo‘lib, unda ideal jamiyat g‘oyasi real siyosiy tizimlar va ijtimoiy institutlarni baholash mezonini sifatida qo‘llanila boshlagan. Ushbu metodologik yondashuv ideal jamiyat

g'oyasining tarixiy evolyutsiyasini tizimli tahlil qilish hamda uning zamonaviy siyosiy va mafkuraviy jarayonlardagi o'rnini aniqlash imkonini berdi.

### **Natijalar.**

Olib borilgan nazariy tahlillar ideal jamiyat g'oyasining insoniyat siyosiy tafakkuri tarixida muhim konseptual evolyutsiyani boshdan kechirganini ko'rsatadi. Tadqiqot jarayonida aniqlanishicha, antik davrdagi ideal jamiyat tasavvurlari asosan axloqiy va siyosiy tartibni mukammal shaklda tashkil etish g'oyasiga asoslangan bo'lib, ular jamiyatdagi ierarxiya, adolat va siyosiy barqarorlik masalalariga qaratilgan. Platon va Aristotel tomonidan ishlab chiqilgan nazariy qarashlar ideal jamiyatni davlat tuzilmasi va siyosiy institutlar bilan bog'liq holda tushuntirishga xizmat qilgan. Keyingi tarixiy davrlarda, ayniqsa o'rta asrlarda ideal jamiyat konsepsiyasi diniy-falsafiy talqinlar orqali rivojlanib, mukammal jamiyat tasavvuri ilohiy adolat va ma'naviy mukammallik bilan bog'langan. Yangi davr siyosiy tafakkurida esa bu g'oya utopik adabiyot orqali yangi shaklga ega bo'lib, jamiyatni tubdan qayta tashkil etish mumkinligi haqidagi nazariy modellar shakllangan. Thomas More va Campanella kabi mutafakkirlarning asarlarida tasvirlangan jamiyat modellarida iqtisodiy tenglik, jamoaviy mulkchilik va ilm-fan rivojiga asoslangan ijtimoiy tuzum g'oyasi ilgari surilgan. Biroq tarixiy rivojlanish jarayonida ideal jamiyat haqidagi qarashlar asta-sekin utopik tasavvurlardan siyosiy nazariyalar darajasiga o'tib, jamiyatni real ijtimoiy institutlar orqali takomillashtirish masalasi bilan bog'lana boshladi. XIX va XX asrlarda siyosiy falsafa doirasida ishlab chiqilgan nazariyalar ideal jamiyat tushunchasini pragmatik siyosiy modellar bilan uyg'unlashtirishga intildi. Tadqiqot natijalari shuni ko'rsatadiki, ideal jamiyat g'oyasi tarix davomida uch asosiy yo'nalishda rivojlangan: birinchisi normativ-falsafiy model bo'lib, unda jamiyatning mukammal shakli nazariy jihatdan tasvirlangan; ikkinchisi ideologik model bo'lib, unda ideal jamiyat tasavvurlari siyosiy mafkuralar shakllanishida muhim rol o'ynagan; uchinchisi esa pragmatik model bo'lib, unda ideal jamiyat g'oyasi real siyosiy institutlarni takomillashtirish uchun nazariy mezon sifatida qo'llanilgan. Bu evolyutsiya jarayoni ideal jamiyat g'oyasining faqat nazariy konstruktsiya emas, balki jamiyat taraqqiyotining mafkuraviy yo'nalishini belgilovchi muhim konseptual vosita ekanligini ko'rsatadi.

### **Muhokama.**

Olingan natijalar siyosiy falsafa va tarixiy tafakkur rivojlanishida ideal jamiyat g'oyasi muhim metodologik va mafkuraviy funksiyani bajarganini ko'rsatadi. Tarixiy tajriba shuni ko'rsatadiki, jamiyat taraqqiyotining har bir bosqichida insoniyat mukammal ijtimoiy tuzum haqidagi tasavvurlarni ishlab chiqishga intilgan. Bu tasavvurlar ko'pincha mavjud siyosiy tizimlarning kamchiliklarini tanqid qilish hamda yangi ijtimoiy tartib haqidagi g'oyalarni shakllantirish uchun nazariy asos vazifasini bajargan. Utopik adabiyotda tasvirlangan ideal jamiyat modellarini faqat fantaziya mahsuli sifatida baholash to'liq to'g'ri bo'lmaydi, chunki ular ko'pincha real tarixiy muammolarga javob sifatida paydo bo'lgan. Masalan, XVI–XVII asrlarda yaratilgan utopik asarlar feodal jamiyatdagi ijtimoiy tengsizlik va iqtisodiy adolatsizlik muammolariga

javoban shakllangan. Keyinchalik bu g'oyalar siyosiy nazariyalar va ideologiyalar rivojiga muhim ta'sir ko'rsatgan. Shu bilan birga zamonaviy siyosiy falsafa ideal jamiyat konsepsiyasini mutlaq mukammallik modeli sifatida emas, balki normativ mezon sifatida talqin qiladi. John Rawls, Jürgen Habermas va boshqa zamonaviy faylasuflar jamiyatni mukammal shaklda tasvirlashdan ko'ra, adolatli siyosiy institutlar va demokratik boshqaruv tizimini shakllantirish muammosiga e'tibor qaratganlar. Bu yondashuv ideal jamiyat g'oyasini utopik tasavvurlardan pragmatik siyosiy nazariya darajasiga olib chiqdi. Natijada ideal jamiyat konsepsiyasi jamiyatning real ijtimoiy tuzilishini tahlil qilish va uni takomillashtirish uchun muhim nazariy instrument sifatida qaralmoqda. Shu nuqtai nazardan ideal jamiyat g'oyasi zamonaviy siyosiy tafakkurda mafkuraviy yo'nalish beruvchi konsepsiya sifatida o'z ahamiyatini saqlab qolmoqda.

Xulosa.

O'tkazilgan tadqiqot ideal jamiyat g'oyasining tarixiy evolyutsiyasi insoniyat siyosiy va falsafiy tafakkurining rivojlanish jarayoni bilan chambarchas bog'liq ekanligini ko'rsatdi. Antik davr falsafasidan boshlab zamonaviy siyosiy nazariyalargacha bo'lgan intellektual an'ana ideal jamiyat haqidagi tasavvurlar doimo ijtimoiy adolat, siyosiy barqarorlik va inson erkinligi muammolari bilan bog'liq holda shakllanganini ko'rsatadi. Tarixiy tahlil natijalari shuni ko'rsatadiki, ideal jamiyat g'oyasi dastlab utopik tasavvurlar shaklida paydo bo'lgan bo'lsa-da, vaqt o'tishi bilan siyosiy nazariya va ijtimoiy falsafaning muhim kategoriyasiga aylangan. Ushbu konsepsiya jamiyatni mukammal tarzda tashkil etish haqidagi nazariy modellarni ishlab chiqish bilan bir qatorda mavjud siyosiy tizimlarni tanqidiy baholash mezoni sifatida ham xizmat qilgan. Zamonaviy siyosiy tafakkurda ideal jamiyat g'oyasi utopik mukammallik modeli sifatida emas, balki jamiyatni yanada adolatli, barqaror va demokratik tarzda rivojlantirishga yo'naltirilgan normativ konsepsiya sifatida talqin qilinadi. Shu sababli ideal jamiyat g'oyasining evolyutsiyasini o'rganish nafaqat siyosiy falsafa tarixini anglash, balki zamonaviy mafkuraviy jarayonlarni tahlil qilish uchun ham muhim ilmiy ahamiyatga ega.

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## **ZAMONAVIY TA'LIM TIZIMIDA MATEMATIK SAVODXONLIKNI RIVOJLANTIRISHNING NAZARIY VA AMALIY JIHATLARI**

**Annotatsiya.** Mazkur maqolada matematika ta'limida matematik savodxonlikni shakllantirish jarayonining dolzarb muammolari tahlil qilinadi. O'quvchilarda tushunchaviy anglashning yetarli darajada shakllanmaganligi, bilimlarning hayotiy vaziyatlar bilan bog'lanmasligi hamda motivatsiya bilan bog'liq qiyinchiliklar asosiy muammolar sifatida ko'rsatib o'tiladi. Shuningdek, matematik savodxonlikni rivojlantirishning muhim tarkibiy qismlari yoritilib, zamonaviy pedagogik yondashuvlar asosida ta'lim samaradorligini oshirish yo'llari tavsiflanadi.

**Kalit so'zlar.** Matematik savodxonlik, kompetensiyaviy yondashuv, tushunchaviy anglash, amaliy ko'nikma, strategik kompetensiya.

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## **THEORETICAL AND PRACTICAL ASPECTS OF DEVELOPING MATHEMATICAL LITERACY IN THE MODERN EDUCATION SYSTEM**

**Abstract.** This article analyzes the current challenges in developing mathematical literacy within mathematics education. Key issues identified include insufficient conceptual understanding among students, the lack of connection between mathematical knowledge and real-life situations, and difficulties related to motivation. Furthermore, the article highlights the essential components for fostering mathematical literacy and outlines ways to enhance educational effectiveness through modern pedagogical approaches.

**Keywords:** Mathematical literacy, competency-based approach, conceptual understanding, practical skills, strategic competence.

Matematika insoniyat taraqqiyotining asosiy omillaridan biri hisoblanadi. U nafaqat fan va texnologiya rivojining poydevori, balki inson tafakkurini

shakllantiruvchi muhim intellektual vositadir. Qadimgi sivilizatsiyalardan boshlab bugungi raqamli jamiyatgacha bo'lgan davrda matematik bilimlar iqtisodiy, texnologik va ijtimoiy rivojlanishning muhim tayanchi bo'lib kelgan.

Zamonaviy jamiyatda har bir shaxsning muvaffaqiyati ma'lum darajada uning matematik savodxonlik darajasiga bog'liqdir. Raqamli texnologiyalar, sun'iy intellekt, muhandislik tizimlari va moliyaviy modellar matematik asosga ega. Shu sababli matematik ta'lim sifatini oshirish, uni zamon talablari asosida takomillashtirish dolzarb masalalardan biri hisoblanadi.

Bugungi globallashuv jarayonida iqtisodiyot bilim va innovatsiyalarga asoslanmoqda. Raqamli iqtisodiyot sharoitida ma'lumotlar bilan ishlash, tahliliy fikrlash va algoritmik yondashuv muhim ahamiyat kasb etadi. Bu esa matematik savodxonlikni asosiy kompetensiyalardan biriga aylantiradi. Matematika inson tafakkurining imkoniyatlarini kengaytiradi, muammoli vaziyatlarni hal qilish qobiliyatini rivojlantiradi hamda mustaqil qaror qabul qilish ko'nikmalarini shakllantiradi. Matematik fikrlash - bu mantiqiylik, aniqlik, izchillik va dalillash madaniyatidir. Bunday ko'nikmalar zamonaviy jamiyatda har bir shaxs uchun zarurdir.

Matematika ta'limining dolzarb muammolari. Bugungi kunda o'quvchilar oldiga qo'yilayotgan talablar avvalgi avlodlarga nisbatan ancha yuqoridir. Ilmiy-texnik taraqqiyot tezlashgani sari matematik bilimlarning hajmi va murakkabligi ortib bormoqda. Shu sababli maktab matematikasi nafaqat nazariy bilim berishi, balki amaliy va hayotiy vaziyatlarga yo'naltirilgan bo'lishi zarur.

Ko'plab tadqiqotlar shuni ko'rsatadiki, o'quvchilarning bir qismi matematik tushunchalarni chuqur anglab yetmaydi, balki faqat qoidalarni yodlab olish bilan cheklanadi. Bu esa ularning mustaqil fikrlash qobiliyatini cheklaydi.

Shu sababli, matematik savodxonlikni quyidagi tarkibiy qismlar orqali kompleks tarzda rivojlantirish zarur:

1. **Tushunchaviy anglash** — o'quvchining matematik tushunchalar, qoidalar va munosabatlarni chuqur tushunishi, ularni bir-biri bilan bog'lab, mantiqiy asosda anglash qobiliyati.

2. **Amaliy ko'nikma** — matematik qoidalarni va usullarni samarali qo'llash, turli muammolarni yechish uchun zarur bo'lgan amaliy malakalar.

3. **Strategik kompetensiya** — muayyan vaziyatda to'g'ri strategiya tanlash va muammolarni turli yondashuvlar yordamida hal eta olish.

4. **Moslashuvchan fikrlash** — yangi, kutilmagan vaziyatlarga tez moslashish, turli usullarni sinab ko'rish va muammoni yechishda kreativ yondashuvni qo'llash qobiliyati.

5. **O'rganishga ijobiy munosabat** — matematikaga qiziqish, o'rganishga bo'lgan ishtiyoq va uning hayotdagi ahamiyatini anglash, qiyinchiliklarga qaramay, o'rganishda davom etish motivatsiyasi.

Ushbu tarkibiy qismlarni rivojlantirishga qaratilgan ta'lim yondashuvlari va metodikalari zamonaviy matematika ta'limining asosini tashkil qiladi. Faqatgina bunday yondashuv orqali o'quvchilar faqat bilim olish bilan cheklanmay, balki

bilimlarni hayotiy vaziyatlarda qo'llay oladigan malakali, ijodiy va tanqidiy fikrlaydigan shaxslar sifatida shakllanadi.

Endi quyidagi masala orqali yuqoridagi tarkibiy qismlarni tahlil qilib ko'raylik.

**Masala.** Maktab sport zalining pol qismi yangilanmoqda. Zalning uzunligi 18 metr, eni 12 metr. 1 kvadrat metr pol qoplamasining narxi 85 000 so'm. O'rnatish (ish haqi) umumiy material narxining 20% ini tashkil qiladi. Sport zalining polini to'liq yangilash uchun jami qancha mablag' kerak bo'ladi?

**Yechilishi.** 1) **Tushunchaviy anglash.** Bunda o'quvchi quyidagilarni tushunishi kerak:

To'rtburchak yuzasi:  $S = a \cdot b$ , umumiy xarajat esa material narxi bilan o'rnatish xarajatining yig'indisidan iborat ekanligini, foiz tushunchasi (20%).

Avvalo yuzani topamiz:  $S = 18 \cdot 12 = 216 m^2$ .

Material narxi:  $216 \cdot 85\,000 = 18\,360\,000$  so'm

O'rnatish narxi materialning 20% ini tashkil qiladi.

2) **Amaliy ko'nikma.** 20% ni hisoblaymiz

$18\,360\,000 \times 0.20 = 3\,672\,000$  so'm

Jami xarajat:  $18\,360\,000 + 3\,672\,000 = 22\,032\,000$  so'm

Demak, sport zalini ta'mirlash uchun **22 032 000 so'm** kerak bo'ladi.

3) **Strategik kompetensiya.** O'quvchi quyidagicha strategiya tanlaydi:

1. Avval yuzani topish

2. Keyin material narxini hisoblash

3. So'ng foizni topish

4. Yakunda jami summani aniqlash yoki boshqacha strategiya:

Material narxini 1.20 ga ko'paytirish:

$18\,360\,000 \times 1.20 = 22\,032\,000$

Bu strategik fikrlashni ko'rsatadi -bir masalani turli usullar bilan yechish mumkin.

4) **Moslashuvchan fikrlash.** Endi shartni o'zgartiramiz:

Agar maktabga 2 000 000 so'm chegirma berilsa, yakuniy xarajat qancha bo'ladi?

$22\,032\,000 - 2\,000\,000 = 20\,032\,000$  so'm

Bu bosqich o'quvchining yangi vaziyatga tez moslashish qobiliyatini rivojlantiradi.

5) **O'rganishga ijobiy munosabat.** Bu masala:

qurilish va ta'mirlash bilan bog'liq, real byudjet hisobini o'rgatadi va foiz tushunchasini hayotiy misolda qo'llaydi.

**Xulosa.** Demak, ushbu amaliy masala orqali o'quvchida geometrik bilim, foiz hisoblash, strategik rejalashtirish, moslashuvchan fikrlash va real hayot bilan bog'liqlik tushuncha va bilimga ega bo'ladi. Bundan u matematikaning hayotiy ahamiyatini tushunadi va unga nisbatan qiziqishi ortadi.

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## **COVID-19 PATSIENTLARIDA IMMUNOLOGIK KO'RSATKICHLARNING O'ZGARISHLARI VA ULARNING PROGNOSTIK QIYMATI**

**Annotatsiya.** Yuqumli kasalliklar patologiyasida organizmning umumiy immunoreaktivligi bilan bog'liq jarayonlar muhim o'rin tutadi, shu boisdan COVID-19 ning turli klinik shakllarida immunologik o'zgarishlar namoyon bo'lishini o'rganish kasallik kechishini prognozlash va og'ir holatlar rivojlanish xavfini baholash nuqtai-nazaridan muhim ilmiy-amaliy ahamiyat kasb etadi.

**Kalit so'zlar:** Koronavirus, immunologik, laborator, epidemiologiya, profilaktika.

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## **CHANGES IN IMMUNOLOGICAL INDICATORS IN COVID-19 PATIENTS AND THEIR PROGNOSTIC SIGNIFICANCE**

**Abstract.** Immune reactivity plays a key role in the pathogenesis of infectious diseases. Studying immunological changes in different clinical forms of COVID-19 is of significant scientific and practical importance for predicting disease progression and assessing the risk of severe complications.

**Keywords:** coronavirus, immunological, laboratory, epidemiology, prevention.

The analysis indicates that COVID-19 primarily affects T-lymphocytes, leading to a significant reduction in their number, particularly CD3+CD4+ and CD3+CD8+ T-cells. Consequently, as the severity of the disease increases, lymphopenia deepens, demonstrating a direct correlation between disease progression and lymphopenia. Additionally, the conducted analysis revealed that in most cases among patients in the third group, there was a decrease in the B-lymphocyte population and in the absolute number of natural killer (NK) cells.

The above findings indicate that assessing these cellular immunological parameters from the earliest days of symptom onset is critically important for predicting severe and critical courses of the disease.

As a result of the conducted study, due to pronounced lymphopenia, patients in Group 3 showed significant differences compared to patients in Groups 1 and 2 in the absolute counts of activated T-lymphocytes, B-lymphocytes, activated NK cells, and activated CD25+ T-lymphocytes expressing the  $\alpha$ -chain of the IL-2 receptor.

Analysis of the cytokine levels in blood serum samples showed that the TNF- $\alpha$  concentration in patients with mild, moderate, and severe COVID-19 remained within the reference range.

Assessment of IL-6 levels in serum revealed that, compared to samples from patients in Group 1, this parameter was approximately 2 times higher in samples from patients in Group 2 and 4 times higher in samples from patients in Group 3. The significant increase in IL-6 levels correlated proportionally with the severity of the patients' condition ( $p < 0.05$ ).

Since the clinical criteria for assessing the severity of COVID-19 are broad and do not fully reflect the dynamics of changes in patient condition, the informativeness and prognostic value of the coefficients were evaluated by calculating the ratio of the absolute number of lymphocytes expressing CD3+CD4+, CD3+CD8+, and CD3-CD56+ markers to the number of neutrophils in the study groups.

The significance of differences between the indicators in the group with severe disease and those in other groups (patients with mild and moderate disease) was determined as follows: significant –  $p < 0.05^*$ ; highly significant –  $p < 0.05^{**}$ ; very highly significant –  $p < 0.05^{***}$ .

In the ICU cohort, compared with patients with moderate disease, the ratios of CD4+ lymphocytes to neutrophils were 3.5 times lower, CD8+ lymphocytes to neutrophils were 2.6 times lower, and NK cells to neutrophils were 5 times lower ( $p < 0.05$ ).

In the next phase of the study, changes in the humoral branch of the immune system during different courses of the disease were examined. During the first 10 days of COVID-19 onset (first assessment), antibodies of the IgM, IgG, and IgA classes were detected in 6.3%, 5.5%, and 21.4% of cases, respectively. It is noteworthy that during the first 10 days of disease onset, there was no significant difference in the frequency of detection between IgM and IgG antibodies ( $p > 0.05$ ), meaning that antibodies of both classes begin to be synthesized almost simultaneously from the first 10 days of illness and at nearly the same frequency. In contrast, during the first 10 days of disease onset, the frequency of detection of IgA antibodies was significantly higher than that of IgM and IgG antibodies ( $p < 0.05$ ).

During days 15–21 of illness, in the second set of samples, the detection frequencies of antibodies of the IgM, IgG, and IgA classes increased markedly, reaching 45.3%, 33.0%, and 91.7%, respectively. At this time point, the frequency of IgA antibody detection remained significantly higher than that of IgM and IgG antibodies ( $p < 0.05$ ).



The obtained results indicate that the humoral immune response in COVID-19 progressively increases and reaches high levels during the late stages of the infection. In samples collected on days 25–30 of illness (third time point), the detection frequencies of IgM, IgG, and IgA antibodies—reflecting seroconversion—were 92.8%, 99.5%, and 93.9%, respectively. In these third-time-point plasma samples, IgM, IgG, and IgA antibodies were not detected in 181 (7.2%), 13 (0.5%), and 151 (6.1%) patients, respectively. This absence can be explained by the fact that, at the time of testing (25–30 days after illness onset), the antibody titers were lower than the diagnostic threshold. Additionally, it should be considered that IgM antibody levels may decline during the convalescent period.

The majority of patients (77.2%) exhibited IgG antibody titers in the range of 1:800–1:1600, indicating that these titers were detected with a significantly higher frequency compared to other titer levels. Minimal seropositive titers of 1:100 and 1:200 were observed in patients with mild COVID-19 (10.9% and 18.5%, respectively) and moderate disease (1.4% and 5.8%, respectively). In contrast, among patients in intensive care units (severe and critical cases), IgG antibodies were reliably detected at high titers, with 90.6% of cases showing a titer of 1:1600. Meanwhile, a titer of 1:1600 was observed in 30.3% of patients with mild disease and 32.4% of patients with moderate disease ( $p < 0.05$ ).

The obtained results indicate that, from a public health perspective, the analysis of both humoral and cellular immunity parameters in clinical practice is essential for the diagnosis, treatment, and prevention of the spread of COVID-19. It is crucial that clinicians fully understand the significance and necessity of determining patients' immune status, and possess well-developed skills in interpreting and assessing immunological indicators.

By the convalescent phase, the frequency of detection of virus-neutralizing antibodies (IgM, IgG, and IgA classes) reaches a high seroconversion level, and in the majority of patients (77.2%), IgG antibody titers are high (1:800–1:1600). This supports the preparation of concentrated immunoglobulin fractions from convalescent plasma, which can be incorporated into therapeutic regimens as an immunotherapeutic intervention in severe cases of COVID-19 or in the presence of prognostic markers indicating a risk of disease aggravation.

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**BO'LAJAK PEDAGOGLARNING SHAXSIY SIFATLARINI  
RIVOJLANTIRISHDA BADIY-TARIXIY ASARLAR ASOSIDA  
INTEGRATIV PEDAGOGIK TEXNOLOGIYALARNING  
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***Annotatsiya** Mazkur maqolada oliy ta'lim muassasalarida bo'lajak pedagoglarning shaxsiy sifatlarini shakllantirish va rivojlantirish jarayonida badiiy hamda tarixiy asarlardan integrativ yondashuv asosida foydalanish mexanizmlari ilmiy jihatdan asoslab beriladi. Tadqiqot davomida pedagogik tajriba-sinov ishlari olib borilib, talabalarning mas'uliyat, empatiya, refleksiv tafakkur va kasbiy motivatsiya ko'rsatkichlaridagi o'zgarishlar statistik jihatdan tahlil qilindi. Natijalar shuni ko'rsatdiki, badiiy-tarixiy merosni muammoli vaziyatlar, keys-stadi, debat va refleksiv esse kabi faol o'qitish metodlari bilan uyg'unlashtirish talabalarning kasbiy o'zini anglash jarayonini sezilarli darajada faollashtiradi. Tadqiqot natijalari pedagogik ta'lim jarayonini shaxsga yo'naltirilgan va qadriyatga asoslangan model asosida takomillashtirish imkonini beradi.*

***Kalit so'zlar:** shaxsiy sifatlar, pedagogik integratsiya, refleksiv tafakkur, empatiya, kasbiy identifikatsiya, badiiy-tarixiy meros.*

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**EFFECTIVENESS OF INTEGRATIVE PEDAGOGICAL  
TECHNOLOGIES BASED ON ARTISTIC-HISTORICAL WORKS IN  
DEVELOPING THE PERSONAL QUALITIES OF FUTURE TEACHERS**

***Abstract** This article provides a scientific substantiation of the mechanisms for utilizing artistic and historical works within an integrative approach to foster and develop the personal qualities of future teachers in higher education institutions. During the research process, pedagogical experimental work was conducted, and changes in students' indicators of responsibility, empathy, reflective thinking, and professional motivation were statistically analyzed. The findings demonstrate that integrating artistic and historical heritage with active teaching methods such as problem-based learning, case studies, debates, and reflective essays significantly enhances students' professional self-awareness and identity formation. The results of the study offer opportunities to improve pedagogical education through a personality-oriented and value-based model of instruction.*

**Keywords:** *personal qualities, pedagogical integration, reflective thinking, empathy, professional identity, artistic and historical heritage.*

Globalashuv jarayonlari, raqamli transformatsiya hamda ijtimoiy munosabatlarning murakkablashuvi zamonaviy pedagog shaxsiga qo'yiladigan talablarni tubdan o'zgartirmoqda. Bugungi kunda o'qituvchi nafaqat bilim beruvchi, balki ma'naviy yetakchi, axloqiy namuna va refleksiv fikrlovchi mutaxassis sifatida namoyon bo'lishi talab etiladi. Shu bois pedagogik ta'lim tizimida shaxsiy sifatlarni rivojlantirish masalasi alohida dolzarblik kasb etmoqda.

An'anaviy bilim uzatishga yo'naltirilgan model o'rnini shaxsga yo'naltirilgan, kompetensiyaviy va qadriyatlarga asoslangan ta'lim paradigmasi egallamoqda. Bunday sharoitda badiiy va tarixiy asarlar nafaqat madaniy meros namunasi, balki shaxsiy refleksiya va axloqiy tafakkurni rivojlantiruvchi pedagogik vosita sifatida namoyon bo'ladi.

Mazkur tadqiqotning maqsadi — oliy ta'lim jarayonida badiiy-tarixiy asarlar asosida integrativ pedagogik texnologiyalarni qo'llash orqali bo'lajak pedagoglarning shaxsiy sifatlarini rivojlantirish mexanizmlarini aniqlash va ularning samaradorligini tajribaviy jihatdan asoslashdan iborat.

Shaxsga yo'naltirilgan pedagogika nazariyasi shaxsning ichki ehtiyojlari, qadriyatlari va refleksiv imkoniyatlarini rivojlantirishni ustuvor yo'nalish sifatida belgilaydi. Zamonaviy tadqiqotlarda pedagog shaxsining kasbiy identifikatsiyasi uning empatiya darajasi, axloqiy pozitsiyasi va ijtimoiy mas'uliyat hissi bilan bevosita bog'liq ekanligi ta'kidlanadi.

Aksiologik yondashuv ta'lim jarayonini qadriyatlar tizimi orqali tashkil etishni nazarda tutadi. Badiiy asarlar insoniy kechinmalarni chuqur ochib berish orqali talabalarda o'z-o'zini anglash, ichki baholash va ijtimoiy voqelikka nisbatan ongli munosabatni shakllantiradi. Tarixiy asarlar esa ijtimoiy mas'uliyat va fuqarolik pozitsiyasini mustahkamlaydi.

Shuningdek, refleksiv ta'lim konsepsiyasi talabaning o'z tajribasini tahlil qilish qobiliyatini rivojlantirishni muhim omil sifatida ko'rsatadi. Shu jihatdan muammoli vaziyat yaratish, debat va keys-stadi usullari pedagogik jarayonda samarali mexanizm sifatida e'tirof etiladi.

Tadqiqot aralash (mixed-method) yondashuv asosida olib borildi. Tajribasinov ishlarida 124 nafar pedagogika yo'nalishi talabasi ishtirok etdi. Tadqiqot uch bosqichda amalga oshirildi:

- Diagnostik bosqich
- Integrativ pedagogik aralashuv bosqichi
- Nazorat va tahlil bosqichi
- Diagnostik vositalar orqali quyidagi ko'rsatkichlar o'lchandi:
- Mas'uliyat darajasi
- Empatiya ko'rsatkichi
- Refleksiv tafakkur darajasi
- Kasbiy motivatsiya indeksi

Ma'lumotlar matematik-statistik usullar yordamida tahlil qilindi.

Tajriba yakunida talabalarning barcha ko'rsatkichlarida ijobiy o'sish kuzatildi. Mas'uliyat darajasi 48 foizdan 71 foizga, refleksiv tafakkur 41 foizdan 69 foizga, empatiya 52 foizdan 74 foizga, kasbiy motivatsiya esa 57 foizdan 78 foizga oshgani aniqlangan.

Statistik tahlil natijalariga ko'ra,  $p < 0,05$  darajasida sezilarli farq qayd etildi, bu esa integrativ modelning samaradorligini tasdiqlaydi.

Natijalar shuni ko'rsatadiki, badiiy-tarixiy asarlarni muammoli vaziyat yaratish, debat va munozara, keys-stadi, refleksiv esse yozish hamda integrativ seminar mashg'ulotlari bilan uyg'unlashtirish talabalarning ichki motivatsiyasini kuchaytiradi va kasbiy o'zini anglash jarayonini chuqurlashtiradi.

Olingan natijalar shuni ko'rsatadiki, shaxsiy sifatlarni rivojlantirish jarayoni faqat nazariy bilim berish orqali emas, balki emotsional-intellektual tajriba orqali amalga oshiriladi. Badiiy asarlar insoniy kechinmalarni boshdan kechirish imkonini bersa, tarixiy manbalar ijtimoiy javobgarlikni anglashga xizmat qiladi.

Integrativ pedagogik model talabaning bilim, his-tuyg'u va qadriyat tizimini uyg'unlashtirishga xizmat qiladi. Bu esa kelajakdagi pedagogning professional identifikatsiyasini mustahkamlaydi.

Tadqiqot natijalari shuni ko'rsatdiki, badiiy va tarixiy asarlar asosida tashkil etilgan integrativ pedagogik texnologiyalar bo'lajak pedagoglarning shaxsiy sifatlarini samarali rivojlantirish imkonini beradi. Mazkur model pedagogik ta'lim tizimida qadriyatga yo'naltirilgan va refleksiv yondashuvni kuchaytirish uchun metodik asos bo'lib xizmat qilishi mumkin.

Kelgusida tadqiqotni kengroq auditoriyada va uzoq muddatli monitoring asosida davom ettirish maqsadga muvofiqdir.

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## **RAQAMLI TRANSFORMATSIYA SHAROITIDA DAVLAT XIZMATCHILARINING KIBERXAVFSIZLIK KOMPETENSIYALARINI RIVOJLANTIRISH MODELİ**

**Annotatsiya:** Mazkur maqolada raqamli transformatsiya sharoitida davlat boshqaruvi tizimida kiberxavfsizlikni ta'minlashda davlat xizmatchilarining kompetensiyalarini rivojlantirish muammolari ilmiy jihatdan tahlil qilingan. Tadqiqotda elektron hukumat va raqamli xizmatlar rivoji bilan bog'liq axborot xavfsizligi tahdidlari tizimli yondashuv asosida ko'rib chiqilgan. Kiberxavfsizlikni ta'minlashda inson omilining hal qiluvchi roli asoslab berilgan. Davlat xizmatchilarining kiberxavfsizlik kompetensiyalari bilimlar, amaliy ko'nikmalar, mas'uliyatli raqamli xulq-atvor va strategik fikrlash komponentlari orqali tavsiflangan. Kompetensiyaviy va ilmiy-tizimli yondashuv asosida kiberxavfsizlik kompetensiyalarini rivojlantirish modeli ishlab chiqilgan. Model uzluksiz kasbiy ta'lim, treninglar va baholash mexanizmlarini o'z ichiga oladi. Tadqiqot natijalari davlat boshqaruvida kiberxavfsizlik madaniyatini shakllantirish zarurligini ko'rsatadi. Mazkur ilmiy ish raqamli davlatni barqaror rivojlantirish strategiyalarini amalga oshirishda amaliy ahamiyatga ega.

**Kalit so'zlar:** Raqamli transformatsiya, davlat xizmatchilari, kiberxavfsizlik, kompetensiya, axborot xavfsizligi, raqamli hukumat, inson omili, kiberxavfsizlik madaniyati.

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## **A MODEL FOR DEVELOPING CYBERSECURITY COMPETENCIES AMONG PUBLIC SERVANTS IN THE CONTEXT OF DIGITAL TRANSFORMATION**

**Abstract:** *This article examines the development of cybersecurity competencies of civil servants in the context of digital transformation of public administration. The study analyzes information security threats arising from the implementation of e-government and digital public services. The decisive role of the human factor in ensuring cybersecurity is substantiated. Cybersecurity competencies of civil servants are structured into knowledge, practical skills, responsible digital behavior, and strategic thinking components. Based on competency-based and systemic approaches, a model for developing cybersecurity competencies is proposed. The model includes mechanisms for continuous professional education, practice-oriented training, and competency assessment. The research findings emphasize the importance of fostering a cybersecurity culture within public sector institutions. The proposed model contributes to strengthening information security and supports the sustainable development of digital government strategies.*

**Key words:** *Digital transformation, civil servants, cybersecurity, competencies, information security, digital government, human factor, cybersecurity culture.*

**Kirish.** XXI asrning ikkinchi choragida global miqyosda raqamli transformatsiya jarayonlari jamiyat hayotining barcha sohalariga, xususan, davlat boshqaruvi tizimiga chuqur kirib bormoqda. Elektron hukumat, raqamli xizmatlar, ma'lumotlarga asoslangan boshqaruv, sun'iy intellekt va bulutli texnologiyalarning joriy etilishi davlat xizmatlarining samaradorligi, shaffofligi va tezkorligini oshirishga xizmat qilmoqda. Shu bilan birga, mazkur jarayonlar axborot xavfsizligi va kiberxavfsizlik masalalarini strategik darajaga olib chiqmoqda.

Davlat boshqaruvi tizimida foydalanilayotgan axborot tizimlari va ma'lumotlar bazalari ko'pincha fuqarolarning shaxsiy ma'lumotlari, moliyaviy axborotlar hamda milliy xavfsizlikka daxldor bo'lgan ma'lumotlarni o'z ichiga oladi. Ushbu resurslarning kiberxavfsizligini ta'minlash faqat texnik choralar bilan emas, balki inson omiliga, ya'ni davlat xizmatchilarining kiberxavfsizlik bo'yicha bilim, ko'nikma va malakalariga ham bevosita bog'liqdir. Statistik ma'lumotlarga ko'ra, kiberhujumlarning katta qismi aynan inson omili bilan bog'liq xatoliklar natijasida yuzaga keladi. Shu sababli davlat xizmatchilarining kiberxavfsizlik kompetensiyalarini tizimli ravishda rivojlantirish dolzarb ilmiy-amaliy muammo hisoblanadi.

Raqamli transformatsiya sharoitida davlat xizmatchilari nafaqat an'anaviy boshqaruv vazifalarini, balki axborot tizimlaridan samarali va xavfsiz foydalanish, kiberxavflarni aniqlash va ularga to'g'ri munosabat bildirish kabi yangi funksiyalarni ham bajarishi talab etiladi. Xalqaro tashkilotlar, jumladan, OECD va BMT tomonidan e'lon qilingan hisobotlarda davlat sektorida kiberxavfsizlik salohiyatini oshirish raqamli hukumatni barqaror rivojlantirishning asosiy sharti sifatida e'tirof etiladi.

Mazkur maqolaning asosiy maqsadi — raqamli transformatsiya sharoitida davlat xizmatchilarining kiberxavfsizlik kompetensiyalarini rivojlantirishga qaratilgan kompleks modelni ilmiy asoslash va uning tarkibiy qismlarini aniqlashdan iborat. Tadqiqot doirasida kiberxavfsizlik kompetensiyalarining mohiyati, ularni shakllantirishga ta'sir etuvchi omillar hamda samarali rivojlantirish mexanizmlari tahlil qilinadi.

**Adabiyotlar tahlili.** Raqamli transformatsiya va davlat boshqaruvi tizimida kiberxavfsizlik kompetensiyalarini rivojlantirish masalasi zamonaviy ilmiy tadqiqotlarda ustuvor yo'nalishlardan biri sifatida e'tirof etilmoqda. Ushbu muammo raqamli hukumat konsepsiyasi, axborot xavfsizligi, inson omili va kompetensiyaviy yondashuv doirasida keng ko'lamda tahlil qilingan.

Davlat boshqaruvida raqamli transformatsiya jarayonlarini ilmiy asosda o'rgangan yetakchi tadqiqotchilardan biri Tomasz Janowski hisoblanadi. Uning tadqiqotlarida raqamli hukumat texnologik yangilanish bilan bir qatorda institutsional va kadrlar salohiyatini rivojlantirishni talab qilishi ta'kidlanadi. Olim raqamli transformatsiya muvaffaqiyati davlat xizmatchilarining raqamli va kiberxavfsizlik kompetensiyalariga bevosita bog'liq ekanini ilmiy asoslab beradi (Janowski, 2015) [1].

Kiberxavfsizlikda inson omilining rolini chuqur tahlil qilgan mashhur mutaxassis Bruce Schneier o'z asarlarida texnik himoya vositalaridan ko'ra foydalanuvchilarning xulq-atvori va xabardorligi muhimroq ekanini ta'kidlaydi. Uning fikriga ko'ra, kiberxavfsizlik madaniyatini shakllantirmasdan turib, davlat sektorida barqaror axborot xavfsizligini ta'minlash mumkin emas (Schneier, 2018) [2].

Kompetensiyaviy yondashuv nazariy asoslarini ishlab chiqqan olimlardan Richard E. Boyatzis kiberxavfsizlik kompetensiyalarini rivojlantirish modelining metodologik asosini tashkil etadi. Boyatzis kompetensiyani bilim, ko'nikma va xulq-atvorning integratsiyalashgan tizimi sifatida talqin qiladi. Ushbu yondashuv davlat xizmatchilarining kiberxavfsizlikka oid bilimlari bilan bir qatorda ularning mas'uliyatli raqamli xulq-atvorini shakllantirish zarurligini asoslaydi (Boyatzis, 2008) [3].

Axborot xavfsizligi menejmenti va tashkilot xodimlarining roli masalasini Ross Anderson ilmiy jihatdan asoslab bergan. Uning tadqiqotlarida axborot tizimlari xavfsizligini ta'minlashda inson resurslarini boshqarish muhim omil ekanligi ko'rsatib berilgan. Anderson davlat tashkilotlarida kiberxavfsizlik siyosatini xodimlar kompetensiyalari bilan uyg'unlashtirish zarurligini ta'kidlaydi (Anderson, 2020) [4].

Davlat sektorida kiberxavfsizlik salohiyatini oshirish masalasi xalqaro tashkilotlar hisobotlarida ham keng yoritilgan. Jumladan, OECD tomonidan e'lon qilingan tahliliy hisobotlarda davlat xizmatchilarining kiberxavfsizlik kompetensiyalarini rivojlantirish raqamli hukumat barqarorligini ta'minlovchi asosiy omil sifatida baholanadi. OECD mutaxassislari kiberxavfsizlikni faqat IT-mutaxassislar vazifasi sifatida emas, balki barcha davlat xizmatchilariga tegishli umumiy kompetensiya deb qarashni taklif etadi.

Shuningdek, “Birlashgan Millatlar Tashkiloti” ning Elektron hukumatni rivojlantirish bo'yicha hisobotlarida davlat sektorida inson kapitalini rivojlantirish kiberxavfsizlik strategiyalarining ajralmas qismi sifatida e'tirof etiladi. BMT ekspertlarining ta'kidlashicha, raqamli transformatsiya jarayonlarida kadrlar tayyorlash va qayta tayyorlash tizimi kuchli bo'lmagan davlatlarda kiberxavflar darajasi yuqori bo'ladi.

Kiberxavfsizlik bo'yicha xalqaro standartlar masalasida ISO/IEC tomonidan ishlab chiqilgan axborot xavfsizligi standartlari muhim nazariy va amaliy asos bo'lib xizmat qiladi. Ushbu standartlarda inson omiliga oid xavflarni boshqarish, xodimlarni muntazam o'qitish va axborot xavfsizligi madaniyatini shakllantirish alohida yo'nalish sifatida belgilangan [5, 6, 7].

Yuqoridagi ilmiy manbalar tahlili shuni ko'rsatadiki, raqamli transformatsiya sharoitida davlat xizmatchilarining kiberxavfsizlik kompetensiyalarini rivojlantirish kompleks va tizimli yondashuvni talab etadi. Mavjud tadqiqotlar asosida ishlab chiqilgan model ushbu ilmiy qarashlarni integratsiyalash orqali milliy davlat boshqaruvi tizimiga moslashtirilgan innovatsion yechim sifatida qaraladi.

**Tadqiqot metodologiyasi.** Mazkur tadqiqot ilmiy-tizimli yondashuv asosida olib borildi va unda bir qator umumilmiy hamda maxsus tadqiqot metodlaridan foydalanildi. Tadqiqot metodologiyasi quyidagi asosiy yo'nalishlarni qamrab oldi:

Davlat boshqaruvida raqamli transformatsiya, kiberxavfsizlik va kompetensiyaviy yondashuvga oid mahalliy va xorijiy ilmiy adabiyotlar, normativ-huquqiy hujjatlar hamda strategik dasturlar tahlil qilindi. Xususan, kiberxavfsizlik bo'yicha xalqaro standartlar, jumladan, ISO/IEC tomonidan ishlab chiqilgan axborot xavfsizligi standartlari asosiy nazariy manba sifatida o'rganildi [6, 7].

Davlat xizmatchilarining kiberxavfsizlik kompetensiyalarini rivojlantirish murakkab ko'p komponentli tizim sifatida qaraldi. Ushbu tizim bilim, amaliy ko'nikma, xulq-atvor, axloqiy mas'uliyat va tashkiliy madaniyat elementlarini o'z ichiga olgan holda modellandi.

Xorijiy davlatlar tajribasi, jumladan, rivojlangan raqamli hukumat tizimiga ega mamlakatlarning davlat xizmatchilarini kiberxavfsizlikka tayyorlash modellari taqqoslandi. Ushbu tahlil asosida umumiy tendensiyalar va samarali amaliy mexanizmlar aniqlanib, milliy sharoitga moslashtirildi.

Tadqiqotning asosiy natijasi sifatida davlat xizmatchilarining kiberxavfsizlik kompetensiyalarini rivojlantirish modeli ishlab chiqildi. Model konseptual, funksional va tashkiliy komponentlardan iborat bo'lib, ularning o'zaro aloqasi grafik va mantiqiy bog'lanishlar orqali asoslandi.

**Tadqiqot natijalari.** O'tkazilgan tadqiqot natijalariga ko'ra, raqamli transformatsiya sharoitida davlat xizmatchilarining kiberxavfsizlik kompetensiyalarini rivojlantirish modeli quyidagi asosiy tarkibiy qismlardan iborat ekanligi aniqlandi [8, 9, 10].



**Muhokama.** Tadqiqot natijalari shuni ko'rsatadiki, raqamli transformatsiya jarayonlarida kiberxavfsizlik masalasi faqat texnik infratuzilma bilan cheklanib qolmasligi lozim. Davlat xizmatchilarining kompetensiyalarini rivojlantirishga qaratilgan kompleks model inson omilidan kelib chiqadigan xavflarni sezilarli darajada kamaytirishga xizmat qiladi.

Xalqaro tajriba bilan taqqoslaganda, taklif etilgan modelning afzalligi shundaki, u texnik bilimlar bilan bir qatorda axloqiy va xulq-atvor jihatlarini ham qamrab oladi. Bu esa davlat boshqaruvida barqaror kiberxavfsizlik madaniyatini shakllantirishga imkon beradi. Shu bilan birga, modelni amaliyotga joriy etishda tashkiliy va moliyaviy resurslar yetarli darajada ta'minlanishi muhim ahamiyat kasb etadi.

Kelgusida mazkur modelni pilot loyihalar asosida sinovdan o'tkazish, empirik ma'lumotlar asosida takomillashtirish hamda raqamli davlat boshqaruvi strategiyalariga integratsiya qilish maqsadga muvofiqdir.

**Xulosa.** Xulosa qilib aytganda, raqamli transformatsiya sharoitida davlat boshqaruvi tizimining barqaror va uzluksiz faoliyat yuritishi davlat



xizmatchilarining kiberxavfsizlik kompetensiyalarini rivojlantirish darajasiga bevosita bog'liqdir. Davlat sektorida joriy etilayotgan raqamli texnologiyalar axborot resurslarining hajmi va ahamiyatini oshirgan holda, ularni himoyalash masalasini strategik ustuvor yo'nalishga aylantirmoqda. Tadqiqot natijalari shuni ko'rsatadiki, kiberxavfsizlikni ta'minlash faqat texnik vositalar bilan cheklanib qolmasdan, inson omiliga asoslangan kompetensiyaviy yondashuvni talab etadi. Mazkur maqolada ishlab chiqilgan kiberxavfsizlik kompetensiyalarini rivojlantirish modeli bilimlar, amaliy ko'nikmalar, mas'uliyatli raqamli xulq-atvor va strategik fikrlashni o'z ichiga olgan yaxlit tizim sifatida asoslandi. Model davlat xizmatchilarining kiberxavflarni anglash, oldini olish va ularga samarali munosabat bildirish salohiyatini oshirishga xizmat qiladi. Shuningdek, taklif etilgan yondashuv davlat organlarida kiberxavfsizlik madaniyatini shakllantirish va mustahkamlash imkonini beradi. Tadqiqotda aniqlangan rivojlantirish mexanizmlari uzluksiz kasbiy ta'lim va amaliy mashg'ulotlar orqali kompetensiyalarni barqaror rivojlantirishga yo'naltirilgan. Modelning amaliy ahamiyati uning davlat boshqaruvi tizimida joriy etilishi orqali axborot xavfsizligiga oid xatarlarni kamaytirish imkoniyati bilan izohlanadi. Mazkur model raqamli davlatni rivojlantirish strategiyalarini amalga oshirishda samarali ilmiy-amaliy vosita bo'lib xizmat qilishi mumkin. Kelgusida modelni empirik tadqiqotlar asosida sinovdan o'tkazish va milliy sharoitlarga moslashtirish uning ilmiy qiymatini yanada oshiradi.

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## PROSPECTS FOR DEVELOPING YOUTH INFORMATION CULTURE IN THE INFORMATION SPACE AND ITS PHILOSOPHICAL SIGNIFICANCE

**Annotation:** *This article examines the prospects for developing youth information culture in the information space and its philosophical significance. It highlights that enhancing young people's information literacy and critical thinking contributes not only to their personal development but also to the formation of reflective and ethically conscious citizens in society. Furthermore, the article demonstrates the impact of the digital environment on youths' values, worldview, and intellectual responsibility, providing a foundation for understanding contemporary information culture from a philosophical perspective.*

**Keywords:** *youth information culture, information space, "information sustainability" concept, information culture, social consciousness, value system.*

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## AXBOROT MAKONIDA YOSHLAR AXBOROT MADANIYATINI RIVOJLANTIRISHNING O'ZIGA XO ISTIQBOLLARI VA UNING FALSAFIY AHAMIYATI

**Annotatsiya:** *Ushbu maqolada axborot makonida yoshlar axborot madaniyatini rivojlantirishning istiqbollarini va uning falsafiy ahamiyati ochib berilgan. Yoshlarning axborot savodxonligi va tanqidiy tafakkurini oshirish nafaqat ularning shaxsiy rivojlanishiga, balki jamiyatda reflektiv va axloqiy ongli fuqarolarni shakllantirishga xizmat qilishi yoritilgan. Shu bilan birga, maqolada raqamli muhitning yoshlarning qadriyatlarini, dunyoqarashi va intellektual mas'uliyatiga ta'sirini ko'rsatadi va zamonaviy axborot madaniyatini falsafiy nuqtai nazardan tushunishga asos yaratishi asoslab berilgan.*

**Kalit so'zlar:** *yoshlar axborot madaniyati, axborot makoni, "axborot barqarorligi" konsepsiyasi, axborot madaniyati, ijtimoiy ong, qadriyat tizimi.*

**Introduction.** The prospects for developing youth information culture in the information space, from a socio-philosophical perspective, reflect the process of human and societal transition to a new qualitative stage. The information space has now become a key arena for shaping social consciousness,

value systems, and social identity. Therefore, its prospects manifest not only in technological modernization but also in the spiritual and axiological growth of individuals. Developing youth information culture requires forming their digital thinking based on the principles of freedom, responsibility, and morality. From a philosophical standpoint, this process is connected to the concept of “information resilience,” which is expressed through an individual’s ability to withstand information threats, the level of critical thinking, and social responsibility. Ensuring stability in the information space is also associated with strengthening the moral immunity of society, reinforcing information ethics, and promoting social cohesion.

**Main Part.** The prospects for developing youth information culture require shaping their digital thinking based on the principles of freedom, responsibility, and morality. From a philosophical perspective, this process is connected to the concept of “information resilience,” which is expressed through an individual’s ability to withstand information threats, the level of critical thinking, and social responsibility. Ensuring stability in the information space is also associated with strengthening the moral immunity of society, reinforcing information ethics, and promoting social cohesion. Charles Taylor, analyzing identity and information relations in modern society, emphasizes that “social stability relies on shared horizons of meaning; when these horizons are lost, society tends toward disintegration” (Taylor C. 1992. – P. 37–39.). This idea indicates that the prospects for developing youth information culture are closely linked to the preservation of shared moral and cultural meanings. Scientific and creative evaluations show that Taylor deeply explores the problem of meaning; however, in the digital information space, the impact of algorithmic flows that fragment these meanings is not sufficiently addressed.

**Methods.** John Rawls, analyzing the relationship between justice and stability, writes that “a stable society is formed in an environment where information and decisions are made based on principles of justice” (Rawls J. 1999. – P. 142–144.). This approach indicates that the prospects for developing youth information culture are closely linked to issues of information justice and equal access. From a critical perspective, although Rawls’ model is strong normatively, it does not sufficiently identify mechanisms to address existing economic and technological inequalities in the real digital space. In contrast, Jodi Dean, analyzing communicative capitalism, notes that “the excessive abundance of information flows may weaken, rather than strengthen, democratic stability.” (Dean J. 2009. – P. 22–24.). This approach demonstrates that the prospects for developing youth information culture are related to the gap between information activity and real social participation. Critical evaluation shows that, although Dean clearly exposes the excesses of communicative capitalism, she does not sufficiently develop constructive ways to overcome this situation through information culture. Shoshana Zuboff, analyzing digital capitalism, emphasizes that “under conditions of surveillance capitalism, information processes personal experience as raw material.” (Zuboff S. 2019. –

P. 94–96.). This idea indicates that the prospects for developing youth information culture highlight the necessity of critical oversight over information to ensure social stability. Scientific and creative evaluations show that Zuboff clearly exposes the exploitative aspects of information, yet she provides less attention to the opportunities for fostering resistance and alternative information practices through youth information culture. Cass R. Sunstein, analyzing the issue of stability in the information environment, notes that “information bubbles and filtered environments exacerbate social fragmentation and instability” (Sunstein C. 2017. – P. 59–61.). This idea demonstrates that the prospects for developing youth information culture are linked to supporting an open and diverse information space. Scientific and creative evaluations show that Sunstein clearly reveals the segmentation in the digital environment; however, he does not sufficiently develop strategies for youth to overcome these bubbles through information culture. Referring to national experience, Q. Nazarov analyzes the relationship between information and social stability, emphasizing that “information culture manifests as a moral mechanism that maintains social balance in society.” (Nazarov Q. 2008. – B.44–46.). This approach demonstrates that, in the context of Uzbekistan, the prospects for developing youth information culture are closely linked to moral stability. From a critical perspective, however, this position requires a deeper analysis of young people’s transnational information experiences within the global information space.

**Analysis and Results.** In the context of the increasingly complex information environment, the prospects for developing youth information culture are directly connected with issues of social stability. This connection calls for a reinterpretation of the categories of freedom, norms, and responsibility within social philosophy. Information culture in this process is not merely the ability to receive or disseminate information, but rather manifests as a conscious mechanism that enables the discernment of social truths, anticipates the consequences of information, and fosters a responsible attitude toward societal stability. Therefore, the prospects for developing youth information culture should be analyzed in dialectical unity with the long-term stability of society.

Within the framework of the sociology of knowledge, Karl Mannheim emphasizes that “social stability is ensured through understanding the social positioning of knowledge and information” (Mannheim K. 1993. – P. 179–181.). This idea indicates that the prospects for developing youth information culture are closely linked to understanding the social context of information sources. Scientific and creative evaluations show that Mannheim’s approach enhances critical thinking; however, in the digital environment-where knowledge is consumed rapidly and superficially-the mechanisms to ensure such understanding need to be further clarified.

Referring to national experience, B. Karimov, analyzing the relationship between information and society, emphasizes that “information culture shapes

young people's responsible attitude toward social stability within society" (Karimov B. 2015. – B. 66–68.). This position demonstrates that, in the context of Uzbekistan, the prospects for developing youth information culture are closely linked to social stability policy. From a critical perspective, however, this approach requires a deeper substantiation of mechanisms for fostering young people's independent stance within the global information space.

Moreover, D. Davronov, analyzing issues of information security and stability, notes that "a low level of information culture creates a fertile ground for social instability and the spread of manipulative ideas" (Davronov D. 2017. – B. 51–53.). This idea indicates that the prospects for developing youth information culture have a preventive and stabilizing significance. Scientific and creative evaluations show that while emphasizing potential risks is important, the creative and integrative opportunities of information culture must also be highlighted in a balanced manner.

A comparative and critical analysis of the aforementioned global and national theoretical positions demonstrates that, in the information space, the prospects for developing youth information culture are linked to social stability at normative-value, institutional, and cognitive levels. As information culture develops, it becomes a cultural resource that mitigates social conflicts, strengthens trust, and supports stability; conversely, if underdeveloped, information flows can become a factor that intensifies instability.

**Conclusion.** In conclusion, the prospects for developing youth information culture in the information space manifest as a complex dialectical balance in social philosophy-between stability and change, information and ethics, freedom and responsibility. Only when this balance is ensured does information culture become a strategic factor that strengthens social stability and shapes young people as conscious, critical, and responsible social actors.

The socio-philosophical models and prospects for developing youth information culture envision managing the exchange of information between individuals and society in a morally, axiologically, and socially balanced way. This model interprets information not merely as a tool for knowledge, but as a factor contributing to moral development, social stability, and personal perfection. From a socio-philosophical analytical perspective, the prospects for developing youth information culture reflect the transition of individuals and society to a new qualitative stage. The information space has now become a primary arena for shaping social consciousness, value systems, and social identity. Therefore, its prospects are manifested not only in technological modernization but also in the moral and axiological growth of the individual.

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## DIFFERENSIAL MANSUBLIK BIR SINFI UCHUN ERISHISH TO‘PLAMI VA ERISHISH SFERASINING XOSSALARI

**Annotatsiya.** Ishda chiziqli differensial mansubliklar bilan ifodalanuvchi dinamik tizimlar uchun Koshi masalasi ko‘rib chiqilgan. Erishish to‘plami va erishish sferasi tushunchalari kiritilib, ularning asosiy xossalari tahlil etilgan. Fundamental matritsa va Koshi formulasi asosida yechimlarning integral ifodasi keltirilgan.

**Kalit so‘zlar:** differensial mansublik, chiziqli dinamik tizim, Koshi masalasi, erishish to‘plami, erishish sferasi.

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## PROPERTIES OF THE REACHABLE SET AND REACHABLE SPHERE FOR A CLASS OF DIFFERENTIAL INCLUSIONS

**Abstract.** The paper considers the Cauchy problem for dynamical systems described by linear differential inclusions. The notions of the reachable set and the reachable sphere are introduced, and their main properties are analyzed. An integral representation of solutions is derived using the fundamental matrix and the Cauchy formula.

**Keywords:** differential inclusion, linear dynamical system, Cauchy problem, reachable set, reachable sphere.

Differensial mansubliklar differensial o‘yinlar, axborot to‘liqsizligi va parameterlar noaniqligi sharoitida boshqarish muammolarida va matematikaning boshqa bir qator masalalarida keng qo‘llaniladi [1-4]. Differensial mansubliklar bilan ifodalanuvchi dinamik tizimlarning erishish to‘plami va erishish sferasining asosiy xossalari o‘rganish, xususan, bu to‘plamlarning yopiq va qavariqligi, parametrlar bo‘yicha uzluksizligi hamda yechimlarning absolyut uzluksizligi shartlari, dinamik tizimlarning boshqariluvchanligini o‘rganishda muhim ahamiyat kasb etadi.

Dinamik tizim modeli sifatida chiziqli differentsial mansubliklarni qaraymiz. Differentsial mansubliklar deb

$$\dot{x} \in F(t, x) \quad (1)$$

ko‘rinishdagi munosabarlarga aytiladi, bu yerda  $x(t)$ - izlanayotgan  $n$  – o‘lchamli vektor-funksiya,  $F(t, x)$  – ko‘p qiymatli akslantirish. Faraz qilaylik, (1) differensial mansublikning o‘ng tomoni quyidagi  $F(t, x) = A(t)x + B(t)$  ko‘rinishga ega bo‘lsin, bu yerda  $A(t)$  –  $n \times n$ -matritsa,  $B: T \rightarrow P(R^n)$ ,  $T = [t_0, t_1]$ .

Differensial mansubliklar uchun quyidagi chiziqli Kosh masalasini qaraymiz:

$$\dot{x} \in A(t)x + B(t), t \in T, x(t_0) = x_0 \in Z \subset R^n. \quad (2)$$

(2)- mansublikning o'ng tomoni uchun quyidagi shartlar bajarilgan deb hisoblaymiz:

a)  $A(t)$  matritsa elementlari  $\|A(t)\| \leq \alpha(t), t \in T, \alpha(\cdot) \in L_1(T)$  larda o'lchovli.

b)  $B: T \rightarrow \Omega(R^n)$  ko'p qiymatli akslantirishni esa  $\|B(t)\| \leq \beta(t), t \in T, \beta(\cdot) \in L_1(T)$  larda o'lchovli deb hisoblaymiz.

$H_T(x_0, A, B)$  (2) Koshi masalasining barcha absolyut uzluksiz yechimlari to'plami.

**Ta'rif 1.** Ushbu

$$X(t_0, \tau, x_0, F) = \{ \eta \in R^n : \eta = x(\tau), x(\cdot) \in H_T(x_0, F) \},$$

to'plam barcha  $x(\cdot) \in H_T(x_0, F)$  trayektoriyalarning  $x(\tau)$  uchlaridan iborat bo'lib,  $\tau \in T$  vaqt momentida (2) sistemaning erishuvchanlik to'plami deyiladi.

Qabul qilingan belgilashlarga asosanib, quyidagilarni faraz qilaylik:

$$X(t_0, \tau, x_0, A, B) = \{ \eta \in R^n : \eta = x(\tau), x(\cdot) \in H_T(x_0, A, B) \},$$

ya'ni  $X(t_0, \tau, x_0, A, B)$ ,  $\tau \in T$  vaqt momentida (2) sistemaning erishuvchanlik to'plamidir.

$Z \in P(R^n)$  bo'lsin.  $X(t_0, \tau, Z, A, B) = \bigcup_{\xi \in Z} X(t_0, \tau, \xi, A, B)$ ,  $\tau \in T$ , to'plamni ko'rib chiqamiz, uni

$$\dot{x} \in A(t)x + B(t), t \in T, x(t_0) \in Z \quad (3)$$

tizimning erishish to'plami deb ataymiz.

**Ta'rif 2.** Ushbu

$$\Sigma(t_0, \tau, Z, A, B) = \bigcup_{t_0 \leq s \leq \tau} X(t_0, s, Z, A, B), \tau \in T = [t_0, t_1], \quad (4)$$

ko'rinishdagi to'plam, (3) tizimning trayektoriyalari orqali  $[t_0, \tau]$  vaqt oralig'ida  $R^n$  holatlar fazosining barcha erishish mumkin bo'lgan nuqtalar to'plami, (3) tizimning  $\tau - t_0$  vaqt oralig'ida erishish sferasi deb ataladi.

$\Phi_A(t, \tau)$  orqali  $\dot{x} = A(t)x, t \in T$ , tenglama yechimlarining fundamental matritsasini belgilaymiz. Ta'rifga ko'ra, har bir fiksatsiyalangan  $\tau \in T$  da o'rinli

$$\frac{\partial \Phi_A(t, \tau)}{\partial t} = A(t)\Phi_A(t, \tau), t \in T, \Phi_A(\tau, \tau) = E,$$

bu yerda  $E$  - birlik  $n \times n$  -matritsa.  $\Phi_A(t, \tau)$  matritsaviy funksiya har bir o'zgaruvchi bo'yicha absolyut uzluksiz,  $T \times T$  dagi o'zgaruvchilar to'plami bo'yicha uzluksiz va har bir integrallanuvchi  $b: T \rightarrow R^n$  funksiya uchun masalaning absolyut uzluksiz yechimi bo'ladi

$$\dot{x} = A(t)x + b(t), t \in T, x(t_0) = \xi$$

Koshi formulalari orqali ifodalanadi [2-3]:

$$x(t) = \Phi_A(t, t_0)\xi + \int_{t_0}^t \Phi_A(t, \tau)b(\tau)d\tau, t \in T. \quad (5)$$

**Teorema 1.** Faraz qilaylik,  $A(t) \equiv A, B(t) \equiv B, t \in T = [t_0, t_1]$ ,  $B \in P(R^n), Z \in P(R^n)$  bo'lsin. Agar  $AZ \subset -B$  shart bajarilsa, u holda

$$X(t_0, t_1, Z, A, B) = \sum (t_0, t_1, Z, A, B). \quad (6)$$

**Isbot.**  $\xi \in \sum (t_0, t_1, Z, A, B)$  bo'lsin, ya'ni  $\tau \in T$  mavjud bo'lib,  $\xi \in X(t_0, \tau, Z, A, B)$  bo'lsin. U holda shunday  $\xi_0 \in Z$  mavjudki

$$\xi \in \Phi_A(\tau, t_0)\xi_0 + \int_{t_0}^{\tau} \Phi_A(\tau, s)Bds.$$

$A$  – matritsa o'zgaras bo'lgani uchun  $\Phi_A(t, \tau) = e^{A(t-\tau)}, \forall t \in T, \tau \in T$  bo'ladi.

Shuning uchun

$$\xi \in e^{A(\tau-t_0)}\xi_0 + \int_{t_0}^{\tau} e^{A(\tau-s)}Bds. \quad (7)$$

$\tau^* = t_1 - \tau$  deb faraz qilamiz. U holda

$$\int_{t_0}^{\tau} e^{A(\tau-s)}Bds = \int_0^{\tau-t_0} e^{At}Bdt = \int_{\tau^*}^{\tau^*+\tau-t_0} e^{A(\tau^*+\tau-t_0-t)}Bdt = \int_{\tau^*}^{t_1-t_0} e^{A(t_1-t_0-t)}Bdt \quad (8)$$

$\int_{\tau^*}^{t_1-t_0} e^{A(t_1-t_0-t)}Bdt$  to'plamning ixtiyoriy  $\eta$  elementini olamiz. U holda shunday

o'lchovli kesim  $b(t) \in B, t \in [\tau^*, t_1 - t_0]$  mavjudki  $\eta = \int_{\tau^*}^{t_1-t_0} e^{A(t_1-t_0-t)}b(t)dt.$

U holda, quydagi

$$\eta = \int_0^{t_1-t_0} e^{A(t_1-t_0-t)}\tilde{b}(t)dt + \int_0^{\tau^*} e^{A(t_1-t_0-t)}A\xi_0dt, \quad (9)$$

tenglikka ega bo'lamiz, bunda  $\tilde{b}(t) = b(t), t \in [\tau^*, t_1 - t_0], \tilde{b}(t) = -A\xi_0, t \in [0, \tau^*]$ .  
 $-A\xi_0 \in B$  bo'lgani uchun (9) tenglikdan kelib chiqadiki

$$\eta \in \int_0^{t_1-t_0} e^{A(t_1-t_0-t)}Bdt + \int_0^{\tau^*} e^{A(t_1-t_0-t)}A\xi_0dt. \quad (10)$$

Endi (7), (9) va (10) dan quyidagini hosil qilamiz:

$$\begin{aligned} \xi &\in e^{A(\tau-t_0)}\xi_0 + \int_0^{\tau^*} e^{A(t_1-t_0-t)}A\xi_0dt + \int_0^{t_1-t_0} e^{A(t_1-t_0-t)}Bdt = e^{A(\tau-t_0)}\xi_0 + \int_0^{\tau^*} e^{A(t_1-t_0-t)}A\xi_0dt + \int_{t_0}^{t_1} e^{A(t_1-t)}Bdt = \\ &= e^{A(\tau-t_0)}\xi_0 - \int_0^{\tau^*} de^{A(t_1-t_0-t)}\xi_0 + \int_{t_0}^{t_1} e^{A(t_1-t)}Bdt = e^{A(\tau-t_0)}\xi_0 - e^{A(t_1-t_0-\tau)}\xi_0 \Big|_0^{\tau^*} + \int_{t_0}^{t_1} e^{A(t_1-t)}Bdt = \\ &= e^{A(t_1-t_0)}\xi_0 + \int_{t_0}^{t_1} e^{A(t_1-t)}Bdt \subset X(t_0, t_1, Z, A, B). \end{aligned}$$

Demak,  $\sum(t_0, t_1, Z, A, B) \subset X(t_0, t_1, Z, A, B)$ . Olingan mansublik oshkor  $X(t_0, t_1, Z, A, B) \subset \sum(t_0, t_1, Z, A, B)$  mansublik bilan birgalikda (6) tenglikning o'rinli ekanligini isbotlaydi

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## FREZALASH JARAYONIDA MINIMAL MIQDORDAGI MOYLASHNING HARORAT VA KESISH KUCHLARIGA TA'SIRI (AISI 1045 PO'LAT MISOLIDA)

**Annotatsiya.** *Mazkur tadqiqotda AISI 1045 markali po'latni frezalash jarayonida quruq va minimal miqdordagi moylash (MQL) sharoitlarining kesish jarayoniga ta'siri eksperimental ravishda o'rganildi. Tajribalar turli kesish tezligi va tishga to'g'ri keladigan surish qiymatlarida olib borildi. Kesish zonasidagi harorat termopara va infraqizil kamera yordamida o'lchandi, kesish kuchlari dinamometr orqali aniqlanib, kesish parametrlarining ta'siri Pareto diagrammalar yordamida baholandi. Natijalar shuni ko'rsatdiki, kesish tezligi va surish miqdori harorat hamda kesish kuchlariga sezilarli ta'sir ko'rsatadi. Quruq frezalashda harorat eng yuqori qiymatlarda qayd etilgan, minimal miqdordagi moylash qo'llanganda esa harorat pasaygan. Mineral asosdagi MQL14 moyi haroratni kamaytirishda eng samarali natijani ko'rsatdi, o'simlik asosidagi moylar esa moylash xususiyati bilan ajralib turdi. Olingan natijalar minimal miqdordagi moylash usuli kesish jarayonining samaradorligini oshirish va issiqlik yuklanishini kamaytirishda muhim ahamiyatga ega ekanligini ko'rsatdi.*

**Kalit so'zlar:** *AISI 1045 po'lat, frezalash jarayoni, minimal miqdordagi moylash, kesish tezligi, tishga to'g'ri keladigan surish, harorat, kesish kuchi, Pareto diagramma, infraqizil kamera, asbob yeyilishi*

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## EFFECT OF MINIMUM QUANTITY LUBRICATION ON TEMPERATURE AND CUTTING FORCES IN MILLING (AISI 1045 STEEL CASE STUDY)

**Abstract.** *This study experimentally investigates the influence of dry and minimum quantity lubrication (MQL) conditions on the milling process of AISI 1045 steel. The experiments were conducted at different cutting speeds and feed per tooth values. Cutting zone temperature was measured using thermocouples and an infrared camera, while cutting forces were recorded using a dynamometer. The influence of cutting parameters was evaluated using Pareto charts. The results indicate that cutting speed and feed per tooth significantly affect temperature and cutting forces. The highest temperatures were observed under dry machining conditions, whereas the application of MQL reduced the temperature. The mineral-based MQL14 oil showed the best performance in temperature reduction, while*

*vegetable-based oils provided effective lubrication. The results demonstrate that MQL is an efficient approach for improving machining performance and reducing thermal loads.*

**Keywords:** *AISI 1045 steel, milling process, minimum quantity lubrication, cutting speed, feed per tooth, temperature, cutting force, Pareto chart, infrared camera, tool wear*

**Usullar:** Tadqiqotda AISI 1045 markali o'rta uglerodli po'latni frezalash jarayoni eksperimental ravishda o'rganildi. Tajribalar MT 60 rusumli universal frezalash stanogida Mitsubishi Materials ishlab chiqargan qattiq qotishmali kesish plastinkalari yordamida amalga oshirildi. Kesish jarayonida to'rtta sharoit qo'llanildi: quruq frezalash hamda LB1000, MQL15 (o'simlik asosidagi) va MQL14 (mineral asosdagi) moylar bilan minimal miqdordagi moylash usuli. Moylash tizimida moy aerosol shaklida 45 ml/soat sarf va 6 bar bosim ostida kesish zonasiga uzatildi. Kesish parametrlaridan kesish tezligi 150 va 200 m/min, tishga to'g'ri keladigan surish 0.07 va 0.14 mm/tish qiymatlarda tanlanib, aksial kesish chuqurligi 1 mm va radial kesish chuqurligi 25 mm qilib doimiy saqlandi. Kesish zonasidagi harorat K-tipli termoparalar va infraqizil kamera yordamida o'lchandi, kesish kuchlari dinamometr orqali aniqlanib, sirt sifati profilometr bilan baholandi, asbob yeyilishi esa mikroskopik tahlil orqali tekshirildi. Eksperimental natijalar statistik usullar yordamida qayta ishlanib, kesish parametrlarining ta'sir darajasi aniqlangan.

**Xulosa:** Mazkur tadqiqotda AISI 1045 po'latni frezalash jarayonida quruq va minimal miqdordagi moylash sharoitlarining ta'siri eksperimental ravishda baholandi. Natijalar kesish tezligi va tishga to'g'ri keladigan surish harorat hamda kesish kuchlariga sezilarli ta'sir ko'rsatishini ko'rsatdi, bunda quruq frezalashda harorat eng yuqori qiymatlarda qayd etildi. Minimal miqdordagi moylash qo'llanganda harorat pasaydi va kesish jarayoni barqarorlashdi, xususan MQL14 mineral moyi haroratni kamaytirishda eng samarali natijani ko'rsatdi. Olingan natijalar minimal miqdordagi moylash usuli kesish jarayonining samaradorligini oshirish va issiqlik yuklanishini kamaytirishda maqsadga muvofiq ekanligini tasdiqlaydi.

### **Kirish**

Zamonaviy mashinasozlik sanoatida kesish jarayonlari detallarni yuqori aniqlik va sifat bilan tayyorlashning asosiy usullaridan biri hisoblanadi. Ayniqsa frezalash jarayoni murakkab shaklli detallarni ishlab chiqarishda keng qo'llaniladi. Biroq ushbu jarayon davomida kesish zonasida yuqori harorat va mexanik yuklanishlar yuzaga keladi, bu esa asbob yeyilishi, sirt sifatining yomonlashuvi va energiya sarfining ortishiga olib keladi.

Kesish jarayonida hosil bo'ladigan issiqlikning asosiy manbalari qirindi hosil bo'lish zonasi, asbob va detal orasidagi ishqalanish hamda qirindi va asbob orasidagi kontakt hisoblanadi. Yuqori harorat kesish asbobining tez yeyilishiga, qattiq qotishma plastinkalarning mustahkamlik xususiyatlarining pasayishiga va



ishlov berilayotgan detal sirtining sifatiga salbiy ta'sir ko'rsatadi. Shu sababli kesish jarayonida issiqlikni boshqarish muhim masalalardan biri hisoblanadi.

An'anaviy ravishda kesish jarayonida sovitish va moylash uchun katta miqdorda kesish suyuqliklari qo'llaniladi. Biroq ushbu usul ekologik muammolarni keltirib chiqaradi, jumladan chiqindilarni utilizatsiya qilish, ishchi muhit xavfsizligi va ishlab chiqarish xarajatlarining ortishi bilan bog'liq. Shu sababli so'nggi yillarda ekologik toza va iqtisodiy samarali texnologiyalarni qo'llash dolzarb masalaga aylangan.

Minimal miqdordagi moylash (MMM yoki MQL) usuli kesish zonasiga juda kichik miqdorda moyni aerosol shaklida uzatish orqali amalga oshiriladi. Ushbu usul moylash va sovitish jarayonlarini birgalikda ta'minlab, kesish jarayonining samaradorligini oshiradi. MQL usulining asosiy afzalliklari sifatida moy sarfining kamayishi, ekologik xavfsizlikning oshishi va ishlab chiqarish xarajatlarining pasayishi keltiriladi.

So'nggi tadqiqotlarda MQL usulida turli turdagi moylarning qo'llanilishi o'rganilgan. Ayniqsa o'simlik asosidagi moylar biologik parchalanish xususiyatiga ega bo'lib, ekologik jihatdan xavfsiz hisoblanadi. Mineral asosdagi moylar esa yuqori issiqlik o'tkazuvchanligi va barqarorligi bilan ajralib turadi. Shu sababli turli moylash muhitlarining kesish jarayoniga ta'sirini kompleks o'rganish zarur hisoblanadi.

Kesish jarayonining samaradorligi bir nechta parametrlar bilan belgilanadi. Kesish tezligi va tishga to'g'ri keladigan surish kesish kuchlari, harorat va sirt sifatiga bevosita ta'sir ko'rsatadi. Ushbu parametrlarning o'zaro ta'sirini aniqlash uchun statistik usullar, xususan Pareto diagrammalar va sirt javobi metodlari keng qo'llaniladi. Ushbu yondashuvlar orqali kesish jarayoniga ta'sir qiluvchi asosiy omillarni aniqlash mumkin.

Mazkur tadqiqotning maqsadi AISI 1045 markali po'latni frezalash jarayonida quruq va minimal miqdordagi moylash sharoitlarining kesish jarayoniga ta'sirini eksperimental ravishda o'rganishdan iborat. Tadqiqot doirasida kesish tezligi va tishga to'g'ri keladigan surishning harorat va kesish kuchlariga ta'siri baholangan, shuningdek, turli moylash muhitlarining samaradorligi solishtirilgan.

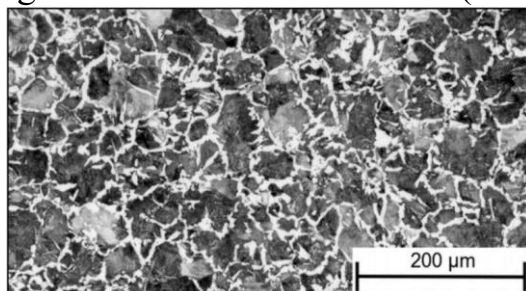
Tadqiqot vazifalari sifatida kesish zonasidagi haroratni termopara va infraqizil kamera yordamida aniqlash, kesish kuchlarini o'lchash, hamda kesish parametrlarining ta'sir darajasini statistik usullar orqali baholash belgilangan. Ushbu tadqiqot natijalari kesish jarayonini optimallashtirish va samarali moylash sharoitlarini tanlash uchun ilmiy asos yaratadi.

### **Tadqiqot usullari**

Tadqiqotda ishlov beriluvchi material sifatida AISI 1045 markali o'rta uglerodli po'lat tanlandi. Ushbu material mashinasozlik sanoatida keng qo'llanilib, yaxshi ishlov beriluvchanlik va yetarli mexanik mustahkamlikni ta'minlaydi. Tajribalarda o'lchamlari  $100 \times 100 \times 500$  mm bo'lgan prokatlangan zagotovkalar ishlatildi.

Materialning kimyoviy tarkibi quyidagicha: uglerod 0.045%, marganes 0.69–0.83%, kremniy 0.19–0.29%, oltingugurt 0.015–0.02%, qolgan qismi temirdan iborat. Ushbu tarkib po‘latning kesish jarayonidagi mexanik va termik xatti-harakatini belgilaydi.

Materialning mikrostrukturasi ferrit va perlit fazalaridan tashkil topgan bo‘lib, ferrit plastiklikni, perlit esa mustahkamlikni ta’minlaydi. Ushbu ikki fazaning kombinatsiyasi kesish vaqtida deformatsiya, issiqlik hosil bo‘lishi va qirindi ajralish jarayoniga bevosita ta’sir ko‘rsatadi (1-rasm).



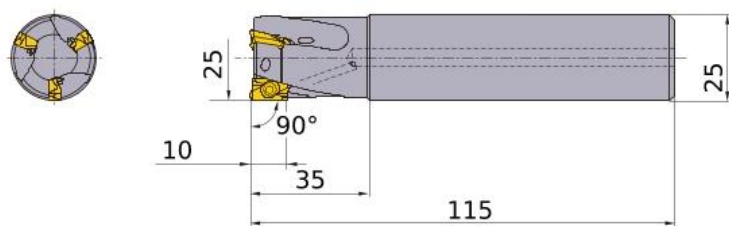
**1-rasm. AISI 1045 po‘latining mikrostrukturasi**

Materialning mexanik xususiyatlari standart sinovlar asosida aniqlangan. Cho‘zilishdagi mustahkamlik 869 MPa ni tashkil etdi, bu materialning yuqori yuklanishlarga bardosh berishini ko‘rsatadi. Nisbiy uzayish 13.6% ga teng bo‘lib, materialning plastiklik darajasini ifodalaydi. Qattqlik qiymati  $262 \pm 11.35$  HV bo‘lib, kesish jarayonida asbob yeyilishiga ta’sir qiluvchi muhim omillardan biri hisoblanadi.

Tajriba ishlari MT 60 rusumli universal frezalash stanogida olib borildi. Stanok 4 kVt quvvatga ega bo‘lib, shpindelning aylanish tezligi 50 dan 1600 ayl/min gacha o‘zgaradi. Uskuna gorizontaal va vertikal frezalash imkoniyatlariga ega bo‘lib, detallarni mexanik ishlov berishda keng qo‘llaniladi. Konstruktiv jihatdan mustahkamligi va barqarorligi tufayli tajribalar davomida yetarli aniqlik va qayta ishlab chiqarish takrorlanuvchanligini ta’minladi.

Kesish asbobi sifatida Mitsubishi Materials tomonidan ishlab chiqarilgan qattiq qotishmali plastinkalar qo‘llanildi. Asbob APX3000R253SA25A tipidagi tutqichga o‘rnatildi. Kesish plastinkasining uch radiusi 0.8 mm, kesish uzunligi 12 mm va old burchagi  $11^\circ$  qilib belgilandi. Ushbu geometriya qirindi hosil bo‘lishini barqarorlashtiradi va kesish jarayonida yuzaga keladigan mexanik yuklanishlarni kamaytiradi.

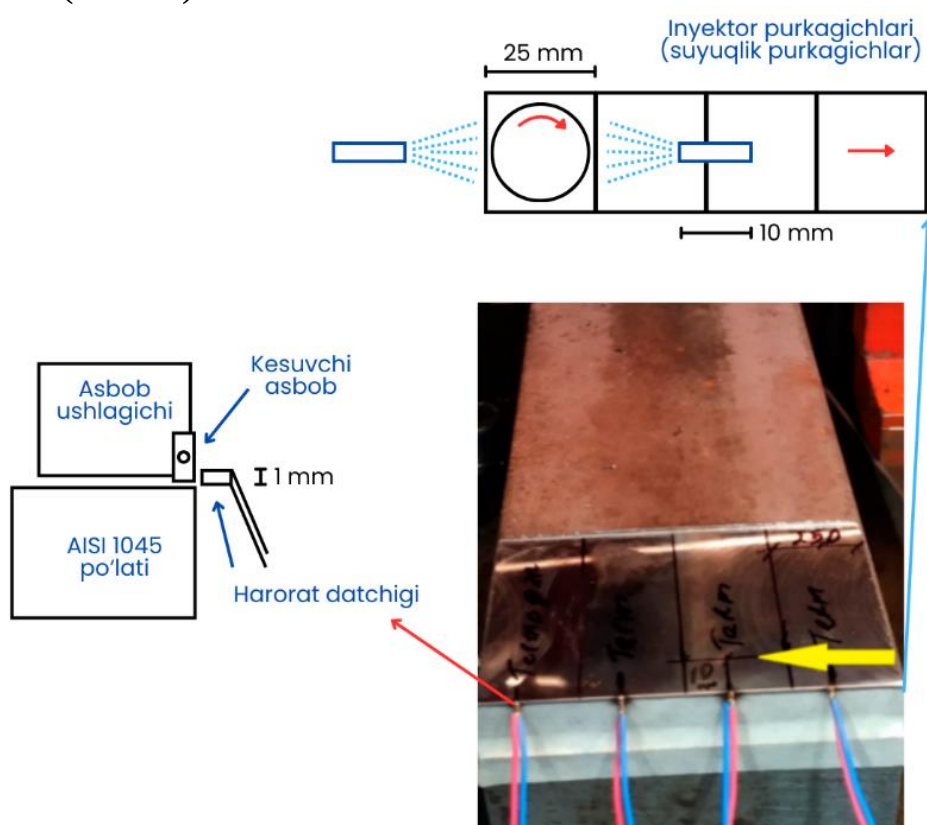
Asbob geometriyasida qirindi sindiruvchi element mavjud bo‘lib, u qirindi uzunligini nazorat qiladi va qirindining asbob yuzasiga yopishib qolishini oldini oladi. Natijada issiqlik tarqalishi yaxshilanadi va kesish zonasida barqaror sharoit ta’minlanadi (2-rasm).



**2-rasm. Frezalash asbobi (APX3000R253SA25A)**

Tadqiqotda to'rtta turdagi kesish sharoitlari qo'llanildi: quruq frezalash, LB1000 biomoyi bilan minimal miqdordagi moylash, MQL15 biomoyi bilan minimal miqdordagi moylash va MQL14 mineral moyi bilan minimal miqdordagi moylash. Minimal miqdordagi moylash usulida moy kesish zonasiga siqilgan havo yordamida aerosol shaklida uzatildi. Moy sarfi 45 ml/soat, siqilgan havo bosimi esa 6 bar qilib belgilandi.

Moylash tizimi ikki purkagichdan iborat bo'lib, ular kesish zonasiga qarama-qarshi tomondan 180° burchak ostida yo'naltirildi. Bu joylashuv moyning qirindi va asbob orasidagi ishqalanish zonasiga to'g'ridan-to'g'ri yetib borishini ta'minlaydi. Natijada ishqalanish kamayadi va issiqlik ajralishi boshqariladi (3-rasm).



**3-rasm MMM tizimi**

Kesish jarayonida parametrlar qat'iy belgilandi. Kesish tezligi 150 m/min va 200 m/min qiymatlarda tanlandi. Ushbu qiymatlar sanoat sharoitlarida keng qo'llaniladigan tezlik diapazonini ifodalaydi. Tish bo'yicha surish miqdori 0.07

mm/tish va 0.14 mm/tish qilib belgilandi, bu esa sirt sifati va qirindi hosil bo'lish jarayonini baholash imkonini beradi.

Aksial kesish chuqurligi 1 mm, radial kesish chuqurligi 25 mm qilib doimiy saqlandi. Ushbu parametrlar tajriba davomida o'zgartirilmadi, bu esa faqat tezlik va surish miqdorining ta'sirini aniqlash imkonini berdi.

Eksperimental reja  $2^2$  faktoriyal dizayn asosida tashkil etildi. Bu yondashuv kesish parametrlarining asosiy va o'zaro ta'sirlarini aniqlash imkonini beradi. Har bir tajriba kamida uch marta takrorlandi va natijalar o'rtacha qiymatlar asosida qayd etildi (1-jadval).

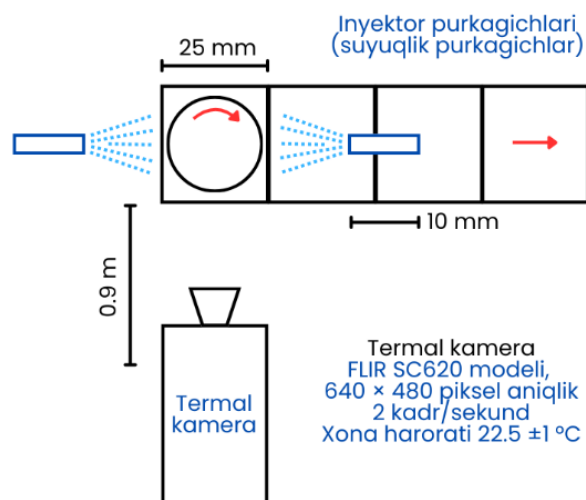
Kesish zonasidagi harorat ikkita mustaqil usul orqali o'lchandi. Birinchi usulda K-tipli termoparalar ishlov berilayotgan detal yuzasiga payvandlab o'rnatildi. Termoparalar kesish yo'nalishi bo'ylab joylashtirilib, 1 mm chuqurlikda harorat o'zgarishini qayd etdi. Ushbu usul ichki haroratni aniqlash imkonini beradi.

**1-jadval**

**Eksperimental parametrlar**

| <b>Parametr</b>          | <b>Qiymat</b>               |
|--------------------------|-----------------------------|
| Kesish tezligi           | 150 m/min; 200 m/min        |
| Surish miqdori           | 0.07 mm/tish; 0.14 mm/tish  |
| Aksial kesish chuqurligi | 1 mm                        |
| Radial kesish chuqurligi | 25 mm                       |
| Moylash sharoitlari      | Quruq; LB1000; MQL15; MQL14 |
| Moy sarfi                | 45 ml/soat                  |
| Havo bosimi              | 6 bar                       |

Ikkinchi usulda infraqizil kamera qo'llanildi. FLIR SC620 rusumli kamera detal yuzasidan 90 mm masofada joylashtirildi va sekundiga 2 kadr tezlikda ma'lumot yig'di. Kamera yordamida kesish zonasidagi issiqlik maydoni va uning vaqt bo'yicha o'zgarishi qayd etildi (4-rasm).



**4-rasm. Haroratni o'lchash tizimi**

Kesish kuchlari Kistler 9257B dinamometr yordamida uch o'q bo'yicha o'lchandi. Olingan signallar maxsus dastur orqali qayta ishlanib, kesish kuchining komponentlari aniqlashtirildi. Ushbu o'lchash usuli kesish jarayonidagi mexanik yuklanishlarni aniq baholash imkonini beradi.

Energiya sarfi Fluke 435 qurilmasi yordamida o'lchandi. Ushbu qurilma yordamida stanokning umumiy quvvat iste'moli qayd etildi va kesish jarayonidagi energiya sarfi hisoblab chiqildi.

Sirt sifati g'adir-budurlik ko'rsatkichlari orqali baholandi. Ra, Rz va Ry parametrlar Time Group TR220 profilometri yordamida o'lchandi. Har bir namunada uchta nuqtada o'lchov amalga oshirildi va o'rtacha qiymatlar hisoblandi. O'lchash yo'nalishi kesish yo'nalishiga perpendikulyar holda tanlandi, bu esa sirtning haqiqiy holatini aks ettiradi (5-rasm).

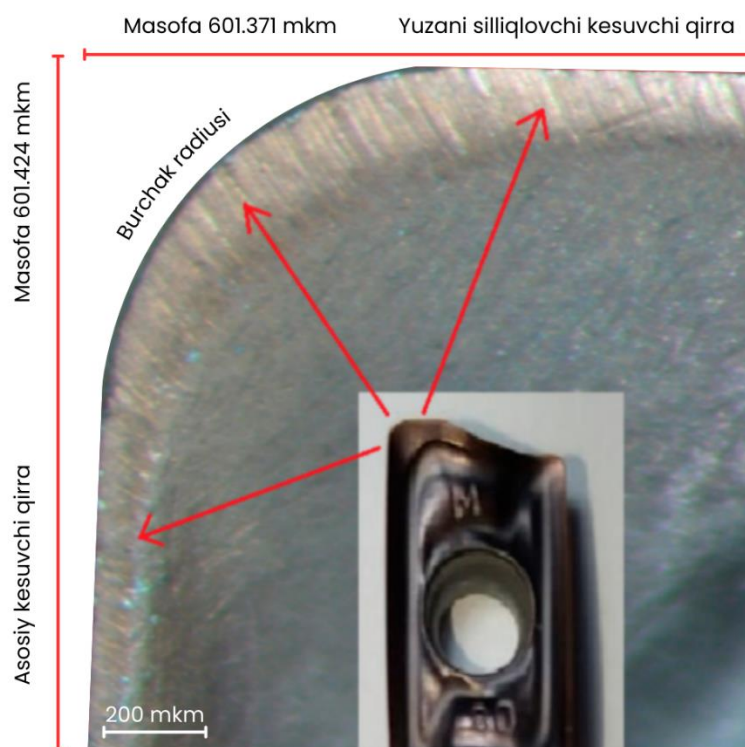


**5-rasm. Sirt g'adir-budurligi o'lchovi (TIME Model: TR220)**

Kesish asbobining yeyilishi orqa yuzadagi yeyilish kengligi bo'yicha baholandi. Chegaraviy qiymat 0.3 mm qilib belgilandi. Ushbu qiymatga yetganda asbob xizmat muddati tugagan deb hisoblandi.

Asbob yuzasi muntazam ravishda tekshirilib, yeyilish zonalari optik mikroskop va elektron mikroskop yordamida tahlil qilindi. Tahlil natijasida abraziv yeyilish, yopishish natijasidagi yeyilish va diffuzion yeyilish mexanizmlari aniqlangan. Ushbu mexanizmlar kesish sharoitiga qarab turlicha intensivlikda namoyon bo'ladi (6-rasm).





6-rasm. Asbob yeyilishi

Eksperimental natijalar statistik jihatdan qayta ishlanib, variatsion tahlil yordamida kesish parametrlarining ta'sir darajasi aniqlandi. Natijalar 95% ishonchlilik darajasida baholandi. Shuningdek, juft taqqoslashlar Tukey mezoni asosida amalga oshirildi, bu esa turli moylash sharoitlari o'rtasidagi farqlarni aniqlash imkonini berdi.

### **Tadqiqot natijalari**

Kesish jarayonida harorat qiymatlari ikkita usul orqali qayd etildi: K-tipli termoparalar yordamida va infraqizil kamera yordamida. Olingan natijalar kesish tezligi, surish miqdori va moylash sharoitlariga bog'liq holda grafik va diagrammalar orqali ifodalangan.

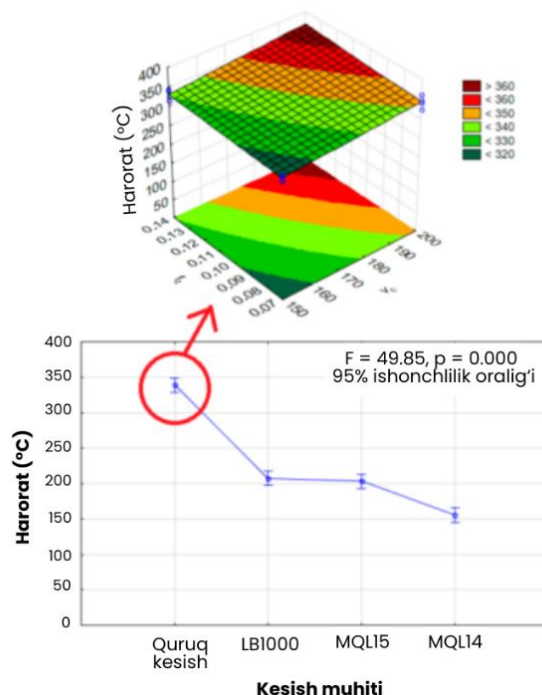
Termopara yordamida o'lchangan harorat natijalari quruq frezalash sharoitida aniqlangan. Haroratning kesish tezligi va surish miqdoriga bog'liqligi sirt javobi grafigida ko'rsatilgan (7-rasm). Grafikda kesish tezligi va surish miqdori oshishi bilan harorat qiymatlari ortishi qayd etilgan. Quruq frezalash, LB1000, MQL15 va MQL14 sharoitlari bo'yicha harorat qiymatlari taqqoslangan grafikda quruq frezalashda harorat eng yuqori, MQL14 da esa eng past qiymatlarda qayd etilgan.

Kesish parametrlarining haroratga ta'siri MQL moylari uchun Pareto diagrammalar orqali ifodalangan. Diagrammalarda kesish tezligi ( $V_c$ ), surish miqdori ( $f_z$ ) va ularning o'zaro ta'siri ( $V_c \times f_z$ ) ko'rsatilgan (8-rasm). MQL15 uchun Pareto diagrammada kesish tezligi ta'siri 2.32, surish miqdori 1.72 va o'zaro ta'sir  $-0.08$  qiymatlarda qayd etilgan. LB1000 moyi uchun kesish tezligi 4.43, surish miqdori 4.15 va o'zaro ta'sir  $0.07$  qiymatlarda berilgan. MQL14



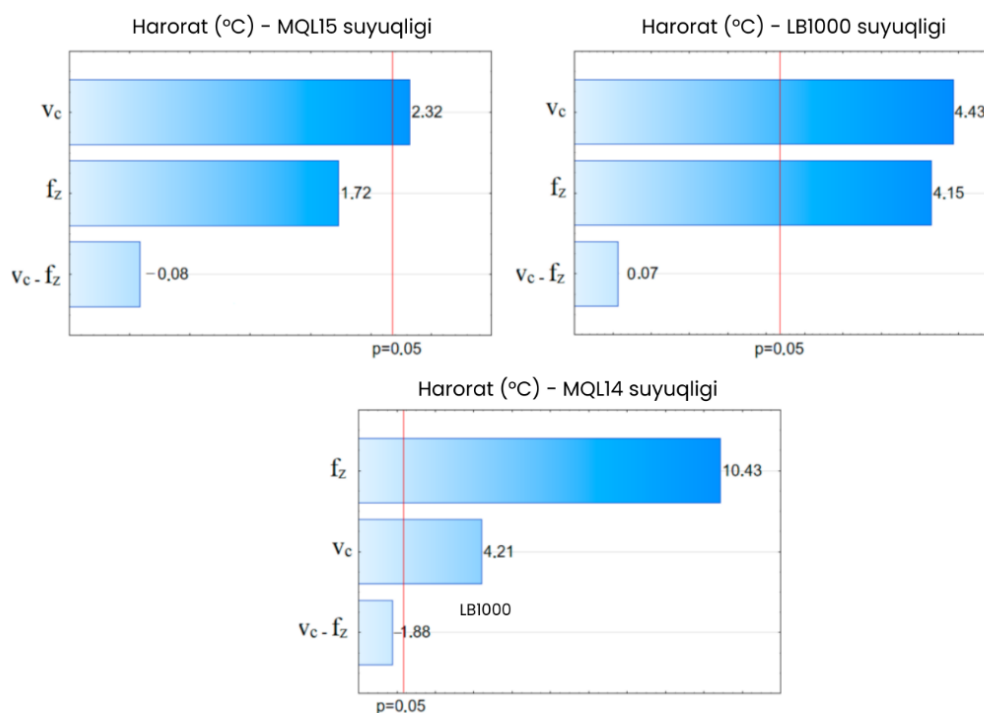
moyi uchun esa surish miqdori 10.43, kesish tezligi 4.21 va o‘zaro ta’sir 1.88 qiymatlarda qayd etilgan.

**Yuzani silliqlovchi kesuvchi qirra**

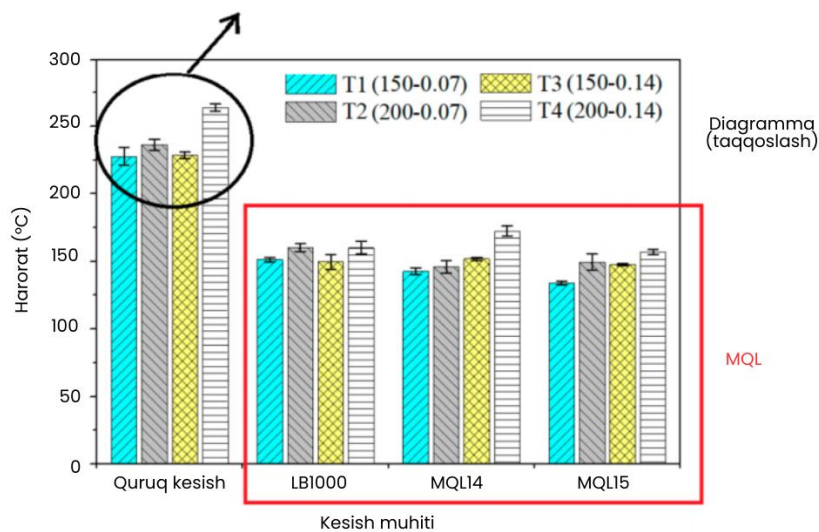
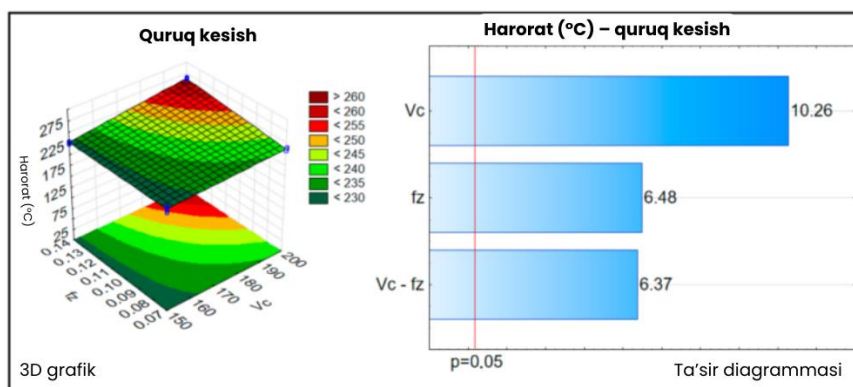


**7-rasm. Termopara orqali harorat**

Infraqizil kamera yordamida o‘lchangan harorat natijalari uch xil ko‘rinishda taqdim etilgan: sirt javobi grafigi, Pareto diagramma va kesish sharoitlari bo‘yicha taqqoslash grafiklari (9-rasm). Quruq frezalash uchun Pareto diagrammada kesish tezligi ta’siri 10.26, surish miqdori 6.48 va ularning o‘zaro ta’siri 6.37 qiymatlarda qayd etilgan. Haroratning kesish muhitiga bog‘liqligi grafikda keltirilgan bo‘lib, quruq frezalashda harorat yuqori, MQL sharoitlarida esa pastroq qiymatlar qayd etilgan.



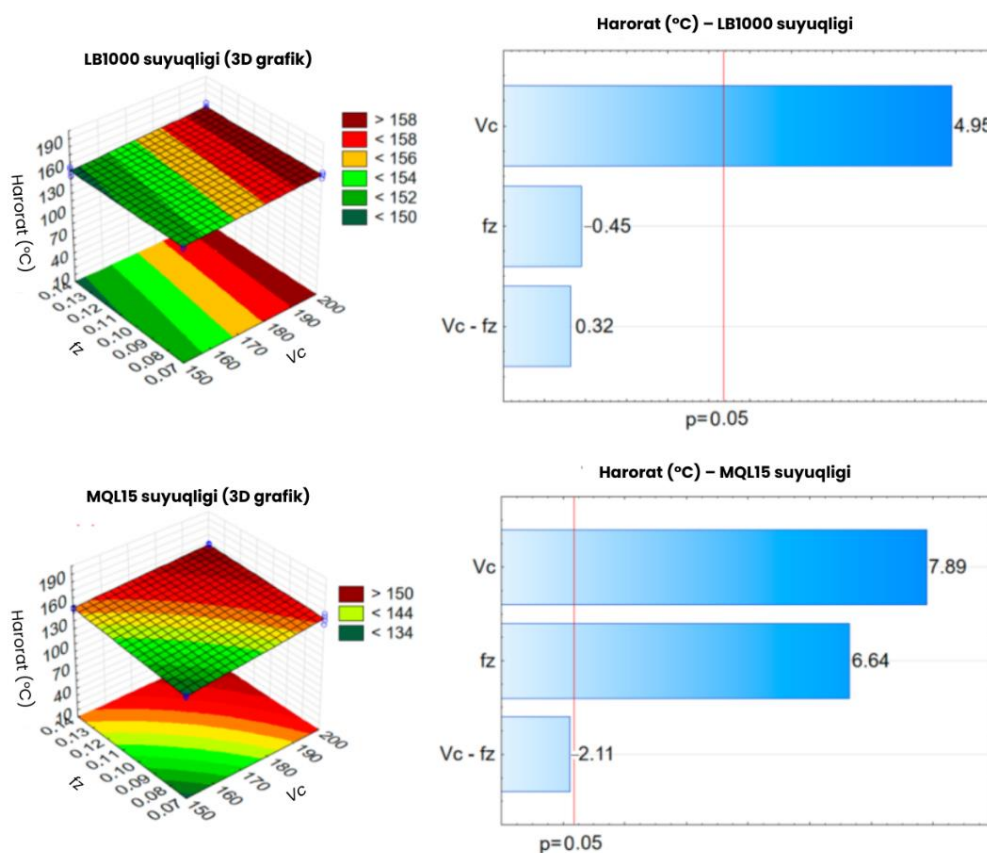
8-rasm. Pareto diagrammalar



9-rasm. Infraqizil kamera harorat natijalari

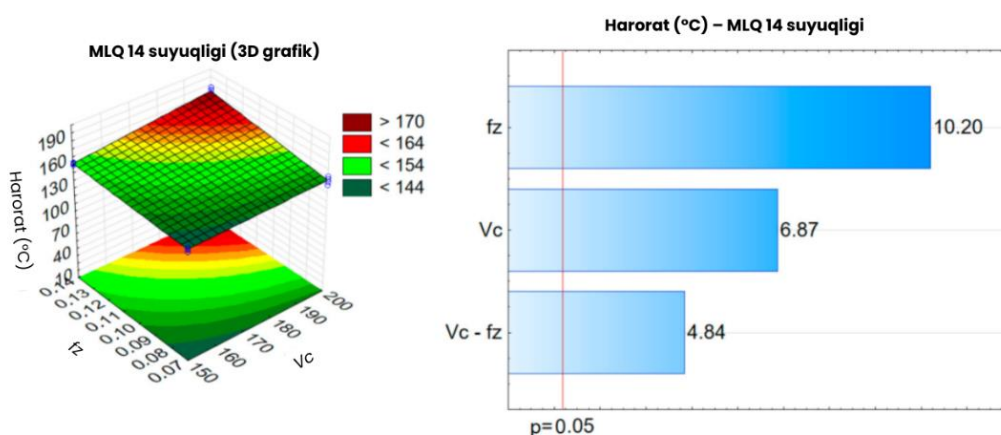
Biomoylar uchun harorat natijalari alohida berilgan. LB1000 moyi uchun Pareto diagrammada kesish tezligi 4.95, surish miqdori 0.45 va o'zaro ta'sir 0.32

qiymatlarda qayd etilgan. MQL15 moyi uchun esa kesish tezligi 7.89, surish miqdori 6.64 va o‘zaro ta’sir 2.11 qiymatlarda ko‘rsatilgan. Ushbu moylar uchun sirt javobi grafigida kesish parametrlarining haroratga ta’siri ifodalangan (10-rasm).



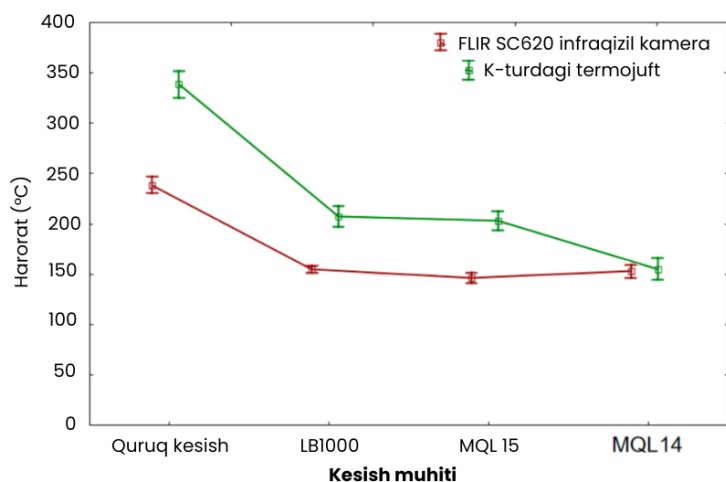
**10-rasm. Biomoylari harorat natijalari**

Mineral asosdagi MQL14 moyi uchun infraqizil kamera yordamida o‘lchangan harorat natijalari alohida keltirilgan. Pareto diagrammada surish miqdorining ta’siri 10.20, kesish tezligi 6.87 va ularning o‘zaro ta’siri 4.84 qiymatlarda qayd etilgan. Sirt javobi grafigida kesish tezligi va surish miqdori oshishi bilan harorat qiymatlari ortishi kuzatilgan (11-rasm).

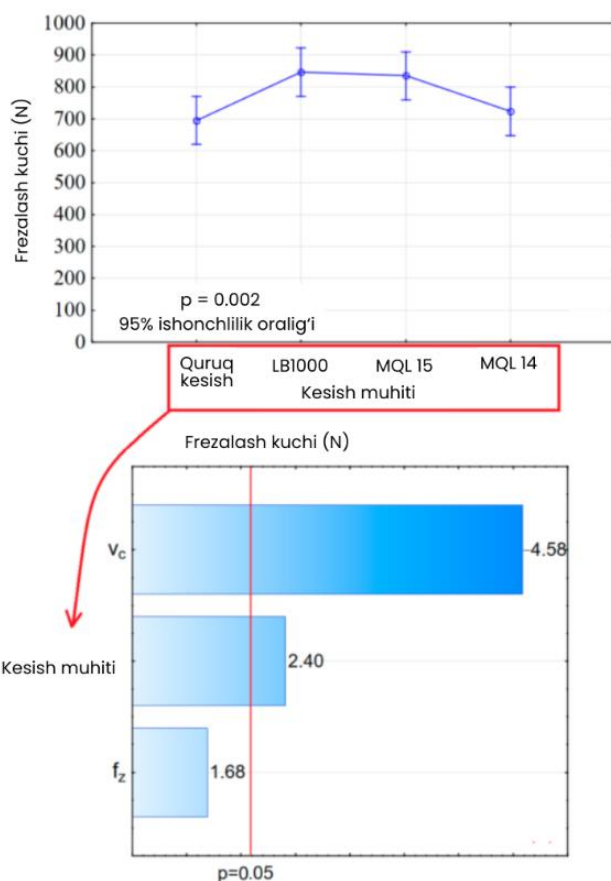


**11-rasm. MQL14 harorat natijalari**

Haroratni o'lchash usullari taqqoslangan grafikda infraqizil kamera va termopara yordamida olingan natijalar ko'rsatilgan. Quruq frezalash sharoitida harorat qiymatlari infraqizil kamera bo'yicha taxminan 240 °C, termopara bo'yicha esa 350 °C atrofida qayd etilgan. LB1000, MQL15 va MQL14 sharoitlarida harorat qiymatlari pasaygan va har ikki o'lchash usuli bo'yicha natijalar bir-biriga yaqin qiymatlarda qayd etilgan (12-rasm).



**12-rasm. O'lchash usullari taqqoslanishi**



**13-rasm. Kesish kuchlari**

Kesish kuchlari natijalari grafik va Pareto diagramma orqali ifodalangan. Grafikda kesish muhitiga bog'liq holda kesish kuchi qiymatlari keltirilgan. LB1000 va MQL15 sharoitlarida kesish kuchi yuqoriroq qiymatlarda qayd

etilgan, MQL14 va quruq frezalash sharoitlarida esa pastroq qiymatlar kuzatilgan. Pareto diagrammada kesish tezligi 4.58, kesish muhiti 2.40 va surish miqdori 1.68 qiymatlarda qayd etilgan (13-rasm).

Eksperimental natijalar kesish tezligi, surish miqdori va moylash sharoitlariga bog'liq holda harorat va kesish kuchlari qiymatlarining o'zgarishini ko'rsatdi. Harorat natijalari termopara va infraqizil kamera yordamida aniqlanib, kesish parametrlarining ta'siri sirt javobi grafigi hamda Pareto diagrammalar orqali ifodalandi. Kesish kuchlari natijalari esa grafik va Pareto diagramma yordamida taqdim etildi.

### **Muhokama**

Olingan natijalar kesish jarayonida issiqlik hosil bo'lishi, ishqalanish sharoiti va material deformatsiyasi bilan bevosita bog'liq ekanligini ko'rsatadi. Harorat, kesish kuchlari va asbob yeyilishi kesish tezligi, tishga to'g'ri keladigan surish hamda moylash sharoitiga bog'liq holda o'zgaradi.

Kesish jarayonida issiqlik hosil bo'lishining asosiy manbai qirindi hosil bo'lish zonasi va asbob–detal orasidagi ishqalanish hisoblanadi. Kesish tezligi oshishi bilan deformatsiya tezligi ortadi va natijada ajralib chiqadigan issiqlik miqdori ko'payadi. Shu sababli kesish tezligi haroratga sezilarli ta'sir ko'rsatadi. Pareto diagrammalarda kesish tezligining yuqori ta'sir qiymatlari aynan shu jarayon bilan izohlanadi.

Tishga to'g'ri keladigan surish ortishi bilan kesilayotgan qatlam qalinlashadi. Bu esa materialning plastik deformatsiyasi hajmini oshiradi va kesish zonasida qo'shimcha issiqlik hosil bo'lishiga olib keladi. Shu bilan birga, kesish kuchlari ham ortadi. Natijalarda surish qiymati kesish kuchiga eng katta ta'sir qiluvchi omil sifatida qayd etilgan bo'lib, bu qirindi kesimi ortishi bilan bevosita bog'liq.

Moylash sharoitining ta'siri kesish zonasidagi ishqalanish jarayoni bilan belgilanadi. Quruq frezalashda asbob va detal orasida to'g'ridan-to'g'ri metall kontakt yuzaga keladi. Bu esa ishqalanish koefitsientini oshiradi va issiqlik ajralishini kuchaytiradi. Natijada harorat yuqori qiymatlarda qayd etiladi va asbob yeyilishi tezlashadi.

Minimal miqdordagi moylash qo'llanganda moy aerosol shaklida kesish zonasiga yetkaziladi. Bu moy qatlami asbob va detal orasida yupqa plyonka hosil qiladi. Ushbu plyonka ishqalanishni kamaytiradi va issiqlik hosil bo'lishini cheklaydi. Natijada harorat pasayadi va kesish jarayoni barqarorlashadi.

Mineral asosdagi MQL14 moyi eng past harorat qiymatlarini ta'minlagan. Bu moyning fizik xususiyatlari, xususan, yopishqoqligi va issiqlik o'tkazuvchanligi yuqori bo'lgani sababli kesish zonasida samarali sovitish va moylash jarayoni amalga oshadi. Shu sababli issiqlik ajralishi kamayadi va kesish jarayonidagi termik yuklanish pasayadi.

Biomoylar (LB1000 va MQL15) kesish jarayonida yuqori moylash xususiyatini ko'rsatadi. Ushbu moylar sirtlar orasida mustahkam moy plyonkasi hosil qiladi, bu esa ishqalanishni kamaytiradi. Natijada asbob yuzasida yopishish

va abraziv yeyilish jarayonlari sekinlashadi. Aynan shu sababli MQL15 moyi qo'llanganda asbob xizmat muddati eng yuqori bo'lgan.

Haroratni o'lchash usullari o'rtasidagi farq issiqlikni qayd etish prinsipi bilan bog'liq. Termopara bevosita detal ichki qatlamidagi haroratni o'lchaydi, infraqizil kamera esa sirt haroratini qayd etadi. Shu sababli termopara orqali o'lchangan harorat qiymatlari yuqoriroq qayd etilgan. Bu farq issiqlikning material ichida to'planishi bilan izohlanadi.

Kesish kuchlari natijalari shuni ko'rsatadiki, kesish tezligi oshishi bilan kuch qiymatlari kamayadi. Bu holat materialning yuqori haroratda yumshashi bilan izohlanadi. Harorat ortishi bilan materialning qarshiligi kamayadi va kesish jarayoni osonlashadi. Shu sababli yuqori tezlikda kesish kuchlari pastroq bo'ladi.

Asbob yeyilishi mexanizmlari kesish jarayonining termik va mexanik sharoitlariga bog'liq. Yeyilishning asosiy turlari abraziv, yopishish va diffuzion yeyilishdan iborat. Quruq frezalashda yuqori harorat va kuchli ishqalanish natijasida bu mexanizmlar birgalikda yuzaga keladi va asbob tez yeyiladi.

Moylash qo'llanganda esa ishqalanish kamayadi va harorat pasayadi. Natijada yeyilish jarayoni sekinlashadi. Biomoylari qo'llanganda yopishish kamayadi, mineral moy qo'llanganda esa issiqlik samarali olib chiqiladi. Shu sababli turli moylar kesish jarayoniga turlicha ta'sir ko'rsatadi.

### **Xulosa**

Mazkur tadqiqotda AISI 1045 markali po'latni frezalash jarayonida quruq va minimal miqdordagi moylash (MQL) sharoitlarining kesish jarayoniga ta'siri eksperimental ravishda o'rganildi. Kesish tezligi, tishga to'g'ri keladigan surish va moylash sharoitining harorat, kesish kuchlari hamda asbob yeyilishiga ta'siri aniqlangan.

Eksperimental natijalarga ko'ra, kesish jarayonida harorat qiymatlari moylash sharoitiga bog'liq holda sezilarli darajada o'zgaradi. Quruq frezalash sharoitida harorat eng yuqori qiymatlarda qayd etilgan, MQL qo'llanganda esa harorat pasaygan. Minimal miqdordagi moylash sharoitida MQL14 mineral moyi eng past harorat qiymatlarini ta'minlagan.

Kesish parametrlarining ta'siri Pareto diagrammalar orqali baholangan. Haroratga ta'sir etuvchi asosiy omillar sifatida kesish tezligi va tishga to'g'ri keladigan surish aniqlangan. MQL14 moyi qo'llanganda surish parametri haroratga eng katta ta'sir ko'rsatgan bo'lsa, quruq frezalashda kesish tezligining ta'siri yuqori qiymatlarda qayd etilgan.

Kesish kuchlari natijalari tishga to'g'ri keladigan surishning eng muhim omil ekanligini ko'rsatdi. Surish qiymati ortishi bilan kesish kuchlari oshgan. Kesish tezligi ortishi bilan esa kesish kuchlari kamaygan. Moylash sharoitlari kesish kuchlariga nisbatan kamroq ta'sir ko'rsatgan.

Haroratni o'lchash usullari taqqoslanganda termopara orqali o'lchangan qiymatlar infraqizil kamera natijalariga nisbatan yuqoriroq qayd etilgan. Bu holat ichki va sirt haroratining farqlanishi bilan izohlanadi.



Moylash sharoitining kesish jarayoniga ta'siri asosan ishqalanish va issiqlik ajralish jarayonlari orqali namoyon bo'lgan. Quruq frezalashda ishqalanish yuqori bo'lib, harorat ortgan va asbob yeyilishi tezlashgan. MQL qo'llanganda ishqalanish kamaygan, harorat pasaygan va kesish jarayoni barqarorlashgan.

O'simlik asosidagi moylar yuqori moylash xususiyatini ko'rsatgan bo'lsa, mineral asosdagi MQL14 moyi issiqlikni samarali olib chiqishi bilan ajralib turgan. Natijada MQL14 haroratni kamaytirishda, MQL15 esa asbob yeyilishini sekinlashtirishda samarali ekanligi aniqlangan.

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## **ULMUS SPP ZARARKUNANDALARI. VA ULARNI NAZORAT QILISH USULLARI**

**Annotatsiya** Ushbu maqolada qayrag‘och (*Ulmus spp.*) daraxtining biologik xususiyatlari, ekologik va xo‘jalikdagi ahamiyati hamda ning asosiy zararkunandalari haqida ketirilib o‘tilgan. Bu hashorotlar bioekologiyasi, ko‘payishi va o‘simlikni zararlashi oqibatlari batafsil yoritilgan. Zararkunandalarga bir necha himoya usullari ham qayd etilgan.

**Kalit** so‘zlar: qayrag‘och, *Ulmus*, o‘rmon xo‘jaligi, himoya o‘rmonlari, ekologiya, qayrog‘och bargini yeyuvchi qo‘ng‘iz, qayrag‘och kattapo‘stloqxo‘ri, shaxar mo‘ylovkori.

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## **PESTS OF ULMUS SPP. AND METHODS OF THEIR CONTROL**

**Abstract.** This article discusses the biological characteristics, ecological and economic importance of elm (*Ulmus spp.*) trees, as well as their main insect pests. The bioecology, reproduction, and the damage caused by these pests to the host plants are described in detail. Several pest management and control methods are also presented.

**Keywords:** elm, *Ulmus*, forestry, protective forests, ecology, elm leaf beetle, large elm bark beetle, longhorn beetle.

**Kirish.** O‘rmon xo‘jaligini rivojlantirish va ekologik muammolarni kamaytirishda daraxt turlarini to‘g‘ri tanlash muhim ahamiyatga ega. Qayrag‘och baland bo‘yli, uzoq umr ko‘ruvchi daraxt bo‘lib, 25–30 metr balandlikka yetishi mumkin. Barglari yirik, tuxumsimon shaklda bo‘lib, changni ushlab qolish qobiliyatiga ega. Ildiz tizimi chuqur va tarvaqaylab ketgan bo‘lib, tuproqni mustahkamlashda muhim rol o‘ynaydi. Ekologik ahamiyati Qayrag‘och daraxtlari havoni tozalash, kislorod ajratish va mikroiklimni yaxshilashda katta ahamiyatga ega. U shamol tezligini kamaytiradi, tuproq namligini saqlaydi va cho‘llanish

jarayonining oldini olishga yordam beradi. O'rmon xo'jaligidagi ahamiyati Qayrag'och o'rmon xo'jaligida ko'p maqsadli daraxt turi hisoblanadi. Uning yog'ochi mustahkam va elastik bo'lib, mebelsozlik, qurilish va qishloq xo'jaligi asboblari tayyorlashda ishlatiladi. Shuningdek, kesilgandan keyin bachkilab tez tiklanish xususiyatiga ega. Himoya o'rmonlaridagi o'rni Qayrag'och yo'l bo'ylari, daryo va kanal qirg'oqlarida himoya o'rmonzorlari barpo etishda keng qo'llaniladi. U suv va shamol eroziyasining oldini olishda samarali hisoblanadi. Lekin Qayrag'och daraxtida uchraydigan zararkunandalar uchrashi va qayragochga zarar keltirishi mumkin bolgan eng xafli zararkunandalar hisoblanadi. Bulardan quyidagi zararkunandalar kuzatilgan va qashi kurash choralari qo'llash mumkin.

**Qayrag'och bargini yeyuvchi qo'ng'iz -*Xanthogaleruca luteola*** (yoki *Pyrrhalta luteola*) Bu qo'ng'iz O'zbekiston, xususan Toshkent va Far'ona vodiysi populyatsiyalarida o'rganilgan. Uning lichinkalari barglarni to'rsimon qoldirib (skeletlashtirib) oziqlanadi, bu esa daraxtlarning zaiflashishiga olib keladi. *Xanthogaleruca luteola* Chrysomelidae oilasidan sariqdan zaytun yashilgacha bo'lgan qo'ng'izdir. Uning ko'krak qismi orqasida nuqtalari va xar bir qanotlarida ikkita yog'on va ingichka chiziqlari mavjud.



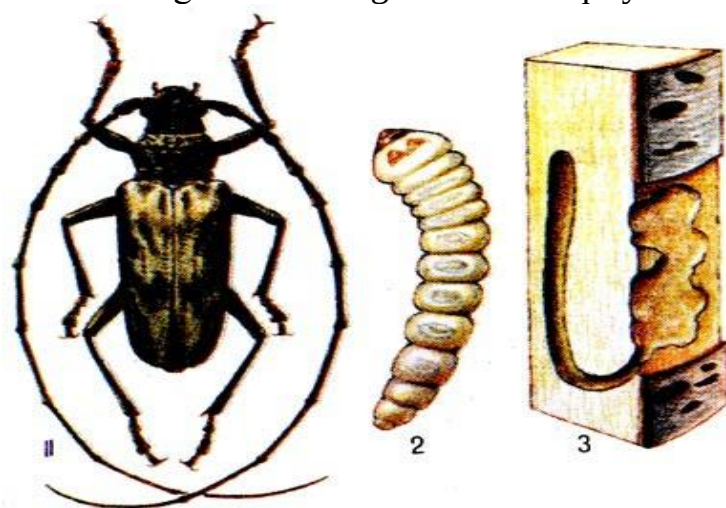
1-rasm. Qayrag'och bargini yeyuvchi qo'ng'iz – (*Xanthogaleruca luteola*)

Lichinkalar qora dog'lar va chiziqlar bilan sariq rangga ega bo'lib, juda ko'zga tashlanadi. Ular odatda barglar bilan oziqlanadi va uzunligi bir 12. mm gacha o'sadi. Voyaga etganlar uylar, garajlar va yog'och qoziqlari kabi himoyalangan joylarda va hovli qoldiqlari ostida qishlashadi. Ular bahorda havo isishi bilan paydo bo'ladi va 25 yoki undan ko'proq to'p-to'p qilib sariq yoki limon shaklidagi tuxumlarni barglarning pastki qismiga qo'yib, qarag'ochning novda uchlariga qarabga siljiydi.. Lichinkalar tuxum qo'yilgandan keyin taxminan bir hafta o'tgach chiqadi. Uch hafta o'tgach, lichinkalar to'liq etuk bo'lib, daraxt tagida g'umbakga ayladi. 14 kun davomida g'umbaklik so'ng imagolar paydo bo'ladi, bir yilda uch yoki undan ortiq avlod paydo bo'lishi mumkin. Lichinkalar ham yetuk zotlar ham barglar bilan oziqlanadi.

Yillar davomida bu qo'ng'iz qayrag'ochlarning asosiy zararkunandasiga aylandi. Kattalar ham, lichinkalar ham barglar bilan oziqlanganligi sababli, kuchli rivojlanish kuzatilganda novdalar barglari to'liq yo'qolishi mumkin..

**Qayrag'och katta po'stloqxo'ri**, qayragochdan boshqa, terak, yong'oq, tol daraxtlarini yo'g'on shoxi va tanalariga zarar yetkazadi. Bu zararkunanda oziqlanadigan daraxtida lichinkalik xolatida qishlab qoladi. Mart oyining birinchi o'n kunligida g'umbakka aylanadi va aprel oyining boshlarida kunduzlari uchib chiqib, qo'shimcha ovqatlanadi. Urg'ochi qo'ng'iz 60 tagacha tuxum qo'yadi. Xamma tuxumini 6-12 kun ichida qoyib bo'ladi. Qo'yilgan tuxumlardan 7-10 kundan keyin lichinkalar chiqadi. Yo'lning uzunligi 70 mm bo'ladi. Lichinka xammasi bo'lib, 18-20 kun ovqatlanadi, tog'li joylarda 30 kun. Bu zararkunanda vodiy joylarida 4 ta, tog'li xududlarda 3 ta avlod beradi

**Shahar mo'ylovdori** qo'ng'iz O'rta Osiyoda keng tarqalgan. U erda ko'plab daraxt turlariga, ayniqsa, shaharlarda o'sadigan terak, chinor, oq akatsiya, yong'oq va boshqalarga katta zarar etkazadi. Qo'ng'izning uzunligi 28–47 mm, to'q kulrang-jigarrang, ustida kumushsimon tuklari bor. Qo'ng'izning parvoz davri aprel oyining oxiridan iyun oyining o'rtalariga qadar davom etadi. Urg'ochilar har qanday yoshdagi, ko'pincha keksa daraxtlarning po'stlog'idagi yoriqlar va chuqurliklarda 1-3 tuxum qo'yadi. Bitta urg'ochi 270 tagacha tuxum qo'yadi.



2-rasm. Shahar mo'ylovdori- (*Aeolesthes sarta* Sols.)

Katta yoshdagi lichinkalar po'stlog'i ostiga chuqur kirib, dastlab po'stlog'i bilan oziqlanadi, so'ngra dastani ichiga chuqur kirib boradigan o'ralgan tunnellarni hosil qiladi va po'stlog'ini keskin kesib tashlaydigan tartibsiz oval bo'shliqlarga kiradi. Kuzda lichinkalar daraxt ichiga chuqurroq kirib, u erda qishlaydi va keyingi yil tunnelini davom ettiradi. Avvaliga tunnel pastga qarab harakat qiladi, so'ngra. Yosh qo'ng'izlar yoz oxirida paydo bo'ladi va tunnellarda qishlaydi. Ikki yilda bir avlod berishi kuzatilgan.

Shahar uzun shoxli qo'ng'iz sog'lom daraxtlarga hujum qiladi va asta-sekin ularning zararlab nobud qiladi. Dengiz sathidan 1800 metr balandlikdagi vodiy va tog' o'rmonlarida uchraydi. Shahar uzun shoxli qo'ng'iz tomonidan shikastlangan

daraxtlar o'zlarining texnik xususiyatlarini butunlay yo'qotadilar va yog'och ishlab chiqarish sohalarida foydalanishgaga yaroqsiz bo'lib qoladi.

Xulosa qilib aytganda, qayrag'och O'zbekiston o'rmon xo'jaligida ekologik va iqtisodiy jihatdan muhim daraxt turi hisoblanadi. Uni keng miqyosda ekish va saqlash ekologik barqarorlikni ta'minlashga va qayragoch daraxtlarida uchraydigan zararkunandalar o'rmon xo'jaligida jiddiy ekologik va iqtisodiy zarar keltirishi oldini olish.

Shu bois qayrag'och o'rmonlarini muhofaza qilishda zararkunandalarni erta aniqlash, doimiy monitoring olib borish hamda integratsiyalashgan kurash choralari — agrotexnik, biologik va kimyoviy usullarni uyg'unlashtirib qo'llash muhim ahamiyatga ega. O'z vaqtida amalga oshirilgan himoya tadbirlari qayrag'och daraxtlarining sog'lom saqlanishini ta'minlab, o'rmon ekotizimining barqarorligini mustahkamlashga xizmat qiladi.

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## SHAHAR MIKROIQLIMI VA UNING SALOMATLIKKA TA'SIRI

**Annotatsiya:** Ushbu maqolada shahar mikroiklimining shakllanish omillari, uning asosiy xususiyatlari hamda inson salomatligiga ko'rsatadigan ta'siri tahlil qilinadi. Shahar hududlarida bino va inshootlar zichligi, transport vositalari, sanoat korxonalari va yashil hududlar miqdori mikroiklimning o'zgarishiga sabab bo'lishi ilmiy jihatdan yoritiladi. Shuningdek, mikroiklimning harorat, namlik, havo almashinuvi va havo sifati orqali inson organizmiga ta'siri hamda sog'lom shahar muhitini shakllantirishning muhim jihatlari ko'rib chiqiladi.

**Kalit so'zlar:** shahar mikroiklimi, urbanizatsiya, havo sifati, harorat rejimi, namlik, ekologik muhit, yashil hududlar, inson salomatligi.

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## URBAN MICROCLIMATE AND ITS EFFECT ON HEALTH

**Abstract:** This article analyzes the factors that shape the urban microclimate, its main characteristics, and its impact on human health. The density of buildings and structures, the number of vehicles, industrial enterprises, and green spaces in urban areas contribute to changes in the microclimate. The impact of microclimate on the human body through temperature, humidity, air exchange, and air quality, as well as important aspects of the formation of a healthy urban environment, are also considered.

**Keywords:** urban microclimate, urbanization, air quality, temperature regime, humidity, ecological environment, green areas, human health.

**Kirish.** Hozirgi davrda urbanizatsiya jarayonining jadallashuvi natijasida shahar hududlarida tabiiy muhit sezilarli darajada o'zgarib bormoqda. Aholi sonining ortishi, sanoat korxonalarining rivojlanishi, transport vositalari sonining ko'payishi hamda turar joy va infratuzilma obyektlarining kengayishi shahar muhitida o'ziga xos iqlim sharoitini – shahar mikroiklimini shakllantiradi. Mikroiklim deganda ma'lum bir kichik hududda, xususan shahar



yoki uning ayrim qismlarida vujudga keladigan iqlimiy sharoitlar majmui tushuniladi.

Shahar mikroiqlimi tabiiy landshaft, qurilish zichligi, yashil hududlarning mavjudligi, suv havzalari hamda antropogen faoliyat natijasida shakllanadi. Ushbu omillar havoning harorati, namligi, shamol rejimi va atmosfera ifloslanish darajasiga ta'sir ko'rsatib, natijada inson salomatligiga ham ijobiy yoki salbiy ta'sir etishi mumkin. Shu sababli shahar mikroiqlimini o'rganish va uni sog'lom ekologik muhitni ta'minlash nuqtai nazaridan baholash zamonaviy geografiya, ekologiya hamda tibbiyot fanlari oldida turgan muhim masalalardan biri hisoblanadi.

**Asosiy qism:** Shahar mikroiqlimining shakllanishida bir qator tabiiy va antropogen omillar muhim rol o'ynaydi. Eng avvalo, shahar hududlarida bino va inshootlarning yuqori zichligi quyosh nurlarining qaytishi va issiqlikning to'planishiga sabab bo'ladi. Natijada shahar hududlarida "issiq orol" effekti deb ataluvchi hodisa yuzaga keladi. Bu holatda shahar markazida harorat atrofdagi qishloq yoki tabiiy hududlarga nisbatan bir necha daraja yuqori bo'lishi mumkin. Bunday harorat farqi ayniqsa yoz oylarida sezilarli bo'lib, aholi salomatligiga salbiy ta'sir ko'rsatishi ehtimoli ortadi.

Shahar mikroiqlimining yana bir muhim ko'rsatkichi havoning namligi va shamol rejimidir. Yuqori qavatli binolar va tor ko'chalar shamol harakatini sekinlashtirib, havo almashinuvini cheklaydi. Natijada zararli gazlar, chang zarrachalari va boshqa ifloslantiruvchi moddalar atmosferada uzoq vaqt saqlanib qoladi. Transport vositalari chiqindilari, sanoat korxonalarining emissiyalari va maishiy chiqindilar natijasida hosil bo'ladigan gazlar shahar havosining sifatini pasaytiradi. Bu esa nafas yo'llari kasalliklari, allergik reaksiyalar hamda yurak-qon tomir tizimi bilan bog'liq muammolar ko'payishiga olib kelishi mumkin.

Mikroiqlimga ta'sir etuvchi muhim omillardan biri yashil hududlarning mavjudligidir. Parklar, xiyobonlar, daraxtzorlar va boshqa ko'kalamzor hududlar shahar muhitida tabiiy filtr vazifasini bajaradi. O'simliklar karbonat angidridni yutib, kislorod ajratadi hamda chang va zararli moddalarning miqdorini kamaytirishga yordam beradi. Bundan tashqari, yashil hududlar haroratni me'yorlashtirib, havoning namligini tartibga soladi va mikroiqlimni yumshatadi. Shuning uchun zamonaviy shaharsozlikda yashil hududlarni kengaytirish va ekologik muvozanatni saqlash muhim vazifalardan biri sifatida qaraladi.

Shahar mikroiqlimining inson salomatligiga ta'siri ko'plab ilmiy tadqiqotlarda ham o'z aksini topgan. Haroratning keskin o'zgarishi, yuqori darajadagi havo ifloslanishi hamda shamol aylanishining yetarli darajada bo'lmasligi inson organizmida turli fiziologik o'zgarishlarni keltirib chiqaradi. Ayniqsa bolalar, keksa yoshdagi aholi va surunkali kasalliklarga ega shaxslar mikroiqlim o'zgarishlariga nisbatan yanada sezgir bo'ladi. Shu sababli shahar muhitida ekologik barqarorlikni ta'minlash, havoning sifatini yaxshilash va yashil hududlarni ko'paytirish sog'lom turmush muhitini yaratishda muhim ahamiyat kasb etadi.

Shahar mikroiqlimi inson salomatligiga sezilarli darajada ta'sir ko'rsatadigan muhim ekologik omillardan biridir. Shahar hududlarida haroratning yuqoriligi, havo ifloslanishi, namlikning o'zgarishi hamda shamol harakatining cheklanishi inson organizmining fiziologik holatiga turli darajada ta'sir etadi. Bunday sharoitlar insonning umumiy sog'lig'i, ish faoliyati, jismoniy holati hamda ruhiy holatiga ham bevosita ta'sir ko'rsatishi mumkin. Shu sababli shahar mikroiqlimi va uning salomatlik bilan bog'liqligini o'rganish tibbiyot, ekologiya va geografiya fanlari uchun muhim ilmiy yo'nalish hisoblanadi.

Avvalo, shahar hududlarida haroratning yuqori bo'lishi inson salomatligiga salbiy ta'sir ko'rsatadigan asosiy omillardan biridir. Shahar muhitida beton va asfalt qoplamalar issiqlikni kuchli yutib, uni uzoq vaqt davomida saqlab turadi. Natijada issiq kunlarda havo harorati yanada oshib ketadi va bu inson organizmida issiqlik almashinuvi jarayoniga salbiy ta'sir qiladi. Yuqori harorat organizmda suvsizlanish, tez charchash, bosh og'rig'i, qon bosimining o'zgarishi va yurak-qon tomir tizimiga ortiqcha yuk tushishiga sabab bo'lishi mumkin. Ayniqsa, keksa yoshdagi insonlar, bolalar va surunkali kasalliklari mavjud bo'lgan shaxslar bunday sharoitlarga nisbatan ancha sezgir bo'ladi.

Bundan tashqari, shahar muhitida havoning ifloslanishi ham inson salomatligiga jiddiy ta'sir ko'rsatadi. Atmosferada zararli gazlar, chang zarrachalari va kimyoviy moddalar miqdorining ortishi nafas olish tizimi faoliyatiga salbiy ta'sir qiladi. Ifloslangan havo bilan uzoq vaqt nafas olish bronxit, astma, allergik kasalliklar hamda o'pka faoliyatining buzilishiga olib kelishi mumkin. Shu bilan birga, havo ifloslanishi yurak-qon tomir kasalliklari xavfini ham oshiradi. Bunday sharoitlarda inson organizmi doimiy ravishda zararli moddalar ta'sirida bo'lib, bu holat umumiy sog'liq darajasining pasayishiga sabab bo'ladi.

Shahar mikroiqlimining inson salomatligiga ta'siri faqat jismoniy holat bilan cheklanib qolmaydi, balki ruhiy holatga ham ta'sir ko'rsatadi. Issiq va ifloslangan muhitda uzoq vaqt yashash insonda charchoq, asabiylik, diqqatning susayishi hamda stress darajasining ortishiga olib kelishi mumkin. Bunday sharoitlar insonning mehnat unumdorligiga, kundalik faoliyatiga ham salbiy ta'sir ko'rsatadi. Bundan tashqari, noqulay mikroiqlim sharoitlari uyqu sifatining yomonlashishiga ham sabab bo'lishi mumkin.

Namlik darajasi ham inson organizmi faoliyatiga ta'sir etadigan muhim omillardan biridir. Juda quruq havo nafas yo'llarining qurishiga, tomoq va burun shilliq qavatining ta'sirlanishiga olib keladi. Juda nam muhit esa organizmda issiqlik almashinuvi jarayonini qiyinlashtirib, insonning o'zini noqulay his qilishiga sabab bo'ladi. Bunday sharoitlar ayrim kasalliklarning rivojlanishi uchun qulay muhit yaratishi mumkin.

Umuman olganda, shahar mikroiqlimining o'zgarishi inson salomatligiga ko'p qirrali ta'sir ko'rsatadi. Yuqori harorat, havo ifloslanishi, namlikning o'zgarishi hamda noqulay ekologik sharoitlar inson organizmida turli

kasalliklarning kelib chiqishiga yoki mavjud kasalliklarning kuchayishiga olib kelishi mumkin. Shu sababli shahar muhitida sog'lom mikroiklimni shakllantirish va aholi salomatligini muhofaza qilish masalasi muhim ahamiyat kasb etadi

**Xulosa** qilib aytganda, shahar mikroiklimi urbanizatsiya jarayonining bevosita natijasi bo'lib, u tabiiy va antropogen omillar ta'sirida shakllanadi. Bino va inshootlarning zichligi, transport vositalari sonining ko'pligi, sanoat faoliyati hamda yashil hududlarning yetishmasligi shahar mikroiklimining o'zgarishiga olib keladi. Bunday o'zgarishlar havoning harorati, namligi, shamol rejimi va atmosfera ifloslanish darajasiga ta'sir ko'rsatib, inson salomatligiga turli darajada ta'sir etadi.

Shu bois shaharlarni rejalashtirish jarayonida ekologik omillarni hisobga olish, yashil hududlarni kengaytirish, transport chiqindilarini kamaytirish hamda atmosfera havosining sifatini nazorat qilish muhim ahamiyatga ega. Shahar mikroiklimini ilmiy asosda o'rganish va uni yaxshilashga qaratilgan chora-tadbirlarni amalga oshirish sog'lom va qulay urban muhitni shakllantirishga xizmat qiladi.

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## **THE ROLE OF INFORMATION TECHNOLOGIES IN THE EDUCATION SYSTEM**

**Abstract:** *This article presents information on the novelty and uniqueness of information and communication technologies in terms of human development, namely that they penetrate almost all spheres of human activity, and can be used in unlimited places and purposes. Such information and communication technologies allow overcoming obstacles in the process of human development with unprecedented efficiency in three directions.*

**Keywords:** *Education system, information technologies, ICT, digitalization, distance learning, e-textbooks, innovative approach, multimedia, internet, educational efficiency.*

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## **TA'LIM TIZIMIDA AXBOROT TEXNOLOGIYALARNING TUTGAN O'RNI**

**Annotatsiya:** *Ushbu maqolada axborot-kommunikatsiya texnologiyalarning yangiligi va o'ziga xosligi insoniyat rivojlanishi nuqtai nazaridan ular deyarli insoniyat faoliyati barcha sohalariga kirib borishi, ulardan cheklanmagan joylar va maqsadlarda foydalanish mumkinligidan iborat. Shu kabi axborotkommunikatsiya texnologiyalari uch yo'nalishda ilgari bo'lmagan juda katta samara bilan insoniyat rivojlanishi jarayonidagi to'siqlarni yengib o'tish imkon berishi haqida ma'lumot berilgan.*

**Kalit so'zlar:** *Ta'lim tizimi, axborot texnologiyalari, AKT, raqamlashtirish, masofaviy ta'lim, elektron darsliklar, innovatsion yondashuv, multimedia, internet, ta'lim samaradorligi.*

### **Kirish**

Hozirgi davrda ta'limni axborot texnologiyalarisiz tasavvur qilib bo'lmaydi, mana shu sababli barchamiz «yangi pedagogik texnologiyalar» atamasini ishlata boshladik. Bir misol, shaxsiy kompyuter ta'limning imkoniyatlarini butunlay o'zgartirib yubordi. Internet leptomlar ta'lim tizimiga

yangi pedagogik texnologiyalarni tatbiq etish bo'yicha yanada kattaroq imkoniyatlar yaratib berdi.

O'zbekistonning mustaqilligi sharoitlarida ta'lim tizimini isloh qilish birinchi navbatda ta'lim va tarbiya tizimiga ilg'or axborot texnologiyalarning tatbiq etish bilan bog'liq. Ma'lumki, axborot-kommunikatsiya texnologiyalari mikroelektronika, hisoblash texnikasi (apparatli vositalar va dasturiy ta'minotlar), elektroaloqa va antoelektronika-mikroprosessorlar, yarimo'tkazgichlar va optik-tolali kabellar sohalaridagi kashfiyotlar bilan bog'liq. Bu kashfiyotlar ulkan axborotlarni ishlab chiqish va saqlashga hamda ularni kommunikatsiya tarmoqlari orqali tez tarqatish imkonini beradi.

Kompyuterlarni birbiriga ulash va ularni bir-biri bilan aloqa qilishga sozlash yangi kuchli texnologik tizimni umumiy protokoldan foydalanuvchi tarmoq axborot sistemalarini yaratishga imkon beradi. Shu bilan birga kompyuter tarmoqlari Yer sharining barcha nuqtalari bilan aloqa qilish imkonini beradi. Ta'lim tizimi uchun bu o'qituvchilar va o'quvchilar o'rtasida kommunikatsiya uchun yangi imkoniyatlar yaratib beradi.

#### Adabiyotlar tahlili va metodologiya

XXI asr - axborot texnologiyalari asri. Bugungi kunda boshqa soxalar katorida ta'lim soxasida ham kompyuter texnologiyalari keng kirib keldi va bu ta'lim tarbiya jarayonini samaradorligini oshirishda va hartamonlama intellektual salohiyatni oshirishda muxim o'rin tutadi. Bugungi kunda hayotni axborot vositalarsiz, jumladan, internetsiz ta'savvur qilib bo'lmaydi. Ta'lim o'qituvchi va o'quvchilarning aqliy mehnati, faollik va ijodiy fikrlashidan iborat bo'lgan ko'pqirrali va murakkab jarayon hisoblanadi. Dars samaradorligini oshirish ta'lim-tarbiya jarayonini ilmiy asosda yo'lga qo'yish va yangi pedagogik texnologiyalarni amalda qo'llash bilan uzviy bog'liq.

Oliy ta'lim muassasalarida innovatsion faoliyatni tashkil etishdan asosiy maqsad o'qituvchilar va talabalar jamoasi hamkorligi izchilligini ta'minlash hamda uni aniq maqsadga yo'naltirilgan holda yo'lga qo'yishdan iboratdir. Bu ishda ham pedagogik, ham boshqaruv masalalari hal etiladi. Shuni qayd etish lozimki, pedagogik innovatsiyalar ishtirokchilari innovatsiyalarning yuzaga kelish, namoyon bo'lish va boshqarish jarayoni qonuniyatlari haqida metodologik, psixologik, pedagogik, texnologik bilimlarni puxta egallashi lozim. Ayrim hollarda samarali bo'lgan an'anaviy usullardan voz kechish holatlari sodir bo'lmoqda. Bu innovatsiyalarni tajribada sinalgan va ijobiy natija berib kelayotgan o'qitishga qarshi qo'yishdek sezilmoqda.

Hozirgi kunda ta'lim tizimida innovatsion texnologiyalarni qo'llashga bo'lgan qiziqish, e'tibor kundan-kunga kuchayibbormoqda. Innovatsion texnologiyalar pedagogik jarayonda o'qituvchi va talaba faoliyatiga yangilik, o'zgartirishlar kiritish bo'lib, uni amalga oshirishda interfaol metodlardan foydalanishni taqozo etadi. Interfaol usullar ta'lim jarayonida qatnashayotgan har bir o'quvchining faolligiga, erkin va mustaqil fikr yuritishga asoslanadi.

Bu usullardan foydalanganda bilim olish o'quvchi uchun qiziqarli mashg'ulotga aylanadi. Interfaol usullar qo'llanilganda o'quvchilar



o'qituvchilar yordami va hamkorligida mustaqil ishlash ko'nikma va malakalariga ega bo'ladilar. O'quvchilar yangi bilimlarni ilmiy izlanish, tadqiqotchilik, tajriba-sinovlar o'tkazish asosida o'zlashtiradilar. Ilm orqali bilim olish tamoyiliga amal qilinadi. Ta'lim jarayoni qatnashchilari kichik guruhlariga bo'lingan holda ishlashadi. O'quv topshiriqlari alohida bir o'quvchiga emas, balki kichik guruhning barcha a'zolariga beriladi. Mikrogruphlarning har bir a'zosi topshiriqni bajarishda o'z hissasini qo'shishga harakat qiladi. Bu holat o'quvchilarda jamoa tuyg'usini shakllantiradi va ularning tashabbuskorligini orttiradi.

#### Muhokama

Shunday qilib, innovatsion faoliyat ta'lim-tarbiya jarayonida o'quvchi va o'qituvchini hamkorga aylantiradi. Darsni qiziqarli va samarali bo'lishini ta'minlaydi. Innovatsiyalarning samaradorligini aniqlashda o'quvchilarning fan asoslarini o'zlashtirish natijalariga qarab fikr yuritish zarur. Hozirgi paytda talabalarning bilim egallashlarida axborot kommunikatsiya vositalaridan keng ko'lamda foydalanilmoqda.

Agar talabada mustahkam bilim bilan birga, uni amaliy faollikda qo'llashning ko'nikma va malakalari tarkib topsa, tajribada sinab ko'rilganda samaradorlikka erishsa, mavjud holatlar ijobiy tomonga o'zgartirilsa, yangi g'oyalar ustida ish olib borilsa, har qanday muammoning echimini atroflicha tasavvur qilinsa, global masshtabda fikr yuritilsa innovatsiya kafolatlangan natijani bergan bo'ladi. Xuddi shunday pedagogik innovatsiyalar har tomonlama kamol topgan, barkamol avlodni tarbiyalab berish vazifasini hal etadi. Yuqorida sanab o'tilgan muammolarning har biri global ko'lamga ega va zamonaviy didaktikada qisman o'z aksini topgan.

#### Xulosa

Xulosa o'rnida shuni aytish joizki axborotlilik prinsipining dolzarbligi bir nechta omillar bilan tushuntiriladi. Axborotni qidirish, yig'ish, saqlash, qayta ishlash, o'zgartirish, taqsimlash va foydalanish prinsiplarini, uni qonunlarini o'rganadigan fan – informatika nuqtai-nazaridan qaraydigan bo'lsak, ixtiyoriy pedagogik texnologiyani axborot texnologiyalariga o'xshatishimiz mumkin, chunki, unda manbaa (pedagog), va axborot qa'bul qiluvchi (o'rganuvchi) bor. Ta'lim jarayonida yangi axborot texnologiyalarining qo'llanilishi o'qituvchilarning yaqin vaqtlargacha faqatgina axborotni o'quvchiga etkazib berish qobiliyati bilan o'lchangan baholash tizimini tubdan o'zgartirib yubordi. Bugunda o'qituvchining ma'lumotlilik, uning faqatgina kommunikatsion qobiliyatlari bilangina emas, balki kompyuterni axborot manbaasi sifatida ishlata olish qobiliyati bilan ham belgilanadi.

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## **SOCIAL-IDEATOLOGICAL ESSENCE OF THE PHENOMENON OF WAR IN THE MODERN PERIOD**

**Abstract:** *This article emphasizes that the socio-ideological essence of the phenomenon of war in the modern era is closely related to the development of society, global political processes and the development of information and communication technologies. It is revealed that modern wars are waged not only through military conflict, but also through ideological struggle, information influence, propaganda and psychological pressure. It also sheds light on the ideological interpretations of the phenomenon of war as a complex socio-ideological phenomenon that affects the consciousness of society, social values and political views.*

**Keywords:** *phenomenon of war, political and hybrid wars, information manipulation, ideological narratives, the concept of "eternal peace", information war.*

### **Introduction**

In contemporary conditions, the concept of war has expanded and is no longer limited solely to armed confrontation. Information, economic, political, and hybrid forms of warfare reveal the new face of war. However, in all its forms the essence of war remains unchanged: it is a process aimed at resolving social contradictions through the use of force or coercive pressure. At the same time, the expansion of the concept of war in modern conditions does not mean that its essence has changed; rather, it indicates that its forms of manifestation have become more complex.

Beyond armed confrontation, the emergence of information, economic, political, and hybrid wars indicates that conflicts between societies are now conducted not only on the military battlefield, but also within the spheres of consciousness, markets, institutions, and communication. Nevertheless, the internal content of war remains stable: it is a process directed at resolving social contradictions through coercion, pressure, and force. The concept of “force,” however, has broadened to include not only physical violence but also informational manipulation, economic pressure, and political destabilization.

In studying the phenomenon of war, a multi-level and interdisciplinary methodology is of great importance. A socio-philosophical and methodological analysis of the war phenomenon helps to understand its complex, dynamic, and multidimensional nature. In particular, the historical method makes it possible to analyze the emergence and development of wars within specific conditions. The systemic and structural approach helps to view war as the interaction of political, economic, informational, and cultural factors. The dialectical method reveals the contradictions between war and peace, violence and justice. Normative-ethical

analysis evaluates the legitimacy of war within the frameworks of just war theory, international law, and human rights. In modern conditions, discursive and critical approaches are also significant, as they analyze ideological narratives about war and the role of information warfare

**Main Part.** In the context of modern globalization, when the forms and manifestations of war are continuously changing, referring to its classical philosophical interpretations acquires significant theoretical and practical importance. Classical heritage provides an opportunity to understand more deeply the essence of war, the factors behind its emergence, and its impact on human civilization. From this perspective, the main objective of this study is to systematically analyze the classical philosophical interpretations of the concept of war and to reveal its key philosophical aspects.

Indeed, the American philosopher S. Huntington, while examining the principles of modern warfare, argues that ideologically determined military actions between states are gradually being replaced by clashes between civilizations. At the same time, S. Huntington notes: *“In this new world, the most widespread, important, and dangerous conflicts will not occur between social classes, the rich and the poor, but between peoples belonging to different cultural identities... And the most dangerous cultural conflicts will occur along the fault lines between civilizations* (Хантингтон С. 2003. – С. 24-25.). He writes that the spread of Western culture into other societies may lead to serious consequences. Naturally, this point of view was not received with enthusiasm. A number of works critically assessing S. Huntington’s position appeared, including in Russia. For instance, B. I. Kaverin emphasizes that, according to S. Huntington, wars between states and their allies do not really exist as independent phenomena, since they are regarded as elements of conflicts between civilizations. According to B. I. Kaverin, S. Huntington “uses such concepts as ‘culture,’ ‘civilization,’ ‘war,’ and ‘military conflict’ rather freely (Каверин Б.И. 2008. – С. 106.). However, in one way or another, S. Huntington’s ideas significantly influenced the formation of the image of war: “bloody” wars have increasingly been replaced by “bloodless” wars, where objectives are achieved not through the direct use of military force but through other instruments of pressure such as economic, political, psychological, informational, energy-based, and other forms.

It should be emphasized that modern society possesses an unprecedented capacity to generate risks. The emergence of new subjects of war - transnational organizations such as the UN, NATO, BRICS, and OPEC, whose roles are connected with the implementation of certain common missions - has altered the nature of war. These international-level organizations may legitimize military violence, which in turn leads to the emergence of what is often called “peacekeeping war.” Within this framework, the use of military violence, including armed force, is permitted in order to establish and maintain peace within the territory of a military conflict. “The emergence of subjects of war that are not directly linked to a particular state is inseparable from global processes. The function of these organizations lies in the transition from a system centered on the nation-state—

where the state fully controls its borders and territory - to a new system in which territorially distinct states gradually disperse and evolve toward trans-territorial, non-state formations.” (Шакирова Е.Ю., Герасимов Н.Н. 2016. – С. 300.). In our view, this process compels humanity to consider not only national interests but also global stability and security. It also demonstrates that the meaning and scope of war are undergoing fundamental changes. Indeed, war is no longer merely a territorial or national conflict; rather, it has become a phenomenon that concerns entire civilizations and global systems.

Methods. The modern (non-classical) interpretation of war is associated with its changing status as a social phenomenon. In the works of philosophers such as M. Kaldor (Калдор М. 2016. – С. 412), M. van Creveld, A. Toffler, and H. Toffler, the specific socio-philosophical aspects of war are explored and analyzed. In particular, according to M. van Creveld, “*war is a distinct type of human activity closely connected with culture.*” (Кревельд М. 2015. – С. 320.). For A. Toffler, war represents a form of production activity that mirrors the stages of economic development and largely emerges under the influence of the same factors. L. L. Stouffer (Штоффер Л.Л. 2009. – С. 26.) L. L. Stouffer draws attention to the fact that globalization is generating new subjects of military violence beyond states and giving rise to new forms of war, including non-armed ones.

The era of globalization has a significant impact on the transformation of the phenomenon of war. In this context, the destructive forces of the world that oppose universalistic and particularistic concepts and ideas, as well as liberal and conservative priorities and values, are becoming increasingly active. As a result, S. Huntington argues that this process leads to the emergence of a clash of civilizations. (Хантингтон С. 2006. – С. 571.) This is supported by D.A.Anikin, S.A. Danilov, and M.O.Orlov (Орлов М.О., Данилов С.А., Аникин Д.А. 2008. – С. 32-38.), Scholars such as V. G. Fedotova and L. L. Stouffer have examined the conditions that give rise to international terrorism. D. Franklin and D. Andrews analyzed economic warfare as a form of conflict between states, which in turn creates favorable conditions within competitive antagonisms.

Philosophers of the CIS such as N.A.Berdyaev, I. A.Ilyin, A.A.Kersnovsky, A.A.Svechin, A.E.Snesarev, V.S.Solovyov, E.N.Trubetskoy, S.L.Frank, and A.S.Khomyakov paid particular attention to the spiritual and ethical components of war, contributing significantly to the formation of its classical type.

Analysis and Results. Indeed, the phenomenon of war is one of the oldest events in human history, so deeply intertwined with it that imagining human society without it is difficult. The works of Frederick II, Immanuel Kant, Johann Gottfried Herder, Johann Gottlieb Fichte, Georg Wilhelm Friedrich Hegel, Carl Philipp Gottlieb von Clausewitz, and others include numerous treatises dedicated to “perpetual peace” and the problems of war and peace.

German authors demonstrated diverse approaches to the problem of war and peace. Some adhered to the view that historical progress inevitably leads to universal peace, while others emphasized the inevitability of wars and conflicts. Particular attention should be given to the perspectives of German philosopher X.

Hofmeister and Norwegian philosopher H. Sise, as well as Russian philosophical scholars A. V. Ivanov and A. D. Kumankov. For example, X. Hofmeister (Хофмайстер Х. 2006. – С. 288.) He argued in detail that war today is no longer merely a tool of politics, but rather signifies its rejection. According to H. Sise, “*a just war must be waged for the sake of peace and humanity*” (Сисе Х. 2007. – С. 176.). A.D.Kumankov (Куманьков А.Д. 2016. – С. 200.) He emphasized that introducing new moral justifications for war does not lead to their limitation, but rather produces the exact opposite effect.

In the 20th century, humanity looked to the future with confidence, social development prospects were viewed optimistically, and people were fascinated by remarkable achievements in science and production. Today, however, as the social and cultural consequences of progressive development have come to the forefront, optimistic thinking has been replaced by pessimistic terminology, setting a completely different perspective on the nature of socio-cultural progress. This indicates that humanity must approach development responsibly, considering not only technological or economic outcomes but also its cultural, ethical, and social consequences.

**Conclusion.** In conclusion, the phenomenon of war in modern society always possesses an economic component. At the same time, war as a social phenomenon is fundamentally impossible without its economic dimension. Globalization has also given rise to a distinct type of war-economic war-where a particular form of violence is linked to the production and distribution of material resources. The production, justification, and legalization of war become a force that affects the lifestyle of the entire society; in other words, globalization integrates war not only into the battlefield but also into everyday life, culture, and political decision-making. This gives rise to new, extensive, and complex forms of war, while also compelling humanity to reconsider its activities and moral responsibilities on a global scale.

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**MERABLAN (PRUNUS CERASIFERA) PAYVANDTAGINI IN VITRO SHAROITIDA MIKROKLON KO‘PAYTIRISHNING DASTLABKI BOSQICHLARI**

**Annotatsiya.** *Tadqiqotda Merablan (Prunus cerasifera) payvandtagi in vitro sharoitida mikrolonal ko‘paytirishning dastlabki bosqichlari – eksplantlarni tashqi muhitdan olib kelish jarayonlar va kulturaga kiritish. Tajribada 0,1% li Natry gipoxlorit va sulema eritmalaridan (NaOCl va HgCl<sub>2</sub>) 7-10 daqiqa davomida sterilizatsiya qilinganda kulturaga kirish ko‘rsatkichi 85% dan yuqori sterillik ko‘rsatkichini ta‘minladi. Ozuqa muhitiga qo‘shilgan BAP fitogormonining (1,5–2,0 mg/l) Merablan 29C payvandtagi regeneratsiyasiga yaxshi ta‘sir etgani kuzatildi, ko‘payishni jadalligi aniqlandi. Tadqiqot jarayonlari shuni ko‘rsatdiki, sterillashni to‘g‘ri tanlash va BAP gormonining maqbul konsentratsiyasidan foydalanish sog‘lom, virussiz hamda yuqori sifatli ko‘chat materiallarini ko‘paytirishning asosi bo‘lib xizmat qildi. Ushbu usul sterillik ko‘rsatkichini tanlash hamda ko‘paytirish jarayonini bir necha barobar tezlashtirish imkonini beradi.*

**Kalit so‘zlar:** *Merablan, In-vitro, Eksplant, Fitogormon, BAP, MS oziqa muhiti, Mikroko‘paytirish, Mikroko‘paytirish, Sterillash, Yashil biomassa, NaOCl va HgCl<sub>2</sub>.*

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**INITIAL STAGES OF IN VITRO MICROCLONAL PROPAGATION OF MYROBALAN (Prunus cerasifera) ROOTSTOCK**

**Abstract.** *The study investigated the initial stages of in vitro microclonal propagation of Myrobalan (Prunus cerasifera) rootstock, including the process of explant introduction from external conditions and their establishment in culture. In the experiment, sterilization of explants with 0.1% sodium hypochlorite and mercuric chloride (NaOCl and HgCl<sub>2</sub>) solutions for 7–10 minutes ensured more than 85% sterility during culture establishment. It was observed that the addition of the phytohormone BAP (1.5–2.0 mg/l) to the nutrient medium had a positive effect on the regeneration of the Myrobalan 29C rootstock and increased the rate of multiplication. The research results showed that proper selection of sterilization*

methods and the optimal concentration of the BAP hormone are essential for producing healthy, virus-free and high-quality planting materials. This method makes it possible to select an optimal sterility level and significantly accelerate the propagation process.

**Keywords:** Myrobalan, *In vitro*, Explant, Phytohormone, BAP, MS nutrient medium, Micropropagation, Sterilization, Green biomass, NaOCl and HgCl<sub>2</sub>.

**Kirish** Merablan (*Prunus cerasifera*) – dunyo bog‘dorchiligida olxo‘ri va o‘rik uchun eng istiqbolli payvandtaglardan biridir. Uning turli tuproq sharoitlariga bog‘liqligi va payvandusti bilan yuqori darajadagi biologik moslashuvchanligi ko‘plab ilmiy ishlarda e‘tirof etilgan. Faqat, an‘anaviy ya‘ni generativ va vegetativ ko‘paytirish usullari ko‘p mehnat talab qilishi, ildiz otish koeffitsientining pastligi hamda ona o‘simlikdagi kasalligining keyingi bo‘g‘inga o‘tishi kabi bir qator sabablarga ega. Shu sababli, zamonaviy bog‘dorchilikda Merablan payvandtagining klonlarini *In vitro* sharoitida mikroklonal ko‘paytirish, biotexnologik usullar qisqa muddat ichida genetik bir xil, sog‘lom va yuqori sifatli ko‘chat materiallarini ishlab chiqaradi. Bu esa bog‘dorchilikda ishlab chiqarish unumdorligini tashkil qilishning strategik asosi bo‘lib xizmat qiladi [1].

Mikroklonal ko‘paytirishning barqaror muhitidagi fitogarmonlar muvozanatiga, ayniqsa, sitokininlar guruhiga mansub BAP (6-benzilaminopurin) konsentratsiyasiga bevosita bog‘liqdir. Mavjud ilmiy manbalarda Merablan payvandtagi uchun BAP gormonining 1,5 mg/l dan 2,5 mg/l gacha bo‘lgan optimal miqdori tavsiya qiladi. Tadqiqotlar shuni tasdiqlaydiki, BAP gormonining maqbul miqdori o‘simlikda apikal dominantlikni pasaytirib, lateral kurtaklarning jadal rivojlanishini va ko‘p sonli yangi novdalar hosil bo‘lishini rag‘batlantiradi. Buning uchun, haddan tashqari yuqori konsentratsiya gormoni novdalarning nitrifikatsiyasi va ta’sir o‘tkazish jarayonining muammosini olib kelishi mumkin. Shu sababli, har bir aniq nav, Merablan 29C kloni uchun Murashi-Skoog muhitining gormonal tarkibini ilmiy holda optimallashtirish eng muhim elementlardan biri bo‘ladi [3].

**Materiallar va usullar.** Tadqiqotlar Akademik M.Mirzayev nomiagi bog‘dorchilikm uzumchilik va vinchilik ilmiy tadqiqot inistitutining “Mevali ekinlar biotexnologiyasi” laboratoriyasida, Merablan (*Prunus cerasifera*) payvandtagining Merablan 29C kloni ustida olib borildi.

**Eksplantlarni tayyorlash.** Tadqiqot uchun boshlang‘ich material sifatida Merablan payvandtagining sog‘lom ona o‘simligidan olingan bir yillik, yashil novdalari tanlab olindi. Novdalar barglardan tozalanib 1,0–1,5 sm hajmdagi apikal va lateral kurtakli segmentlarga (eksplantlarga) ajratiladi. Eksplantlar laboratoriya va suv ostida (oqar suv ostida) 10 daqiqada yuvildi (sovunli suv).

**Sterillash tartibi.** Eksplantlarni tashqi sterillash jarayoni laminarboks shkafida, qat’iy sterill sharoitda amalga oshirildi. Sterillash uchun ikki bosqichli usul qo‘llanildi:

| Bosqichlar | Sterillovchi voetasi                           | Konsentratsiya | Vaqt (daqiqa) | Vazifasi               |
|------------|------------------------------------------------|----------------|---------------|------------------------|
| 1-bosqich  | Etil spirti (C <sub>2</sub> H <sub>5</sub> OH) | 70%            | 1 daqiqa      | Yuzaki dezinfektsiyasi |
| 2-bosqich  | Natriy gipoxlorit (NaOCl)                      | 2,5%           | 10 daqiqa     | Birlamchi tozalash     |

Sterillovchi vositalarning qoldiqlarini yo‘qotish uchun eksplantlar har bir qadamdan so‘ng steril distillangan suvda 3-4 marta (5 daqiqadan) yaxshilab yuvildi.

**Ozuqa muhiti va fitogarmionlar.** Tajribada ozuqa muhiti sifatida Murashge va Skoog (MS) tarkibi tanlandi. Muhit tarkibi qo‘llanildi:

- Saxaroza: 30 g/l; Agar-agar: 7,5 g/l; pH Korsatkichi: 5.7 – 5.8.

Novda regeneratsiyasini himoya qilish uchun MS muhitiga sitokininlar guruhiga mansub BAP (6-benzilaminopurin) fitogormonining 1,5 mg/l va 2,0 mg/l konsentratsiyalari qo‘shildi. Ozuqa muhitlari 120°C haroratda va 1.1 atm bosimda 20 daqiqada avtoklavda sterillanadi.

**Saqlash sharoitlari va yetishtirish.** Eksplantlar solingan probirkalar va idishlar maxsus o‘stirish inkubatorlarda kerakli parametrlar asosida saqlangan:

- Harorat: 24 – 26 °C; Yoritish tartibi: 16 soat yorug‘lik/8 soat qorong‘ulik;
- Yorug‘lik intensivligi: 2500–3000 lyuk (lyuminessent lampochkalar).

**Kuzatish va tahlil usullari.** Tadqiqot natijalari 4 haftalik kultivatsiyadan so‘ng hisoblanadi. Bunda ko‘rsatkichlar inobatga olingan:

1. Sterillik darajasi (%): (Toza eksplantlar soni / Umumiy eksplantlar soni) x 100.
2. Regeneratsiya unumi (%): Novda hosil qilgan eksplantlar ulushi.
3. Ko‘payish koeffitsienti: Har bir eksplantndan hosil bo‘lgan o‘rtacha novdalar soni.

**Natijalar va munozara.** Merablan (*Prunus cerasifera*) payvandtagini *In vitro* usuli eksplantlarning sterillik darajasi va hayotchanligini saqlab qolishning eng muhim bosqichi hisoblanadi. Tadqiqot yordamida qo‘llanilgan ikki bosqichli himoya usuli yuqori daraja ko‘rsatdi. Oldin eksplantlarga 0,1% li NaOCl eritmasi bilan 10 daqiqada tashqi sterillash qo‘llash, so‘ngra 0,1% li sulema (HgCl<sub>2</sub>) eritmasida 7 daqiqa davomida sterillash usuli kulturalashda 85,6% natijanini tashkil qildi.

Ushbu jarayonda nafaqat NaOCl dan foydalanilganda sterillik ko‘rsatkichi past bo‘lganligi (45-50%), balki sulema bilan uzoq vaqt davomida ishlov berish esa nekrozga (qorayishiga) olib kelganligi kuzatildi. Demak, eritmalarning kombinatsiyalangan holda qo‘llab Merablan 29C kloni uchun eng maqbul sterillash rejimini isbotladi.

**BAP fitogormonining novda proliferatsiyasiga ta’siri.** Eksplantlar aseptik o‘rnatishdan so‘ng, qayta tiklanish (regeneratsiya) jarayoni MS ozuqa muhiti tarkibidagi BAP (6-benzilaminopurin) konsentratsiyasiga bog‘liqligi o‘rganildi. To‘rt haftalik kulturaga kiritish miqdori quyidagi jadvalda keltirilgan

| Ozuqa xususiyatlari variantlari | BAP gormonlari (mg/l) | Ishlov berilgan eksplantlar unumi (%) | O'rtacha novdalar soni (dona/eksplant) | Novdalarning o'rtacha uzunligi (sm) |
|---------------------------------|-----------------------|---------------------------------------|----------------------------------------|-------------------------------------|
| MS ozuqa muhiti                 | 0 (nazorat)           | 15,2                                  | 1,1                                    | 1,4                                 |
|                                 | 1,5                   | 78,4                                  | 1,3                                    | 4,2                                 |
|                                 | 2,0                   | 92,1                                  | 1,6                                    | 3,6                                 |

Ozuqa muhitida sitokininlar konsentratsiyasining ortishi Merablan 29C payvandtagining morfofiziologik ko'rsatkichlariga erishishga ta'sir ko'rsatib, regeneratsiya jarayonini jadal stashkil etish va bu uyqudagi kurtaklarning differensiatsiyasiga zamin yaratishda BAP fitogormoni bilan ishlov berish firtillik ishlab chiqarish eksplantlarda meristematik faollik kuchayadi va tadqiqotlar shuni tasdiqladiki, 2.0 mg/l konsentratsiyali BAP qo'llanilganda, hosil bo'lgan novdalarning hayotchanlik darajasi yuqori bo'lib, ularda barg plastinkalarining normal kuzatildi. Ushbu zuqadagi yangi novdalarning ko'payish koeffitsienti ortishi bilan birga, o'simlikning fiziologik rivojlanishi yangi novdalar va aklimatizatsiya bosqichi uchun muhim poydevor. Shunday qilib, gormonal balans o'simlikning vegetativ ko'payish saqlashini maksimal darajada yuqori bo'lishiga xizmat qiladi.

**Xulosa va tavsiyalar.** O'tkazilgan kompleks tadqiqotlar natijasida Merablan (*Prunus cerasifera*) payvandtagining Merablan 29C klonini *In vitro* sharoitida mikroklonal ko'paytirishning dastlabki bosqichlari va yashil biomassa to'plash qobiliyati ilmiy asoslab berildi. Sterillash jarayonida natriy gipoxlorit (NaOCl) bilan birlamchi ishlov berish va 0,1% li sulema (HgCl<sub>2</sub>) eritmasida 7 daqiqa davomida sterillashh eng yuqori natijani ko'rsatdi. Ushbu usul eksplantlarning 85,6% sterilligini ta'minlash bilan birga, o'simlik to'qimalarining fiziologik faolligini saqlab qolishga xizmat qildi. Ozuqa muhitidagi BAP fitogormoni konsentratsiyasi novda ko'payishiga sezilarli ta'sir ko'rsatishi aniqlandi. Xususan, 2,0 mg/l BAP qo'shilgan MS ozuqa muhiti ko'payish koeffitsientini 1,6 donaga yetkazib, regeneratsiya unumini 92,1% gacha oshirdi. Ushbu ko'rsatkichlar laboratoriya sharoitida Merablan payvandtagini ko'paytirishning ilmiy-amaliy asosini ishlab chiqishda muhim manba bo'lib xizmat qiladi.

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## **IMPROVEMENT OF APPLE FERTILIZATION TECHNOLOGY IN ORCHARDS**

**Annotation.** *Efficient nutrient management is a key factor in increasing apple productivity, fruit quality, and orchard sustainability. This study aims to improve fertilization technology in apple orchards through optimized nutrient rates, timing, and application methods based on soil and leaf analysis. Field experiments were conducted to evaluate mineral and organo-mineral fertilization systems under irrigated orchard conditions. The results demonstrated that balanced fertilization combined with fertigation significantly improved yield, fruit size, and biochemical quality indicators while reducing nutrient losses. The proposed technology enhances nutrient use efficiency and environmental safety. The findings can be recommended for sustainable apple production systems.*

**Keywords:** *apple orchard, fertilization technology, nutrient management, fertigation, yield, fruit quality.*

**Introduction.** Apple (*Malus domestica*) is one of the most widely cultivated fruit crops worldwide and plays an important role in food security and agricultural economies. In intensive orchards, high productivity depends largely on proper nutrient management. However, traditional fertilization practices often involve unbalanced nitrogen application, insufficient micronutrients, and poor synchronization with plant demand, leading to reduced efficiency and environmental risks.

Improving fertilization technology requires a scientific approach based on soil diagnostics, plant nutritional status, and modern application methods such as fertigation. Balanced supply of nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), and micronutrients is essential for vegetative growth, flowering, fruit formation, and storage quality.

This study aims to develop and evaluate an improved fertilization technology for apple orchards to enhance yield, fruit quality, and nutrient use efficiency.

**Materials and Methods.** The research was conducted in a commercial irrigated apple orchard located in a temperate continental climate zone. The soil type was loamy with medium fertility and neutral pH. Experimental Design. A randomized block design with three treatments and three replications was established:

1. Control (T1): Traditional farmer practice (broadcast NPK application).
  2. T2: Soil-test-based balanced NPK fertilization.
  3. T3: Soil-test-based NPK + micronutrients applied through fertigation.
- Each plot consisted of 20 apple trees of uniform age and vigor.



**Fertilization Scheme.** Nitrogen applied in split doses (pre-bloom, fruit set, post-harvest). Phosphorus applied early spring. Potassium applied during fruit development. Micronutrients (Zn, B, Fe) applied via fertigation and foliar spray.

**Data Collection.** The following parameters were measured: Annual shoot growth (cm). Leaf chlorophyll content (SPAD units). Yield per tree (kg). Average fruit weight (g). Fruit soluble solids content (°Brix). Statistical analysis was performed using ANOVA at  $p \leq 0.05$ .

**Results.** The improved fertilization treatments significantly affected vegetative growth and yield parameters.

1. T2 increased yield by 12% compared to control.
2. T3 increased yield by 22% compared to control.
3. Average fruit weight increased by 15% under fertigation (T3).
4. Soluble solids content improved from 12.1°Brix (control) to 13.4°Brix (T3).
5. Leaf chlorophyll index increased significantly in balanced treatments.

Nutrient use efficiency was highest in T3 due to reduced leaching losses and improved synchronization with plant demand.

**Discussion.** The results confirm that balanced fertilization based on soil analysis improves nutrient uptake and orchard productivity. Split nitrogen application prevents excessive vegetative growth and reduces nitrogen losses. Potassium application during fruit enlargement enhances fruit size and sugar accumulation.

Fertigation technology provides precise nutrient delivery directly to the root zone, increasing nutrient use efficiency and minimizing environmental contamination. Similar findings have been reported in intensive apple production systems worldwide.

Improved fertilization technology also contributes to sustainable orchard management by reducing input waste and optimizing economic returns.

**Conclusion.** The present study demonstrated that improving fertilization technology in apple orchards significantly enhances productivity, fruit quality, and nutrient use efficiency. The results confirmed that traditional broadcast fertilization methods are less effective compared to scientifically optimized nutrient management systems based on soil and leaf analysis. Balanced application of nitrogen, phosphorus, and potassium, combined with essential micronutrients, ensures better synchronization between nutrient supply and plant demand during critical growth stages of *Malus domestica*.

The implementation of split nitrogen application reduced nutrient losses and prevented excessive vegetative growth, while potassium application during fruit development improved fruit size and soluble solids content. The fertigation-based treatment showed the highest agronomic efficiency, increasing yield by up to 22% compared to conventional practices. In addition, improvements were observed in chlorophyll content, fruit weight, and biochemical indicators, demonstrating enhanced physiological activity and nutrient uptake.

Importantly, the improved fertilization technology not only increased economic returns through higher yield and better market quality but also contributed to environmental sustainability by minimizing leaching and nutrient wastage. Efficient nutrient management reduces the risk of soil degradation and groundwater contamination, which are common challenges in intensive orchard systems.

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## **KOLLEKTOR-DRENAJ SUVLARINING HOLATI VA MELIORATIV AHAMIYATI (BUXORO VILOYATIDA)**

**Annotatsiya:** Mazkur maqolada Buxoro viloyati hududida kollektor-drenaj tizimining bugungi holati, uning texnik va gidromeliorativ ko'rsatkichlari hamda qishloq xo'jaligi yerlarining meliorativ holatini yaxshilashdagi o'rni ilmiy tahlil qilinadi. Tadqiqotda sug'oriladigan yerlarning sho'rlanish darajasi, sizot suvlarining sathi va minerallasuvi, kollektor-drenaj tarmoqlarining samaradorligi hamda ularning rekonstruksiya va modernizatsiya jarayonlari o'rganilgan. Shuningdek, hududning tabiiy-iqlimiy sharoiti, Amudaryo havzasi bilan bog'liq gidrologik omillar hamda antropogen yuklama natijasida yuzaga kelayotgan meliorativ muammolar yoritiladi. Tahlillar shuni ko'rsatadiki, kollektor-drenaj tizimining barqaror ishlashi sug'oriladigan maydonlarda tuproq unumdorligini saqlash, ikkilamchi sho'rlanishning oldini olish va agroekologik barqarorlikni ta'minlashda muhim omil hisoblanadi. Maqolada tizimni takomillashtirish, suv resurslaridan oqilona foydalanish va innovatsion meliorativ texnologiyalarni joriy etish bo'yicha ilmiy-amaliy tavsiyalar ishlab chiqilgan.

**Kalit so'zlar:** kollektor-drenaj tizimi, melioratsiya, sug'oriladigan yerlar, tuproq sho'rlanishi, sizot suvlari, gidromeliorativ holat, agroekologik barqarorlik, suv resurslari boshqaruvi.

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## **THE STATE AND RECLAMATION VALUE OF COLLECTOR- DRAINAGE WATERS. (IN THE BUKHARA REGION)**

**Abstract:** This article examines the current condition of the collector-drainage system in Bukhara Region and its meliorative significance for irrigated agriculture. The study analyzes soil salinity levels, groundwater table depth and mineralization, operational efficiency of drainage networks, and the processes of rehabilitation and modernization. Special attention is given to the natural-climatic conditions of the region, hydrological factors related to the Amu Darya basin, and anthropogenic impacts affecting land reclamation conditions. The findings indicate that the sustainable functioning of the collector-drainage system plays a crucial role in preventing secondary salinization, maintaining soil fertility, and ensuring agro-ecological stability. The paper proposes scientific and practical recommendations

*aimed at improving drainage infrastructure and promoting rational water resource management.*

**Keywords:** *collector-drainage system, land reclamation, irrigated lands, soil salinity, groundwater, hydro-meliorative condition, agro-ecological sustainability, water resource management.*

Kollektor-sugʻoriladigan yerlarning meliorativ holatini yaxshilash, sizot suvlar sathini meʼyorlashtirish va tuproqning shoʻrlanishini kamaytirish maqsadida barpo etiladigan gidrotexnik inshootdir. U asosan ortiqcha yer osti va yer usti suvlarini yigʻib, ularni xavfsiz ravishda daryo, koʻl yoki maxsus suv qabul qiluvchi havzalarga chiqarib yuborish vazifasini bajaradi. Kollektorlar melioratsiya tizimining ajralmas qismi boʻlib, drenaj tarmoqlari orqali yigʻilgan suvlarni umumiy oqimga birlashtiradi. Kollektor tizimi odatda ikki asosiy turga boʻlinadi: ochiq va yopiq kollektorlar. Ochiq kollektorlar yer yuzasida kanalsimon shaklda quriladi va katta hajmdagi suvni qabul qilish imkoniyatiga ega boʻladi. Yopiq kollektorlar esa quvurli tizim koʻrinishida boʻlib, yer ostiga joylashtiriladi va asosan intensiv dehqonchilik hududlarida qoʻllaniladi. Ularning samaradorligi tuproqning mexanik tarkibi, filtratsion xususiyati va gidrogeologik sharoitiga bogʻliq. Oʻzbekiston sharoitida kollektor-drenaj tarmoqlari, ayniqsa, sugʻoriladigan hududlarda, jumladan Buxoro viloyatida muhim ahamiyat kasb etadi. Ushbu hududda yer osti suvlari sathining koʻtarilishi va tuproq shoʻrlanishi xavfi yuqori boʻlganligi sababli kollektorlar meliorativ barqarorlikni taʼminlovchi asosiy vosita hisoblanadi. Kollektorlar orqali chiqarilayotgan suvlar koʻpincha Amudaryo yoki tabiiy pastqamliklarga yoʻnaltiriladi.

Ilmiy tadqiqotlarda kollektorlarning samaradorligi quyidagi koʻrsatkichlar asosida baholanadi: suv oʻtkazuvchanlik qobiliyati, drenaj moduli, sizot suvlarining sathi dinamikasi, suvning minerallashuv darajasi hamda tuproqning agroximik holati. Ayniqsa, suvning minerallashuvi yuqori boʻlgan hollarda kollektor suvlari ekologik muammolarni keltirib chiqarishi mumkin. Shu bois zamonaviy ilmiy yondashuvlar kollektor suvlarini qayta foydalanish, ularni biologik tozalash yoki aralashtirish texnologiyalarini joriy etishni taklif etadi. Kollektor tarmoqlarining texnik holatini saqlash ham dolzarb masala hisoblanadi. Choʻkindi toʻplanishi, oʻsimliklar bilan qoplanishi yoki qiyalikning buzilishi oqibatida suv oqimi sekinlashadi va meliorativ samaradorlik pasayadi. Shuning uchun muntazam ravishda mexanik tozalash, rekonstruksiya qilish va gidromonitoring ishlari olib borilishi zarur. Buxoro viloyati hududi Oʻzbekiston Respublikasining janubigʻarbiy qismida joylashgan boʻlib, keskin kontinental iqlim, kam yogʻin miqdori, yuqori bugʻlanish koeffitsiyenti va choʻl landshaftlari ustunligi bilan tavsiflanadi. Viloyat hududining asosiy qismi Qizilqum choʻli zonasiga toʻgʻri keladi, sugʻoriladigan dehqonchilik esa asosan Amudaryo havzasiga tutash volalarda shakllangan. Tabiiy sharoitning qurgʻoqchil xususiyati sugʻorish tizimlarini hayotiy zarurat darajasiga olib chiqqan boʻlsa, uzoq yillar davomida intensiv sugʻorish natijasida yerlarning meliorativ holatida murakkab jarayonlar yuzaga kelgan. Shu bois kollektor-drenaj tizimi viloyat qishloq xoʻjaligi barqarorligining asosiy

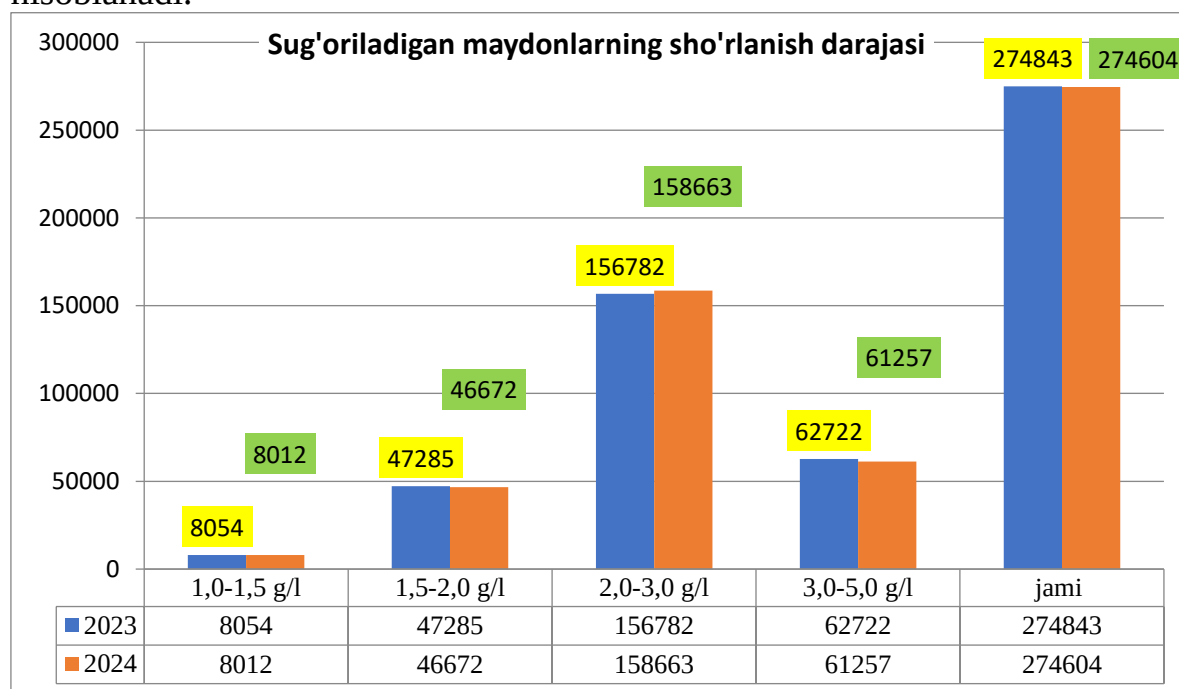
infratuzilmaviy omillaridan biri hisoblanadi. Hududda sugʻoriladigan yerlar asosan allyuvial va allyuvial-prolyuvial yotqiziqlarda shakllangan boʻlib, mexanik tarkibi ogʻir va oʻrta qumoq tuproqlar ustunlik qiladi, bu esa tabiiy filtratsiya jarayonini sustlashtiradi va sizot suvlarining yuqoriga koʻtarilish xavfini kuchaytiradi. Iqlim sharoitida yillik yogʻin miqdori 100–150 mm atrofida boʻlib, bugʻlanish 1000–1200 mm dan ortiqni tashkil etadi, natijada sugʻorish suvlari bilan kirib kelgan tuzlarning tuproq profilida toʻplanish ehtimoli ortadi. Aynan shu omillar kollektor-drenaj tarmoqlarining ilmiy asoslangan holda tashkil etilishini taqozo etadi. Viloyatda kollektor-drenaj tizimi XX asrning ikkinchi yarmida keng miqyosda barpo etilgan boʻlib, uning asosiy vazifasi sugʻoriladigan maydonlarda sizot suvlar sathini meʼyoriy chuqurlikda ushlab turish, ortiqcha mineralizatsiyalashgan suvlarni hududdan chiqarish va ikkilamchi shoʻrlanishning oldini olishdan iboratdir. Tizim ochiq kollektorlar, yopiq gorizontall drenaj quvurlari va ayrim hududlarda vertikal drenaj quduqlaridan iborat murakkab gidrotexnik inshootlar majmuini tashkil etadi. Ochiq kollektorlar suvni tez va katta hajmda chiqarishga xizmat qilsa, yopiq drenaj tarmoqlari tuproq qatlamidagi ortiqcha namlikni meʼyorlashtirishda muhim ahamiyat kasb etadi. Vertikal drenaj esa yuqori minerallashtirilgan sizot suvlarini nasos yordamida tortib chiqarish orqali gidrodinamik muvozanatni taʼminlaydi.

Soʻnggi yillarda oʻtkazilgan kuzatuvlar shuni koʻrsatadiki, viloyatda sugʻoriladigan yerlarning muayyan qismida sizot suvlar sathi 1,5–2,5 metr oraligʻida joylashgan boʻlib, bu qishloq xoʻjaligi ekinlari uchun nisbatan xavfsiz meʼyor hisoblanadi, biroq ayrim pastqam hududlarda bu koʻrsatkich 1–1,2 metrgacha koʻtarilishi natijasida tuproqning kapillyar namlanishi va tuzlarning yuqoriga migratsiyasi kuchayadi. Sizot suvlarining minerallashtirish darajasi ham hududlar kesimida farqlanadi va ayrim joylarda 3–5 g/l, baʼzan undan ham yuqori koʻrsatkichlarga yetadi. Bunday sharoitda kollektor-drenaj tizimining samarali ishlashi tuproq profilidagi tuz balansini barqarorlashtirishda hal qiluvchi omil boʻlib xizmat qiladi.

Meliorativ holatni baholashda tuproqning shoʻrlanish darajasi, gumus miqdori, strukturaviy holati, suv-fizik xossalari va agrochimik koʻrsatkichlari kompleks ravishda tahlil qilinadi. Buxoro viloyatida yengil va oʻrta shoʻrlangan yerlar ulushi yuqori boʻlib, kuchli shoʻrlangan maydonlar asosan kollektor tarmoqlaridan uzoq yoki ularning texnik holati qoniqarsiz boʻlgan hududlarda uchraydi. Shoʻrlanish jarayoni asosan natriy xlorid va sulfat tuzlari toʻplanishi bilan xarakterlanadi, bu esa tuproqning fizik xossalari yomonlashtirib, suv oʻtkazuvchanlikni kamaytiradi hamda ekinlarning hosildorligiga salbiy taʼsir koʻrsatadi. Kollektor-drenaj tizimining texnik holati ham muhim masala hisoblanadi. Ayrim ochiq kollektorlarning loyqa va oʻt-oʻlan bilan toʻlib qolishi, qiyaliklarning yemirilishi, drenaj quvurlarining choʻkishi yoki tiqilib qolishi ularning samaradorligini pasaytiradi. Rekonstruksiya va modernizatsiya jarayonlarida kollektorlarning mexanik tozalash ishlari, qirgʻoq mustahkamlash choralari, zamonaviy plastmassa drenaj quvurlarini qoʻllash va energiya tejamlor nasos agregatlarini joriy etish muhim ahamiyat kasb etadi. Soʻnggi yillarda suv resurslarini boshqarishning integratsiyalashgan yondashuvi asosida kollektor



suvlaridan qayta foydalanish, ya'ni ularni aralashtirish yoki biomeliorativ usullar bilan tozalab sug'orishga yo'naltirish tajribalari ham amalga oshirilmoqda. Viloyat iqtisodiyotida paxtachilik, g'allachilik va bog'dorchilik yetakchi tarmoqlar hisoblanadi.



#### ***Sug'oriladigan maydonlarning sho'rlanish darajasi***

Diagramma 2023 va 2024 yillarda sug'oriladigan maydonlarning sho'rlanish darajasini ko'rsatadi. 1,0–1,5 g/l (kam sho'rlangan) 2023 yilda 8054 ming gektar bo'lsa 2024 yilda 8012 gektarni tashkil qilgan. Sho'rlanish darajasi 1,5–2,0 g/l bo'lgan maydonlar 2023 yilda 47285 gektarni tashkil qilgan bo'lsa, 2024 yilda esa 46672 gektarni tashkil qilgan.

Ushbu ekinlarning yuqori va barqaror hosildorligi bevosita yerlarning meliorativ holatiga bog'liq. Kollektor-drenaj tizimining me'yoriy ishlashi natijasida tuproqdagi namlik va tuz rejimi optimallashtiriladi, aeratsiya yaxshilanadi, ildiz tizimining rivojlanishi uchun qulay muhit yaratiladi. Aks holda, sho'rlanish va botqoqlanish jarayonlari kuchayib, hosildorlik keskin pasayadi hamda yerlarning iqtisodiy samaradorligi kamayadi. Global iqlim o'zgarishi sharoitida suv resurslarining kamayishi va vegetatsiya davrida yuqori haroratlar kuzatilishi meliorativ tizimlarga qo'shimcha yuklama bermoqda. Shu bois suv tejovchi texnologiyalarni joriy etish, tomchilatib sug'orish, lazerli tekislash va agrotexnik tadbirlarni takomillashtirish kollektor-drenaj tizimi bilan uyg'un holda olib borilishi zarur. Ilmiy tadqiqotlar shuni ko'rsatadiki, drenaj va sug'orish tizimlari o'zaro muvozanatda ishlaganda yerlarning meliorativ holati barqarorlashadi va uzoq muddatli agroekologik xavfsizlik ta'minlanadi.

Xulosa qilib aytganda, Buxoro viloyatida kollektor-drenaj tizimi sug'oriladigan dehqonchilikning barqaror rivojlanishi, tuproq unumdorligini saqlash va ekologik muvozanatni ta'minlashning asosiy omillaridan biridir. Tizimning samaradorligi muntazam monitoring, ilmiy asoslangan boshqaruv, texnik modernizatsiya va suv resurslaridan oqilona foydalanish bilan chambarchas



bog‘liqdir. Kelgusida raqamli monitoring texnologiyalari, masofaviy zondlash ma’lumotlari va gidrogeologik modellashtirish usullarini keng joriy etish orqali meliorativ jarayonlarni yanada chuqur tahlil qilish va prognozlash imkoniyati kengayadi. Bu esa viloyat qishloq xo‘jaligi salohiyatini oshirish va yer resurslaridan samarali foydalanishning ilmiy asoslarini mustahkamlashga xizmat qiladi.

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## **YUQORI DARAJALI ALGEBRAIK TENGLAMALARNI YECHISH USULI HAQIDA**

**Annotatsiya:** Ushbu maqolada yuqori darajali algebraik tenglamalarni yechishning Bezu teoremasi va uning tatbiqlariga asoslangan usuli - ko'phadni ko'paytuvchilarga ajratish usuli hamda uning tatbiqiga doir masalalar qaralgan. Qaralayotgan tenglama butun koeffitsientli bo'lgan holda uning ratsional, xususan butun ildizlari mavjud bo'lsa, ularni topish mumkinligi ko'rsatilgan. Bu holda qaralayotgan algebraik tenglamaning kasr ratsional ildizlarini topish usulini ifodalovchi teorema va uning natijalari va tatbiqlari o'rganilgan.

**Kalit so'zlar:**  $n$ -darajali algebraik tenglama, bosh koeffitsient, ozod had, Bezu teoremasi, ko'phad, ko'phadni ko'paytuvchilarga ajratish, usul, butun son, kasr ratsional ildiz, qoldiq, qoldiq had, to'liqsiz bo'linma, Gerner sxemasi.

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## **ON THE METHOD OF SOLVING HIGHER-DEGREE ALGEBRAIC EQUATIONS**

**Annotation:** This article examines the method of solving high-degree algebraic equations based on Bézout's theorem and its applications - the method of factoring polynomials and its applications. It has been shown that in the case of an integer-coefficient equation under consideration, it is possible to find its rational, in particular, integer, roots if they exist. In this case, the theorem describing the method of finding fractional rational roots of the considered algebraic equation and its results and applications were studied.

**Key words:** algebraic equation of degree  $n$ , leading coefficient, constant term, Bézout's theorem, polynomial, factorization of polynomials, method, integer, fractional rational root, remainder, remainder term, incomplete quotient, Horner scheme.

Respublikamizda so'nggi yillarda ixtisoslashtirilgan davlat maktablari soni ko'payganligi hamda ularda matematika fanini chuqurlashtirib o'qitish dasturlari bo'yicha ishlar keng amalga oshirilayotganligi va natijada ta'limni rivojlantirishga alohida e'tibor qaratilayotganligi va bu jarayon malakali mutaxassislar tayyorlashda, fan-texnika va ishlab chiqarish taraqqiyotida muhim ahamiyatga ega. Bunda Prezidentimiz Sh.M.Mirziyoyevning 2020 yil 7 may dagi "Matematika sohasidagi ta'lim sifatini oshirish va ilmiy tadqiqotlarni rivojlantirish chora tadbirlari to'g'risida" nomli PQ-4708 qarori [1] - asosiy hujjatlardan biri ekanligini ta'kidlash joiz. Unda

“Ta’limning barcha bosqichlarida matematika fanini o’qitish tizimini yanada takomillashtirish va matematika sohasidagi ta’lim sifatini oshirish” bo’yicha belgilab berilgan vazifalar hayotga tatbiq etilayotganligini ko’ramiz.

Matematikani chuqurlashtirib o’rgatish sinflarini takomillashtirish maktab ta’lim bosqichidanoq keng qo’llanilishi, keyinchalik oliy ta’lim muassasalarida o’gishda hamda matematika to’garaklarida davom etadi va ular ko’plab yosh matematiklar, muhandislar va texniklarning yetishib chiqishiga yordam beradi. Bunday iqtidorli ta’lim oluvchilar murakkab masalalarni va ularni yechish usullarini o’rganib borishlari ularda matematik qobiliyatlar shakllanishiga asos bo’ladi [2-4].

Ma’lumki, algebraik tenglamalarni yechishga oid masalalar bilan turli davrlarda ko’pchilik matematiklar shug’ullanishgan. Ulardan biri, buyuk olim Abu Abdulloh Muhammad ibn Muso al-Xorazmiyning matematika taraqqiyotida muhim o’rin tutgan algebraga oid “Al-kitob al-muxtasar fi al-jabr va al-muqobala” nomli asari mavjud bo’lib, u bu asari bilan algebraga asos soladi va algebrani alohida fan darajasiga ko’taradi.

Xorazmiy tadqiqotlari, keyinchalik uzoq yillar va asrlar davomida ko’plab olimlar tomonidan davom ettirilgan. Jumladan, yevropalik olimlar Viyet, Kardano va Ferrarilar mos ravishda ikkinchi, uchinchi va to’rtinchi darajali tenglamalarning ildizlarini topish formulalarini yaratishgan. XIX asrda yosh matematik olim E.Galua esa beshinchi darajali algebraik tenglamaning ildizlari radikallarda ifodalanadigan umumiy formula (usul) mavjud emasligini isbotlagan.

Ushbu maqolada yuqori darajali algebraik tenglamalarni yechish usullaridan biri bo’lgan ko’phadni ko’paytuvchilarga ajratish usuli va uning tatbiqiga doir masalalarni o’rganish maqsad qilindi. Yuqori darajali tenglamalarni yechishda tenglama chap tomonidagi ko’phadni ko’paytuvchilarga ajratish usuli quyidagi Bezu teoremasi va uning tatbiqiga asoslanadi (Bezu - fransuz matematigi, XVIII-asr).

**Teorema (Bezu teoremasi).** Agar  $\alpha$  soni  $n$ -darajali  $P(x)$  ko’phadning ildizi bo’lsa, u holda bu ko’phadni  $P(x) = (x - \alpha)Q(x)$  ko’rinishida tasvirlash mumkin, bunda  $Q(x)$  -  $P(x)$  ni  $(x - \alpha)$  ga bo’lishdagi bo’linma  $(n - 1)$ - darajali ko’phad.

Demak, agar  $n$ -darajali  $P(x) = 0$  tenglamaning kamida bitta ildizi mavjud bo’lsa, Bezu teoremasi yordamida masalani  $(n - 1)$ -darajali tenglamani yechishga keltirish mumkin, ya’ni tenglama darajasini pasaytirish mumkin. Bu yerda **tabiiy savol** tug’iladi: tenglamaning hech bo’lmaganda bitta ildizini qanday topish kerak?

Tenglama butun koeffitsientli bo’lgan holda uning ratsional, xususan butun ildizlarini (agar ular mavjud bo’lsa) izlashimiz mumkin. Bu holda qaralayotgan algebraik tenglamaning ratsional ildizlarini topish usuli quyidagi teorema orqali ifodalanadi.

**Teorema.**  $\frac{p}{q}$  qisqarmas kasr butun koeffitsientli

$$a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \dots + a_{n-1}x + a_n = 0 \quad (1)$$

ko'phad (tenglama) ildizi bo'lsin. U holda  $p$  soni  $a_n$  ozod had bo'luvchisi,  $q$  soni esa  $a_0$  bosh koeffitsent bo'luvchisi bo'ladi.

Teoremani isbotlash uchun  $\frac{p}{q}$  ni (1) tenglamaga qo'yib, maxrajlardan qultirish kerak va hosil bo'lgan tenglikni ikki xil usulda yozish orqali  $a_n$  ning  $p$  ga va  $a_0$  ning  $q$  ga bo'linishi ko'rsatiladi. Bu teoremadan quyidagi ikkita natija kelib chiqadi.

**1-natija.** Butun koeffitsentli tenglamaning har qanday ildizi uning ozod hadi bo'luvchisi bo'ladi.

**2-natija.** Agar butun koeffitsentli tenglamaning bosh koeffitsenti 1 ga teng va bu holda tenglamaning ratsional ildizlari mavjud bo'lsa, ular hammasi butun sonlardan iborat bo'ladi.

**1-misol.**  $2x^3 - 7x^2 + 5x - 1 = 0$  tenglamani yeching.

**Yechish.** Tenglamaning ratsional ildizlarini topamiz. Faraz qilaylik  $\frac{p}{q}$  qisqarmas kasr tenglama ildizi bo'lsin. U holda teorema natijalariga ko'ra  $p$  sonini ozod had bo'luvchilari orasidan izlash kerak, ya'ni  $\pm 1$  ichidan,  $q$  ni esa bosh koeffitsentning musbat bo'luvchilari 1, 2 lar ichidan izlaymiz. Shunday qilib, tenglamaning ratsional ildizlarini  $\pm 1$ ,  $\pm \frac{1}{2}$  lar ichidan izlash kerak. Tekshirish natijasida faqatgina  $\frac{1}{2}$  soni tenglama ildizi bo'lishini ko'ramiz va tenglamaning chap tomonini ko'paytuvchlarga ajratamiz. Buning uchun  $2x-1$  ni qavsdan tashqariga chiqaramiz. Tenglamani

$$2x^3 - x^2 - 6x^2 + 3x + 2x - 1 = 0 \text{ ko'rinishida yozamiz va natijada}$$

$$x^2(2x-1) - 3x(2x-1) + (2x-1) = 0 \text{ yoki } (2x-1)(x^2 - 3x + 1) = 0$$

tenglamani hosil qilamiz. Ikkinchi ko'paytuvchini no'lga tenglab,  $x^2 - 3x + 1 = 0$

kvadrat tenglama ildizlari  $\frac{3 \pm \sqrt{5}}{2}$  ni topamiz. Demak,  $x_1 = \frac{1}{2}$ ,  $x_2 = \frac{3 - \sqrt{5}}{2}$ ,  $x_3 = \frac{3 + \sqrt{5}}{2}$

lar berilgan tenglama ildizlari bo'ladi.

Yuqorida ta'kidlanganidek,  $P(x) = 0$  tenglama ildizi  $\alpha$  ma'lum bo'lsa, tenglama darajasini pasaytirish  $P(x)$  ko'phadni  $x - \alpha$  ga bo'lishdagi bo'linmani topishga keltiriladi.  $P(x) = a_0x^n + a_1x^{n-1} + \dots + a_{n-1}x + a_n$  ko'phadni  $x - \alpha$  ga bo'lishni Gornersxe-masi deb ataluvchi sxema bo'yicha bajarish qulay bo'ladi.  $P(x)$  ko'phadni  $x - \alpha$  ga bo'lishdagi to'liqmas bo'linmani  $Q(x) = b_0x^n + b_1x^{n-1} + \dots + b_{n-1}$  ko'rinishida, qol-diqni esa  $b_n$  orqali belgilaymiz.  $P(x) = (x - \alpha)Q(x) + b_n$  bo'lganligi uchun quyidagi ayniyat o'rinli:

$$a_0x^n + a_1x^{n-1} + \dots + a_{n-1}x + a_n = (b_0x^n + b_1x^{n-1} + \dots + b_0x^n + b_1x^{n-1} + \dots + b_{n-1})(x - \alpha) + b_n.$$

Bu tenglik o'ng tomonidagi qavslarni ochib, tenglikning chap va o'nggidagi  $x$  noma'lumning koeffitsentlarini tenglashtiramiz. Natijada  $b_0 = a_0$  va  $b_k = a_k + \alpha b_{k-1}$ , ( $1 \leq i \leq n$ ) munosabat o'rinli bo'ladi.

$Q(x)$  ko'phad koeffitsentlari va  $b_n$  - qoldiqni hisoblash quyidagi jadval ko'rinishida yoziladi:

|             |                          |                          |         |                                      |                              |
|-------------|--------------------------|--------------------------|---------|--------------------------------------|------------------------------|
| $a_0$       | $a_1$                    | $a_2$                    | $\dots$ | $a_{n-1}$                            | $a_n$                        |
| $b_0 = a_0$ | $b_1 = a_1 + \alpha b_0$ | $b_2 = a_2 + \alpha b_1$ | $\dots$ | $b_{n-1} = a_{n-1} + \alpha b_{n-2}$ | $b_n = a_n + \alpha b_{n-1}$ |

va bu jadval Gorner sxemasi deb ataladi. Birinchi satrda  $P(x)$  ko'phad koeffitsentlari, ikkinchi satrda  $Q(x)$  - to'liqmas bo'linma (ko'phad) koeffitsentlari va qoldiq had hosil qilinadi.

Bezu teoremasiga asosan  $b_n = P(\alpha)$  bo'lganligi uchun Gorner sxemasi  $P(x)$  ko'phadning  $x = \alpha$  dagi qiymatini topish imkonini beradi. Ko'p hollarda Gorner sxemasi  $x = \alpha$  ni  $P(x)$  ko'phadga to'g'ridan to'g'ri qo'yishdan qulayroq bo'ladi.

**2-misol.** Agar  $P(x) = 4x^5 - 7x^4 + 5x^3 - 2x + 1$  bo'lsa,  $P(3)$  ni hisoblang.

**Yechish.** Berilgan ko'phadga mos Gorner sxemasini tuzamiz:

|   |   |    |    |    |     |     |
|---|---|----|----|----|-----|-----|
|   | 4 | -7 | 5  | 0  | -2  | 1   |
| 3 | 4 | 5  | 20 | 60 | 178 | 535 |

Natijada,  $P(3) = 535$  ekanligini ko'ramiz.

**3-masala.**  $P(x) = 4x^5 - 7x^4 + 5x^3 - 2x + 1$  butun koeffitsentli ko'phadni ko'paytuvchilarga ajrating: .

**Yechish:** Butun ildizlarni ozod had bo'luvchilari  $\pm 1$  lardan izlaymiz. Bu yerda  $-1$  mos keladi.  $P(x)$  ko'phadni  $x+1$  ga bo'lamiz, ya'ni Gorner sxemasi ni

|    |   |    |    |    |    |
|----|---|----|----|----|----|
|    | 2 | -7 | -3 | 5  | -1 |
| -1 | 2 | -9 | -6 | -1 | 0  |

tuzamiz. Uning ikkinchi satrida  $Q(x)$ -to'liqmas bo'linma koeffitsentlari va qoldiq hadni topamiz. U holda  $P(x) = (x+1)(2x^3 - 9x^2 + 6x - 1)$  bo'lib,  $b_1 = -7 + (-1)2 = -9$ . Ikkinchi qavsdagi 3-darajali ko'phad butun ildizlarini uning ozod hadi bo'luvchilari  $\pm 1$  lardan izlaymiz. Tekshirish natijalari ko'rsatadiki, butun ildizlar yo'q. Bosh koeffitsent 1 ga teng bo'lmaganligi uchun bu ko'phad kasr ratsional ildizlar  $\frac{1}{2}$  va

$-\frac{1}{2}$  ga ega bo'lishi mumkin. Bulardan  $\frac{1}{2}$  mos keladi. Natijada,

$P(x) = (x+1)\left(x - \frac{1}{2}\right)(x^2 - 4x + 1) = (x+1)(2x-1)(x^2 - 4x + 1)$  ga ega bo'lamiz. Bu yerda

$x^2 - 4x + 1$  kvadrat uchhad butun koeffitsentli ko'paytuvchilarga ajralmaydi:

$D = 4^2 - 4 \cdot 1 \cdot 1 = 12$  va  $x_{3,4} = \frac{4 \pm \sqrt{12}}{2} = 2 \pm \sqrt{3}$ . Va,  $P(x) = (x+1)(2x-1)(x^2 - 4x + 1)$ .

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## **DIFFERENSIAL HISOB METODLARINING TATBIQIGA OID BA’ZI MASALALAR**

**Annotatsiya:** Ushbu maqolada hosila tatbiqlariga oid turli mazmundagi ba’zi masalalar, jumladan ekstremal masalalar (maksimum va minimum masalalari), funksiyalarning ekstremal va boshqa xossalardan foydalanish orqali yechiladigan masalalar hamda turli xil tengsizliklarni isbotlash masalalari, ularni yechish usullari qaraladi.

**Kalit so‘zlar:** funksiya hosilasi, funksiya monotonligi, funksiya qavariqligi, masala, tenglama, tengsizlik, nostandart masala, ildiz, butun qiymat, eng katta qiymat, yechim.

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## **SOME ISSUES ON THE APPLICATION OF DIFFERENTIAL CALCULUS METHODS**

**Annotation:** This article discusses some problems of various content related to applications of the derivative, including extremal problems (maximum and minimum problems), problems solved using extremal properties, quarks, and other properties of functions, as well as problems of proving various inequalities and methods for solving them.

**Keywords:** derivative of a function, monotonicity of a function, convexity of a function, problem, equation, inequality, non-standard problem, root, integer value, maximum value, solution.

Hozirgi davrda uzluksiz ta’limning eng muhim vazifalaridan biri shaxs tarbiyasida yangicha yondashuvni tashkil etishdir. Matematikaga iqtidorli o‘quvchi va talabalarda matematik qobiliyatlarni va izlanuvchanlikni o‘stirib borish barcha fanlarni o‘zlashtirishda muhim o‘rin tutadi. Bunda turli mazmundagi qiyinlik darajasi yuqoriroq matematik masalalarni yechishda mavjud bilimlardan foydalana bilish, ulardagi ijodkorlikni rivojlantiradi.

Xususan, hosila tushunchasi tatbiqlari yordamida turli mazmundagi ko‘p masalalarni, jumladan murakkab masalarni yecha bilish - ta’lim oluvchilarning differensial hisob element-laridan masalalarni yechishda keng foydalana olish ko‘nikma va malakalarini shakllanganligini hamda matematik savodxonligini ko‘rsatadi. Ushbu maqolada hosila tatbiqlariga oid ba’zi masalalar va ularni yechish metodlarini o‘ganiladi.

**1-masala.** Sistemani yeching:

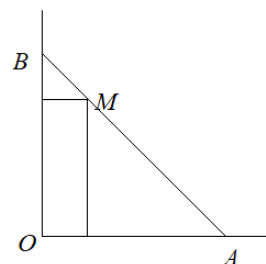
$$\begin{cases} x^3 + 2x^2 + 2x = u \\ u^3 + 2u^2 + 2u = z \\ z^3 + 2z^2 + 2z = x \end{cases}$$

**Yechish.**  $f(t) = t^3 + 2t^2 + 2t$  funksiyani qaraymiz.  $t$  ning ixtiyoriy qiymatida uning hosilasi  $f'(t) = 3t^2 + 4t + 2 > 0$  bo'lganligi uchun  $f(t)$  o'suvchi. Sistema  $u = f(x)$ ,  $z = f(u)$ ,  $x = f(z)$  ko'rinishga ega, ya'ni  $x = f(f(f(x)))$ . Teorema ko'ra,  $x = f(x) = x$  tenglamani qanoatlantiradi yoki  $x^3 + 2x^2 + 2x = x$ ,  $x(x+1)^2 = 0$ ,  $x_1 = 0$ ,  $x_2 = -1$ . Demak,  $(0; 0; 0)$  va  $(-1; -1; -1)$  uchliklar sistemaning yechimlaridir.

**2-masala.** Uchlari to'g'ri burchak tamonlarida bo'lgan kesma shu burchak tamonlaridan 1 va 8 birlik masofalarda uzoqlashgan nuqtaga ega. Bunday kesmaning eng kichik uzunlikdagi toping.

**Yechish.** Faraz qilaylik  $OA = x$ ,  $OB = y$  (1-rasm).  $x$  va  $y$  larning o'zaro bog'liqligini mos uchburchaklar o'xshashligidan hosil qilish mumkin, shuningdek,  $S_{OBA} = S_{OMA} + S_{OMB}$  tenglikka ko'ra  $xy = 8x + y$ .

Bundan  $y = \frac{8x}{x-1}$  yoki Pifagor teoremasiga ko'ra



1-rasm

$AB^2 = x^2 + y^2 = x^2 + \frac{64x^2}{(x-1)^2}$ . Masalani yechish uchun  $f(x) = x^2 + \frac{64x^2}{(x-1)^2}$  funksiyaning eng kichik qiymatini topishimiz kerak bo'ladi. Bu funksiya hosilasini topib, uni nolga tenglaymiz. Natijada  $f'(x) = 2x + \frac{128x(x-1)^2 - 128x^2(x-1)}{(x-1)^4} = 0$  va uni ixchamlab  $(x-1)^3 = 64$  yoki  $x = 5$  ga ega bo'lamiz. U holda  $f(x)$  funksiyaning eng kichik qiymati  $AB^2$  ga tengligidan  $AB^2 = \left( x^2 + \frac{64x^2}{(x-1)^2} \right)_{x=5} = 25 + \frac{64 \cdot 25}{16} = 125$ . Bundan  $AB = 5\sqrt{5}$  eng kichik uzunlikdagi kesmani topamiz.

**3-masala.**  $R$  - radiusli doiradan sektor qirg'ilgan va sektordan konus hosil qilingan. Hosil qilingan konus po'kakning eng katta hajmi qanday?

**Yechish:** Sektorning markaziy burchagi  $\alpha$ , konus asosi radiusi  $r$  bo'lsin.

$R\alpha = 2\pi$  (asos aylanasi uzunligi sektor yoyiga teng) tenglikdan  $r = \frac{R\alpha}{2\pi}$  ni topamiz.

Konus yasovchisi  $R$  bo'lganligi uchun uning uzunligi  $R\sqrt{1 - \frac{\alpha^2}{4\pi^2}}$ , hajmi esa

$V = \frac{1}{3}\pi \frac{R^3\alpha^2}{4\pi^2} \sqrt{1 - \frac{\alpha^2}{4\pi^2}}$  ga teng. Masala  $\alpha$ - ning funksiyasi bo'lgan  $y = \alpha^2 \sqrt{1 - \frac{\alpha^2}{4\pi^2}}$

yoki  $y^2 = \alpha^4 - \frac{\alpha^6}{4\pi^2}$  funksiyaning eng katta qiymatini topishga keltiriladi.  $\alpha$ - bo'yi-

cha **hosilani** hisoblaymiz va uni nolga tenglab quyidagilarga ega bo‘lamiz.

$$4\alpha^3 - \frac{6\alpha^5}{4\pi^2} = 0, \text{ bundan } \alpha^2 = \frac{8}{3}\pi^2 \text{ yoki } \alpha = 2\pi\sqrt{\frac{2}{3}} \text{ va natijada}$$

$$V = \frac{1}{3}\pi \frac{R^3 \frac{8}{3}\pi^2}{4\pi^2} \sqrt{1 - \frac{\frac{8}{3}\pi^2}{4\pi^2}} = \frac{8}{9}R^3\pi \frac{\sqrt{4 - \frac{8}{3}}}{2} = \frac{8}{9}\pi R^3 \frac{2\frac{1}{\sqrt{3}}}{2} = \frac{8}{9\sqrt{3}}\pi R^3 \text{ ni hosil qilamiz.}$$

**4-masala.** Tenglamani yeching:  $x\sqrt{1+x} + \sqrt{3-x} = 2\sqrt{1+x^2}$ .

**Yechish.** Ushbu tenglamani yechish uchun  $a_1a_2 + b_1b_2 \leq \sqrt{a_1^2 + b_1^2} \sqrt{a_2^2 + b_2^2}$  tengsizlikdan foydalanamiz. Bu tengsizlikning geometrik ma’nosi quyidagicha: ikki  $\vec{c}(a_1, b_1)$  va  $\vec{d}(a_2, b_2)$  vektorlar skalyar ko‘paytmasi ular modullari (uzunliklari) ko‘paytmasidan oshmaydi. Ushbu tengsizlik umumiy holdagi Koshi-Bunyakovskiy tengsizligining  $n=2$  dagi xususiy holi hisoblanadi [3]. Tengsizlikdagi tenglik  $\vec{c}(a_1, b_1)$  va  $\vec{d}(a_2, b_2)$  vektorlar kollinear bo‘lgan holda bajariladi.

Mazkur tengsizlikka ko‘ra,

$$x\sqrt{1+x} + 1\sqrt{3-x} \leq \sqrt{1+x^2} \cdot \sqrt{(1+x)+(3-x)} = 2\sqrt{1+x^2} \text{ ga ega bo‘lamiz.}$$

$$\text{Demak, } \vec{n}(x;1) \text{ va } \vec{m}(\sqrt{1+x};\sqrt{3-x}) \text{ vektorlar kollinear, yani } \frac{x}{\sqrt{1+x}} = \frac{1}{\sqrt{3-x}}.$$

$$\text{Bundan, } x\sqrt{3-x} = \sqrt{x+1}, x^3 - 3x + x + 1 = 0 \text{ yoki}$$

$$(x-1)(x^2 - 2x - 1) = 0, x_1 = 1, x_2 = 1 + \sqrt{2}, x_3 = 1 - \sqrt{2} \text{ (oxirgi ildiz chet ildiz).}$$

**5-masala.** Tenglamani yeching:  $\log_{6-x} \log_2 x = \log_{7-x} \log_2 (2x)$ .

$$\text{Yechish. Berilgan tenglamani shakl almashtiramiz: } \frac{\lg \log_2 x}{\lg(6-x)} = \frac{\lg(\log_2 x + 1)}{\lg(7-x)}$$

yoki

$$\frac{\lg(7-x)}{\lg(6-x)} = \frac{\lg(\log_2 x + 1)}{\lg \log_2 x} \text{ yoki } \log_{(6-x)}(7-x) = \log_{\log_2 x}(\log_2 x + 1).$$

$f(t) = \log_t(t+1)$  funksiyani qaraymiz. Bu funksiyaning  $t > 1$  da monoton kamayuvchi ekanligini ko‘rsatamiz. Buni quyidagi usulda bajarish mumkin:

$$f(t) - 1 = \log_t(t+1) - 1 = \log_t\left(1 + \frac{1}{t}\right). \text{ Natijada hosil bo‘gan } \log_t\left(1 + \frac{1}{t}\right) \text{ funksiya}$$

kamayuvchi funksiya dan iborat (ya’ni asos o’sadi, logarifm belgisi ostidagi funksiya kamayadi).

Qaralayotgan tenglamamiz  $f(6-x) = f(\log_2 x)$  ko‘rinishga ega va demak  $\log_2 x = 6-x$  tenglikdan chapda o’suvchi, o’ngda kamayuvchi funksiya turganligi uchun yechim yagona:  $x = 4$ .

**6-masala.**  $x^3 + 1 = 2\sqrt[3]{2x-1}$  tenglamani yeching.

**Yechish.** Masalani yechish quyidagi teoremaga asoslanadi.

**Teorema.** Agar  $y = f(x)$  funksiya monoton o’suvchi bo‘lsa, u holda

$$f(x) = x \quad (1) \quad \text{va} \quad f(f(x)) = x \quad (2)$$

tenglamalar ekvivalent [1-2].

**Isbot.** (2) tenglama (1) tenglamaning natijasi bo'lganligi uchun (1) ning har qanday yechimi (2) ni qanoatlantirishi ravshan. (Agar  $f(x_0) = x_0$  bo'lsa, u holda  $f(f(x_0)) = f(x_0) = x_0$ ). (2) tenglamaning har qanday yechimi (1) ni qanoatlantirishini isbotlaymiz.  $x_0$  shunday bo'lsinki,  $f(f(x_0)) = x_0$  o'rinli bo'lsin. Faraz qilaylik,  $f(x_0) \neq x_0$  va aniqlik uchun  $f(x_0) > x_0$  bo'lsin. U holda  $f(f(x_0)) > f(x_0) > x_0$  bo'lib, bu  $f(f(x_0)) = x_0$  farazimizga qarama-qarshidir. Teorema isbotlandi.

**Izoh:** Agar  $y = f(x)$  monoton o'suvchi bo'lsa, u holda ixtiyoriy  $k$  da  $\underbrace{f(f(\dots(f(x)\dots)))}_{k\text{-marta}} = x$  va  $f(x) = x$  tenglamalar ekvivalent.

Tenglamada shakl almashtiramiz:  $\frac{1 + \left(\frac{x^3 + 1}{2}\right)^3}{2} = x$ . Berilgan tenglama  $f(f(x)) = x$  ko'rinishga ega, bunda  $f(x) = \frac{1 + x^3}{2}$  bo'lib,

$$f(f(x)) = f\left(\frac{1 + x^3}{2}\right) = \frac{1 + \left(\frac{1 + x^3}{2}\right)^3}{2} = x.$$

Teoremaga asosan unga ekvivalent  $\frac{1 + x^3}{2} = x$  tenglamaga ega bo'lamiz. Bundan,

$$x^3 + 2x + 1 = 0, (x - 1)(x^2 + x - 1) = 0. \quad x_1 = 1, \quad x_2 = \frac{-1 + \sqrt{5}}{2}, \quad x_3 = \frac{-1 - \sqrt{5}}{2}.$$

**Xulosa.** Differensial hisob metodlari, funksiyaning ekstremal xossalari va ulaning tatbiqlariga oid tushunchalarni yaxshi o'zlashtirgan iqtidorli o'quvchi va talabalar muntazam ravishda ushbu maqolada o'rganilgan ba'zi qiyinroq masalalarni hamda mustaqil ravishda turli mazmundagi masalalarni [4-6] yechish bilan shug'ullanib, o'z bilimlarini mustahkamlab borishlari orqali mavzu doirasidagi ko'plab konkurs masalalarini yecha olish ko'nikma va malakalariga ega bo'lishadi.

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## **BIOMETRIK TIZIMLARDA TASVIRLARGA DASTLABKI ISHLOV BERISH ALGORITMI**

**Annotatsiya:** Ushbu maqola tasvirlarni algoritmlar yordamida oldindan qayta ishlash haqida. Tasvir yaratilgandan so'ng, uni keyingi bosqichda qayta ishlash uchun unga tegishli buyruq va ko'rsatmalar ketma-ket joylashtiriladi. Buning uchun biz algoritm yaratamiz.

**Kalit so'zlar:** Tasvirlarning grafik tasviri, Image Processing Toolbox muhitida tasvirlarni filtrlash tasvirlarga raqamli ishlov berish, tasvir sifatini yaxshilashda retinex algoritmdan foydalanish.

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## **ALGORITHMS OF INITIAL PROCESSING TO IMAGES IN BIOMETRIC SYSTEMS**

**Abstract:** This article is about the pre-processing of images through algorithms. After generating an image, its commands and instructions are sequentially placed in it for further processing. For this, we will create an algorithm.

**Key words:** Graphic image of the images, filter of images in condition of Image Processing Toolbox, digital treatment of images, Using retinex algorithm to improve image quality.

### **Kirish**

Tasvirni qayta ishlashda, agar ularni ko'p o'lchovli signallarga umumlashtirish mumkin bo'lsa, bir o'lchovli signallarni qayta ishlash usullari keng qo'llaniladi. Shu bilan birga, ko'p o'lchovli tizimlarni tavsiflashning matematik usullari to'liq emasligini hisobga olish kerak. Ko'p o'lchovli tizimlar katta miqdordagi erkinlik darajasiga ega va ularning dizayni bir o'lchovli tizimlarga xos bo'lmagan moslashuvchanlikni oladi. Shu bilan birga, ko'p o'lchovli polinomlar tub omillarga ajralmaydi, bu ko'p o'lchovli tizimlarning tahlili va sintezini murakkablashtiradi.

### **MUHOKAMA VA NATIJALAR**

Axborot xavfsizligini ta'minlashda biometrik tizimlar muhim o'rin egallaydi. An'anaviy identifikatsiya usullaridan (parol, PIN-kod, karta) farqli ravishda biometrik tizimlar insonning o'ziga xos biologik xususiyatlariga asoslanadi.



Bunday tizimlarga yuzni aniqlash, barmoq izi, ko'z qorachig'i (iris), kaft izi va boshqa usullar kiradi.

Biometrik tizimlarda tasvir sifatini oshirish va harakterlovchi belgilarini ajratish algoritmlari va dasturiy majmualari bo'yicha olingan natijalari asosida:

Biometrik ob'ektlar tasvirlariga dastlabki ishlov berish va harakterlovchi belgilarini ajratish bo'yicha inson shaxsini identifikatsiyalashda tasvirlarga dastlabki ishlov berish uchun dasturiy majmuasi yaratish. Natijada biometrik ob'ektlar tasvirlariga dastlabki ishlov berish va harakterlovchi belgilarini ajratish algoritmlari asosida yaratilgan dasturiy ta'minot biometrik tizimlarni ishlab chiqish imkoni yaratilgan.

Gabor filtrini bosh komponentalar va bo'laklarga bo'lish algoritmlari bilan birgalikda qo'llash hamda takomillashtirilgan Retinex algoritmiga asoslangan shaxsni tanib olishga asoslangan tasvirlar sifatini oshirish va ularning harakterlovchi belgilarini ajratib olish

Matematik tasvirdagi tasvir juda katta hajmdagi ma'lumotni olib yuradigan ikki o'lchovli signaldir. Rangli tasvir  $500 \times 500$  element - bu bir necha yuz ming baytlik massiv. Bunday ma'lumotlarni faqat hisob-kitoblarni oqilona tashkil etish orqali qayta ishlash mumkin. Muayyan tasvirni qayta ishlash vazifalari uchun siz murojaat qilishingiz mumkin samarali usullar ushbu aniq vazifaning xususiyatlari va cheklovlarini hisobga olgan holda qayta ishlash. Ammo agar biz keng miqyosli masalalarni hal qilish uchun tasvirni qayta ishlash haqida gapiradigan bo'lsak, unda standart operatsiyalar to'plamini ajratib ko'rsatish kerak, ulardan ixtiyoriy muammolarni hal qilish uchun algoritmlarni qurish mumkin. Bularga chiziqli transformatsiyalar, 2D konvolyutsiya va 2D diskret Furye transformatsiyalari kiradi.

Biometrik tizimlarda tasvirlarga dastlabki ishlov berish quyidagi asosiy bosqichlardan iborat:

1) Tasvirni olish (Image Acquisition). Tasvir kamera yoki maxsus skaner yordamida olinadi va raqamli ko'rinishga keltiriladi.

2) Kulrang formatga o'tkazish. Rangli tasvirlar hisoblash murakkabligini kamaytirish maqsadida grayscale formatga o'tkaziladi.

3) Shovqinni kamaytirish. Tasvirdagi tasodifiy shovqinlarni bartaraf etish uchun quyidagi filtrlar qo'llaniladi:

- Median filtri
- Gauss filtri
- Wiener filtri

4) Kontrastni oshirish. Tasvir aniqligini yaxshilash uchun:

- Histogram tenglashtirish (Histogram Equalization)
- Adaptiv kontrastni oshirish (CLAHE)

5) Segmentatsiya. Kerakli biometrik obyekt (masalan, yuz yoki barmoq izi) fonidan ajratib olinadi.

6) Normalizatsiya. Tasvir o'lchami va yorug'lik intensivligi standart diapazonga keltiriladi.

7) Belgilarni ajratish (Feature Extraction) Chegaralarni aniqlash (Sobel, Canny operatorlari) yoki boshqa metodlar yordamida muhim belgilar ajratib olinadi.

Tasvirni qayta ishlashda, agar ularni ko'p o'lchovli signallarga umumlashtirish mumkin bo'lsa, bir o'lchovli signallarni qayta ishlash usullari keng qo'llaniladi. Shu bilan birga, ko'p o'lchovli tizimlarni tavsiflashning matematik usullari to'liq emasligini hisobga olish kerak. Ko'p o'lchovli tizimlar katta miqdordagi erkinlik darajasiga ega va ularning dizayni bir o'lchovli tizimlarga xos bo'lmagan moslashuvchanlikni oladi. Shu bilan birga, ko'p o'lchovli polinomlar tub omillarga ajralmaydi, bu ko'p o'lchovli tizimlarning tahlili va sintezini murakkablashtiradi.

**Transformatsiya sohalari va bosqichlari.** Tasvirlarni tekstura va detallarga bo'lish mumkin. Teksturali tasvirlarda barcha namunalar (elementlar) axborotni (televizor ekranidagi tasvir) olib yuradi. Batafsil tasvir - bu xalaqit beruvchi ob'ektlarni, fonni va foydali narsalarni ajratib ko'rsatishingiz mumkin bo'lgan rasm.

Kompyuterda tasvirni qayta ishlash algoritmlarining uchta asosiy guruhi mavjud:

1. Qayta tiklash, tasodifiy shovqinlardan tozalash, sifatni yaxshilash, optik tizimlarning geometrik buzilishlarini tuzatish (fokusni yo'qotish, aberatsiyalar va boshqalar) maqsadida birlamchi (dastlabki) tasvirni qayta ishlash.

2. Tasvirlarning tavsifi, naqshni aniqlash. U tasvir detallarining parametrlarini aniqlash uchun bajariladi va quyidagilarni o'z ichiga oladi: yorug'lik va rang jihatidan bir xil bo'lgan tasvir sohalarni topish, tasvir shakli xususiyatlarini ajratib ko'rsatish, ob'ektlarning maxsus nuqtalarining koordinatalarini aniqlash va boshqalar.

3. Uzatish va saqlashda hajmni kamaytirish uchun samarali kodlash.

Tasvirlarni tiklash va ularning sifatini yaxshilash uchun chiziqli bo'lmagan usullar ham talab qilinishi mumkin. Shunday qilib, masalan, shovqinni bostirish va bir vaqtning o'zida tasvirlarning kontur qismini saqlab qolish uchun darajali algoritmlar tomonidan amalga oshiriladigan chiziqli yoki chiziqli fazoviy o'zgarmas (LPNI) filtrlardan foydalanish kerak. Barcha darajali nochiziqli filtrlar mahalliy histogrammalarni hisoblash uchun tezkor algoritmlarga asoslanadi.

Zamonaviy tadqiqotlarda tasvirga dastlabki ishlov berish biometrik tizimlarning samaradorligini oshiruvchi muhim bosqich sifatida qaraladi. Ko'plab ilmiy ishlarda shovqinni kamaytirish uchun Gauss va median filtrlari, kontrastni oshirish uchun histogram tenglashtirish usuli qo'llanilishi ko'rsatilgan.

So'nggi yillarda chuqur o'rganish (Deep Learning) asosidagi modellar, xususan, konvolyutsion neyron tarmoqlar (CNN) keng qo'llanilmoqda. Biroq, neyron tarmoqlar samarali ishlashi uchun kiruvchi ma'lumotlar oldindan sifatli qayta ishlanishi talab etiladi.

Dastlabki ishlov berish bosqichi biometrik tizim aniqligini sezilarli darajada oshiradi. Tajribalar shuni ko'rsatadiki, shovqin kamaytirilgan va kontrasti oshirilgan tasvirlarda obyektning aniqlash darajasi yuqori bo'ladi. Ayniqsa, chuqur o'rganish modellarida pre-processing bosqichi o'qitish vaqtini qisqartiradi va xatolik ehtimolini kamaytiradi.

**Xulosa:** Biometrik tizimlarda tasvirlarga dastlabki ishlov berish algoritmi butun identifikatsiya jarayonining muhim tarkibiy qismi hisoblanadi. Shovqinni kamaytirish, kontrastni oshirish, segmentatsiya va normalizatsiya bosqichlari tizim samaradorligini oshiradi. Zamonaviy chuqur o'rganish texnologiyalari bilan birgalikda qo'llanilganda ushbu algoritmlar yuqori aniqlik va ishonchlilikni ta'minlaydi.

Kelgusida adaptiv va intellektual pre-processing usullarini ishlab chiqish biometrik tizimlar samaradorligini yanada oshirish imkonini beradi.

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## **SANOAT VA TURIZM SALOHIYATI: ISTIQBOLLI STRATEGIYALAR (NAVOIY VILOYATI MISOLIDA)**

**Annotatsiya:** Muallif tomonidan ushbu maqolada Navoiy viloyatining sanoat va turizm salohiyati kompleks geografik, iqtisodiy va institutsional yondashuv asosida tahlil qilinadi. Hududning shakllanish tarixi, geografik oʻrni, tabiiy resurs bazasi, sanoat infratuzilmasi hamda turizm imkoniyatlari oʻzaro bogʻliqlikda oʻrganiladi. Shuningdek, mintaqaning barqaror rivojlanishini taʼminlashga qaratilgan istiqbolli strategik yoʻnalishlar ishlab chiqiladi. Tadqiqot natijalariga koʻra, sanoat va turizm integratsiyasi hududiy iqtisodiy oʻsishning muhim drayveri hisoblanadi.

**Kalit soʻzlar:** sanoat salohiyati, turizm resurslari, erkin iqtisodiy zona, hududiy rivojlanish, geografik joylashuv, investitsiya, iqtisodiy diversifikatsiya.

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## **INDUSTRIAL AND TOURISM CAPACITY: PROSPECTIVE STRATEGIES (USING THE EXAMPLE OF THE NAVAI REGION)**

**Abstract:** This scientific article provides a comprehensive geographical and economic analysis of the industrial and tourism potential of Navoi region. The historical formation, natural resource base, industrial infrastructure, and tourism opportunities of the region are examined in an integrated manner. *nepcnekmu8* strategic directions for sustainable regional development are proposed. The study concludes that the integration of industry and tourism serves as a key driver of regional economic growth.

**Keywords:** industrial potential, tourism resources, free economic zone, regional development, investment, economic diversification.

**Kirish.** Hududiy iqtisodiyotni barqaror rivojlantirish zamonaviy iqtisodiy siyosatning ustuvor yoʻnalishlaridan biri hisoblanadi. Oʻzbekiston Respublikasining markaziy-gʻarbiy qismida joylashgan Navoiy viloyati maydoni jihatidan eng yirik hududlardan biri boʻlib, boy tabiiy resurslari va strategik

geografik o'rnini bilan ajralib turadi. Viloyat 1982-yil 20-aprelda tashkil etilgan bo'lib, 1992-yilda qayta tiklanganidan so'ng respublikaning yirik sanoat markaziga aylandi.

Hozirgi davrda hududlarning ijtimoiy-iqtisodiy rivojlanishi ko'p jihatdan ularning mavjud resurs salohiyati, ishlab chiqarish imkoniyatlari va xizmatlar sohasining rivojlanganlik darajasiga bog'liqdir. Ayniqsa, sanoat va turizm tarmoqlari hududiy rivojlanishni jadallashtiruvchi, yangi ish o'rinlari yaratishga xizmat qiluvchi hamda aholi farovonligini oshiruvchi muhim omillar sifatida namoyon bo'lmoqda. Shu boisdan ham hududlarning sanoat va turizm salohiyatini chuqur o'rganish, ularni rivojlantirishning samarali strategiyalarini ishlab chiqish bugungi kunda dolzarb ilmiy-amaliy vazifalardan biri hisoblanadi.

Shavkat Mirziyoyevning Oliy Majlisga dekabr oyidagi Murojaatnomasida sanoat sohasini rivojlantirish masalasi ustuvor yo'nalishlardan biri sifatida belgilandi. Unda mamlakat sanoatini modernizatsiya qilish, ishlab chiqarish quvvatlarini yangilash va zamonaviy texnologiyalarni keng joriy etish zarurligi alohida ta'kidlandi. Prezident sanoatda yuqori qo'shilgan qiymatga ega mahsulotlar ishlab chiqarishni ko'paytirish orqali iqtisodiyot raqobatbardoshligini oshirish lozimligini qayd etdi. Murojaatnomada mahalliyashtirish siyosatini davom ettirish, import o'rnini bosuvchi mahsulotlar ishlab chiqarishni kengaytirish va ichki bozorni mahalliy mahsulotlar bilan ta'minlash muhim vazifa sifatida ko'rsatildi. Shu bilan birga, tayyor sanoat mahsulotlari eksportini oshirish, yangi tashqi bozorlarni egallash hamda mahsulot sifatini xalqaro standartlarga moslashtirish zarurligi ta'kidlandi. Energiya samaradorligini oshirish ham sanoatni rivojlantirishning muhim omili sifatida tilga olindi. Korxonalarda energiya tejamkor texnologiyalarni joriy etish, qayta tiklanuvchi energiya manbalaridan foydalanish va ishlab chiqarish xarajatlarini kamaytirish orqali mahsulot tannarxini pasaytirish vazifalari belgilandi. Shuningdek, hududlarda sanoatni rivojlantirish, kichik sanoat zonalarini tashkil etish, yangi investitsiya loyihalarini amalga oshirish va shu orqali yangi ish o'rinlari yaratish masalalariga alohida e'tibor qaratildi. Xususiyl sektorini qo'llab-quvvatlash, davlat ishtirokini qisqartirish hamda xorijiy investitsiyalarni jalb qilish orqali sanoatni barqaror rivojlantirish ustuvor vazifa sifatida belgilandi.

O'zbekiston Respublikasida amalga oshirilayotgan iqtisodiy islohotlar jarayonida mintaqaviy rivojlanishga alohida e'tibor qaratilmoqda. Hududlarning tabiiy-resurs bazasidan oqilona foydalanish, ishlab chiqarish tarmoqlarini modernizatsiya qilish va xizmatlar sohasini kengaytirish orqali barqaror iqtisodiy o'sishga erishish davlat siyosatining ustuvor yo'nalishlaridan biri etib belgilangan. Ushbu jarayonda Navoiy viloyati o'zining strategik geografik o'rnini, boy mineral resurslari hamda yirik sanoat korxonalari bilan alohida ajralib turadi.

Navoiy viloyati respublikaning eng yirik sanoat markazlaridan biri bo'lib, bu yerda tog'-kon sanoati, rangli metallurgiya, kimyo sanoati va energetika tarmoqlari rivojlangan. Viloyat hududida joylashgan yirik sanoat korxonalari nafaqat ichki bozorni muhim mahsulotlar bilan ta'minlab kelmoqda, balki eksport salohiyatini oshirishda ham muhim rol o'ynamoqda. Shu bilan birga, sanoat tarmoqlarining

rivojlanishi hududda transport, logistika va ijtimoiy infratuzilmaning kengayishiga turtki bo'lmoqda.

Biroq Navoiy viloyatining iqtisodiy salohiyati faqat sanoat bilan cheklanib qolmaydi. Viloyat hududida tarixiy-madaniy meros ob'ektlari, noyob tabiiy landshaftlar, arxeologik yodgorliklar va ekologik jihatdan qimmatli hududlar mavjud bo'lib, ular turizm sohasini rivojlantirish uchun muhim asos bo'lib xizmat qiladi. Xususan, Sarmishsoy darasidagi qadimiy qoya rasmlari, cho'l va tog' oldi hududlarining o'ziga xos tabiati madaniy, ekologik va ilmiy turizm yo'nalishlarini shakllantirish imkonini beradi.

Hozirgi kunda Navoiy viloyatida turizm sohasining rivojlanish darajasi mavjud imkoniyatlarga nisbatan yetarli emasligi kuzatilmoqda. Bu holat turizm infratuzilmasining to'liq shakllanmaganligi, xizmatlar sifati va marketing tizimining yetarli darajada rivojlanmaganligi bilan izohlanadi. Shu sababli sanoat va turizm tarmoqlarini o'zaro uyg'unlashtirish, innovatsion yondashuvlar asosida rivojlantirish va investitsiya muhitini yanada yaxshilash muhim ahamiyat kasb etadi.

**Asosiy qism.** Navoiy viloyati O'zbekiston Respublikasining markaziy-g'arbiy qismida joylashgan bo'lib, maydoni 110,8 ming kvadrat kilometrni tashkil etadi va mamlakat hududining qariyb to'rtidan bir qismini egallaydi. Shimolda Qozog'iston Respublikasi, g'arbda Buxoro viloyati, janubda Qashqadaryo va Samarqand viloyatlari, sharqda esa Jizzax viloyati bilan chegaradosh. Geografik joylashuvi viloyatni mintaqaviy tranzit hudud sifatida rivojlantirish imkonini beradi.



**1-rasm. Navoiy viloyatining ma'muriy xaritasi**



Hududning asosiy qismi Qizilqum cho‘li hududiga to‘g‘ri keladi. Janubi-sharqiy qismida Nurota tog‘ tizmalari joylashgan bo‘lib, ular viloyatning tabiiy-landshaft xilma-xilligini ta’minlaydi. Iqlimi keskin kontinental, yoz oylarida havo harorati  $+40^{\circ}\text{C}$  dan yuqori ko‘tarilishi, qishda esa sovuq bo‘lishi bilan xarakterlanadi. Yillik yog‘in miqdori kam bo‘lib, bu qishloq xo‘jaligi va suv resurslarini boshqarishda alohida yondashuvni talab etadi. Zarafshon daryosi, shuningdek Aydarko‘l va Tudako‘l suv havzalari hudud iqtisodiyotida muhim ahamiyat kasb etadi.

Viloyat iqtisodiyotining asosini sanoat tarmog‘i tashkil etadi. Ayniqsa, konchilik va metallurgiya sanoati yetakchi o‘ringa ega. Muruntov oltin koni dunyodagi eng yirik ochiq konlardan biri bo‘lib, Navoiy kon-metallurgiya kombinati tomonidan qayta ishlanadi. Shuningdek, hududda uran, fosforit, marmar, granit va boshqa foydali qazilmalar zaxiralari mavjud. Bu esa viloyatni respublika eksport salohiyatining muhim manbaiga aylantirgan.

Mustaqillik yillarida “Navoiy” erkin iqtisodiy zonasi tashkil etilishi sanoatni diversifikatsiya qilish jarayonini jadallashtirdi. Mazkur hududda yuqori texnologiyali ishlab chiqarish korxonalari, elektrotexnika, kimyo va qurilish materiallari sanoati rivojlanmoqda. Transport-logistika infratuzilmasi, jumladan, xalqaro aeroport va temir yo‘l tarmoqlarining mavjudligi investitsion jozibadorlikni oshiradi.

Sanoat bilan bir qatorda, viloyatda turizmni rivojlantirish uchun ham muhim resurslar mavjud. Sarmishsoy dasaridagi qadimiy petrogliflar Markaziy Osiyodagi eng yirik tosh suratlar majmualaridan biri hisoblanadi. Nurota tog‘lari hududida ekologik turizmni rivojlantirish imkoniyati yuqori. Aydarko‘l hududi esa rekreatsion turizm, baliqchilik va dam olish maskani sifatida tobora mashhur bo‘lib bormoqda. Turizm sohasini rivojlantirish hudud iqtisodiyotini diversifikatsiya qilish va yangi ish o‘rinlari yaratish imkonini beradi.

Sanoat va turizmni o‘zaro integratsiyalashgan holda rivojlantirish istiqbolli yo‘nalish hisoblanadi. Masalan, sanoat turizmi – yirik kon va ishlab chiqarish korxonalariga ekskursiyalar tashkil etish – hududning innovatsion imijini shakllantirishi mumkin. Shu bilan birga, “yashil iqtisodiyot” tamoyillarini joriy etish, ekologik xavfsizlikni ta’minlash va qayta tiklanuvchi energiya manbalaridan foydalanish barqaror rivojlanishning muhim sharti hisoblanadi.

| №  | Yo‘nalish          | Asosiy resurs yoki obyekt    | Rivojlanish istiqboli                   |
|----|--------------------|------------------------------|-----------------------------------------|
| 1. | Konchilik          | Oltin, uran, fosforit        | Yuqori eksport salohiyati               |
| 2. | Kimyo sanoati      | Mineral o‘g‘itlar            | Qayta ishlashni kengaytirish            |
| 3. | Energetika         | Issiqlik elektr stansiyalari | Modernizatsiya zarur                    |
| 4. | Ekoturizm          | Nurota tog‘lari              | Turizm klasteri yaratish                |
| 5. | Arxeologik turizm  | Sarmishsoy                   | Xalqaro miqyosda targ‘ibot              |
| 6. | Rekreatsion turizm | Aydarko‘l                    | Dam olish infratuzilmasini kengaytirish |

**1-jadval. Navoiy viloyatining sanoat va turizm salohiyati ko‘rsatkichlari.**

Navoiy viloyatining sanoat salohiyati, avvalo, uning boy mineral-xomashyo resurslari bilan bevosita bog‘liqdir. Viloyat hududida oltin, uran, fosforit, marmar, granit kabi foydali qazilmalarning katta zaxiralari mavjud. Ayniqsa, Muruntov oltin koni dunyodagi eng yirik oltin konlaridan biri hisoblanib, mamlakatning eksport salohiyatini oshirishda muhim rol o‘ynaydi. Navoiy kon-metallurgiya kombinati faoliyati viloyat sanoatining tayanch tarmog‘i bo‘lib, yuqori qo‘shilgan qiymatga ega mahsulotlar ishlab chiqarishga xizmat qilmoqda.

Viloyatda kimyo sanoati ham jadal rivojlanib bormoqda. “Navoiyazot” aksiyadorlik jamiyati mineral o‘g‘itlar, kimyoviy mahsulotlar ishlab chiqarish orqali qishloq xo‘jaligi va boshqa tarmoqlarning rivojlanishiga sezilarli hissa qo‘shmoqda. Energetika sohasi ham sanoat rivojida muhim o‘rin egallaydi. Issiqlik elektr stansiyalari va qayta tiklanuvchi energiya manbalariga asoslangan loyihalar viloyatning energetik mustaqilligini mustahkamlashga xizmat qilmoqda.

Sanoat zonalarining tashkil etilishi va erkin iqtisodiy hududlarning faoliyati Navoiy viloyatida investitsiya muhitini yaxshilashga ijobiy ta’sir ko‘rsatmoqda. Navoiy erkin iqtisodiy zonasi xorijiy investitsiyalarni jalb etish, eksportbop mahsulotlar ishlab chiqarish hamda yangi ish o‘rinlari yaratishda muhim ahamiyat kasb etmoqda. Zamonaviy logistika markazlari va transport infratuzilmasining rivojlanishi viloyat sanoatini ichki va tashqi bozorlar bilan bog‘lash imkonini bermoqda.



*2-rasm. Navoiy erkin iqtisodiy zonasi*

Turizm sohasiga to'xtaladigan bo'lsak, Navoiy viloyati katta, ammo to'liq foydalanilmagan turizm salohiyatiga ega. Viloyat hududida joylashgan Sarmishsoy darasi, qadimiy qoya rasmlari, tarixiy-me'moriy yodgorliklar madaniy va tarixiy turizmni rivojlantirish uchun muhim resurs hisoblanadi. Shuningdek, cho'l landshaftlari, noyob flora va fauna vakillari ekologik va ekstremal turizm yo'nalishlarini rivojlantirish uchun qulay sharoit yaratadi.

Navoiy viloyatida turizmni rivojlantirishda infratuzilma masalasi alohida ahamiyatga ega. Mehmonxonalar, transport xizmatlari, turistik marshrutlar va servis sifatini oshirish turizm oqimini ko'paytirishga xizmat qiladi. Mahalliy aholini turizm jarayonlariga jalb etish, milliy hunarmandchilik va an'anaviy madaniyatni targ'ib qilish hududning turistik jozibadorligini yanada oshiradi.

Sanoat va turizmni uyg'un rivojlantirish Navoiy viloyatining barqaror ijtimoiy-iqtisodiy rivojlanishini ta'minlashda muhim strategik yo'nalish hisoblanadi. Masalan, sanoat turizmini rivojlantirish orqali yirik sanoat korxonalari faoliyati bilan tanishtirish, ekologik standartlarga rioya etilgan holda ochiq tashrif dasturlarini tashkil etish mumkin. Bu nafaqat turizm daromadlarini oshiradi, balki hududning imijini mustahkamlaydi.

Istiqbolli strategiyalar qatoriga innovatsion texnologiyalarni joriy etish, raqamli iqtisodiyot elementlarini sanoat va turizm sohalariga tatbiq etish, ekologik barqarorlikni ta'minlash ham kiradi. Xususan, "yashil iqtisodiyot" tamoyillariga asoslangan ishlab chiqarish va ekologik turizmni rivojlantirish viloyatning uzoq muddatli rivojlanish strategiyasida muhim o'rin tutadi.

### **Xulosa**

O'tkazilgan tahlillar shuni ko'rsatadiki, Navoiy viloyati O'zbekiston Respublikasining eng muhim sanoat hududlaridan biri bo'lib, uning iqtisodiy salohiyati asosan boy mineral-xomashyo resurslari, yirik sanoat korxonalari hamda qulay geografik joylashuvi bilan belgilanadi. Tog'-kon sanoati, rangli metallurgiya,

kimyo va energetika tarmoqlarining rivojlanganligi viloyatni respublika miqyosida yetakchi ishlab chiqarish markaziga aylantirgan. Bu tarmoqlar hududning eksport salohiyatini oshirish, sanoat mahsulotlari hajmini ko'paytirish hamda aholi bandligini ta'minlashda muhim rol o'ynamoqda.

Shu bilan birga, Navoiy viloyati turizmni rivojlantirish uchun katta, ammo hozircha to'liq ishga solinmagan imkoniyatlarga ega. Tarixiy-madaniy yodgorliklar, arxeologik ob'ektlar, ekologik jihatdan noyob hududlar va cho'l landshaftlari viloyatda turizmning turli yo'nalishlarini shakllantirish imkonini beradi. Biroq turizm infratuzilmasining yetarli darajada rivojlanmaganligi, xizmatlar sifati va marketing faoliyatining sustligi bu sohaning rivojlanish sur'atlarini cheklab kelmoqda.

Tadqiqot natijalari shuni ko'rsatadiki, sanoat va turizm tarmoqlarini alohida-alohida emas, balki o'zaro integratsiyalashgan holda rivojlantirish hududning barqaror ijtimoiy-iqtisodiy rivojlanishini ta'minlashda samaraliroq hisoblanadi. Sanoat turizmini rivojlantirish, yirik sanoat korxonalari faoliyatini ekologik talablar asosida turistik obyekt sifatida namoyish etish, shuningdek, sanoat infratuzilmasi va xizmatlar sohasini uyg'unlashtirish Navoiy viloyatining raqobatbardoshligini oshiradi.

Umuman olganda, Navoiy viloyatining sanoat va turizm salohiyatidan oqilona foydalanish, innovatsion va ekologik barqaror rivojlanish tamoyillariga asoslangan strategiyalarni amalga oshirish orqali hududning iqtisodiy o'sishi, aholi turmush darajasi va hududiy imijining yaxshilanishiga erishish mumkin.

### **Takliflar**

Navoiy viloyatining sanoat va turizm salohiyatini yanada samarali rivojlantirish maqsadida quyidagi amaliy takliflarni ilgari surish mumkin:

Birinchidan, sanoat tarmoqlarini modernizatsiya qilish va innovatsion texnologiyalarni keng joriy etish zarur. Tog'-kon va kimyo sanoatida energiya tejamkor, ekologik xavfsiz texnologiyalardan foydalanish ishlab chiqarish samaradorligini oshirish bilan birga atrof-muhitga salbiy ta'sirni kamaytiradi. Bu esa viloyatda ekologik barqarorlikni ta'minlashga xizmat qiladi.

Ikkinchidan, sanoat turizmini rivojlantirishga alohida e'tibor qaratish lozim. Yirik sanoat korxonalari huzurida maxsus ekskursiya yo'nalishlari, muzeylar va axborot markazlarini tashkil etish orqali mahalliy va xorijiy turistlar uchun yangi turistik mahsulotlar yaratish mumkin. Bu nafaqat turizm daromadlarini oshiradi, balki yosh avlodda sanoat va texnikaga bo'lgan qiziqishni kuchaytiradi.

Uchinchidan, turizm infratuzilmasini rivojlantirish masalasiga kompleks yondashuv talab etiladi. Zamonaviy mehmonxonalar, transport va yo'l infratuzilmasi, xizmatlar sifati hamda turistik servislarni yaxshilash orqali viloyatning turistik jozibadorligini oshirish mumkin. Ayniqsa, Sarmishsoy va boshqa tarixiy hududlarda ekologik talablarga mos infratuzilma yaratish muhim ahamiyatga ega.

To'rtinchidan, mahalliy aholini turizm va xizmatlar sohasiga keng jalb etish zarur. Hunarmandchilik, milliy taomlar, an'anaviy madaniyatni rivojlantirish orqali ichki turizmni qo'llab-quvvatlash va yangi ish o'rinlarini yaratish mumkin. Bu esa

aholi daromadlarini oshirish va ijtimoiy barqarorlikni mustahkamlashga xizmat qiladi.

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## **CARTOGRAPHIC ILLUSTRATION OF ENERGY SOURCES**

**Abstract.** *This article analyzes the average daily and annual solar radiation on the horizontal surface of Uzbekistan's territory. The technical potential and geographical distribution of wind energy resources in Uzbekistan have also been examined. A digital map has been created using a geospatial database. The methodology for developing alternative energy resource maps has been improved based on international experience and national research efforts. Furthermore, geodetic studies of energy facilities have been conducted.*

**Key words:** *database, electronic map, alternative energy, topographic survey, GPS device, CredoCAD software, AutoCAD software.*

The initial stage of utilizing alternative energy resources at the national and local levels is closely related to the development of its geographic, cartographic, and geodetic foundations. This is due to the territorial, periodic, complex, and systemic characteristics of wind, solar, bio, and hydro resources. For example, while solar energy is widely used in Southern Europe, wind energy is more characteristic of Northern Europe. In Uzbekistan, with nearly 300–320 sunny days per year, solar energy is a primary resource. According to specialists at the Institute of Physics-Solar under the Academy of Sciences of Uzbekistan, the total potential of solar energy is 51 billion tons of oil equivalent (toe), while the technical potential is 177 million toe. However, the distribution of solar radiation across different surfaces varies depending on local conditions. Therefore, studying the geographic characteristics of alternative energy resources and developing their cartographic and geodetic foundations is of great importance.



A map was developed using data from the Global Solar Atlas (GSA) project, compiled by the World Bank. A map was developed using data from the Global Solar Atlas (GSA) project, compiled by the World Bank. The map is based on the database of average daily and annual solar radiation on Uzbekistan's horizontal surface from 1999 to 2018. The map data were obtained from satellite images with 15- and 30-minute intervals, while the terrain surface was provided with a nominal spatial accuracy of 250 meters. Due to the lack of highly accurate geodetic instruments, the data were modeled, with an error range of 8% to 61% (Figure 1).

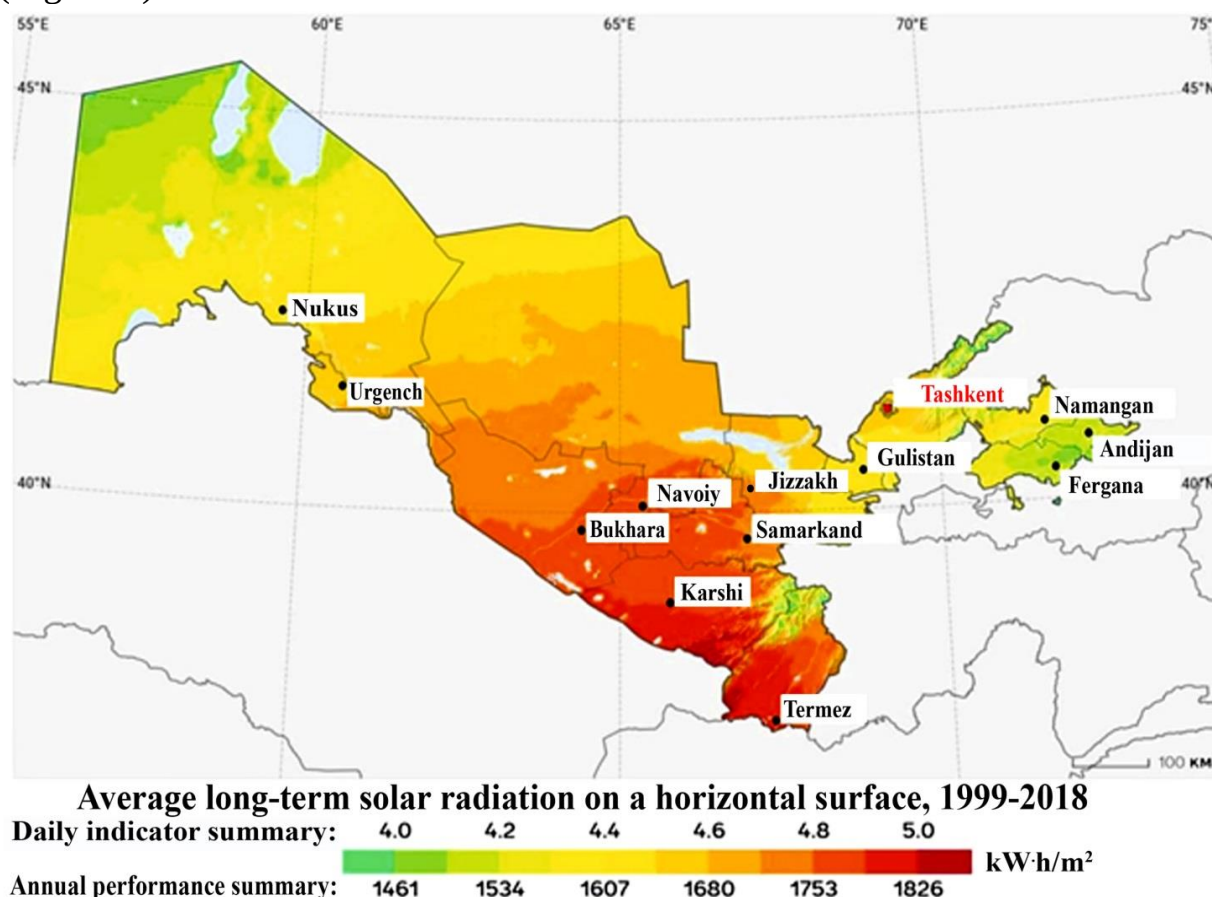


**Figure 1. Average daily and annual solar radiation on the surface of Uzbekistan, kWh/m<sup>2</sup>**

The analysis of the map reveals that in Kashkadarya and Surkhandarya regions, the daily solar radiation on the Earth's surface ranges between 4.8 – 5.3 kWh/m<sup>2</sup>, while in the northern Ustyurt, Kyzylkum, and Aral Sea regions, it decreases to 4.0 kWh/m<sup>2</sup> or lower. The annual solar radiation values follow a geographical gradient from 1,400 to 1,830 kWh/m<sup>2</sup> toward the north. Such variability corresponds not only to zonal, but also to the laws of zoning of solar radiation in altitude regions.

To reduce electricity and natural gas consumption for social purposes, it is planned to implement solar photovoltaic stations with a daily capacity of 54.3

kcal and a total capacity of 1.5 MW. Additionally, solar collectors with a daily capacity of 1.3 Gcal will be introduced for hot water supply and heating in social facilities.

The technical potential of wind energy resources in Uzbekistan exceeds 1 million GWh, with an installed capacity of approximately 520 MW. However, their geographical distribution varies significantly (Figure 2).

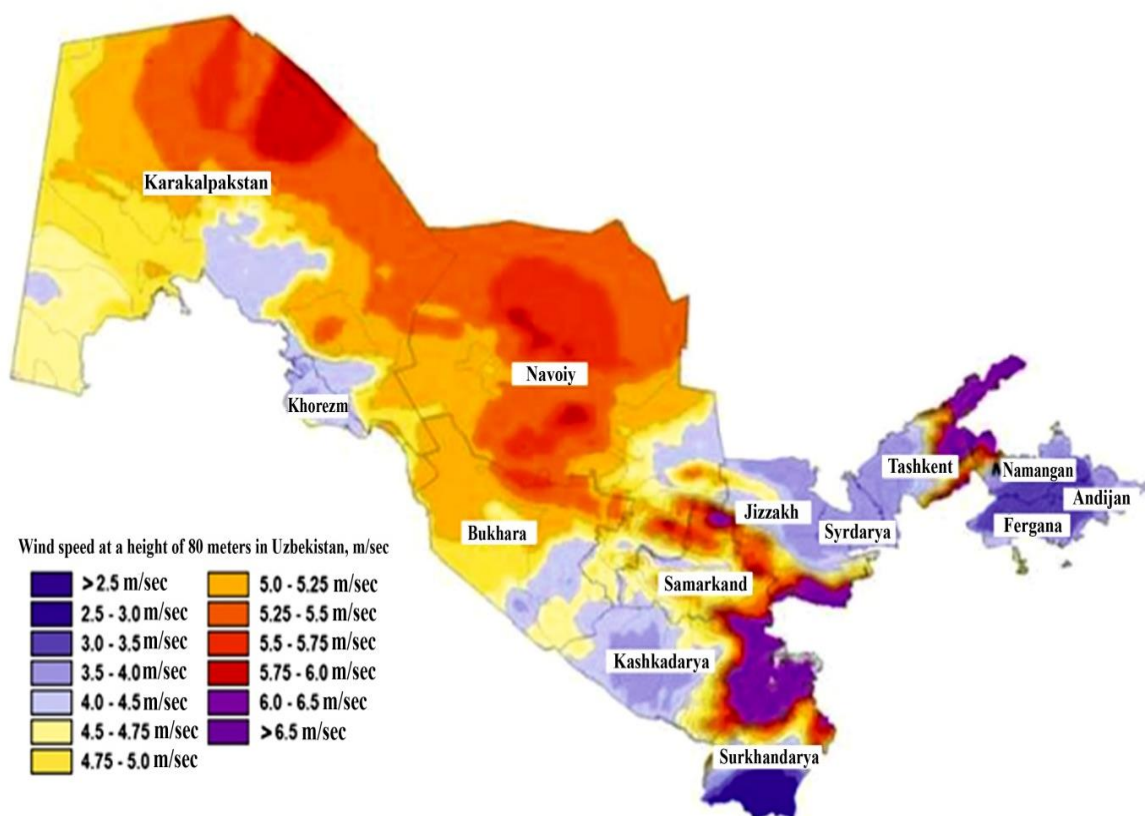


**Figure 2. Wind speed at a height of 80 meters in Uzbekistan, m/s.**

Unlike solar radiation intensity, wind energy is stronger at 80 meters altitude in northern regions and high-mountain areas, with speeds ranging from 5.5 m/s to over 6.5 m/s. Exceptions include the Bekabad-Khavos zone in Syrdarya, the Kokand-Yazyavan zone in the Fergana Valley, and the southern Surkhandarya region, where “Afghan winds” are prevalent.

To replace thermal power plants (TPPs) with renewable energy sources, the construction of wind power stations with capacities exceeding 100 MW is recommended, particularly to supply energy to social facilities in remote areas.

Between 2017 and 2019, the development of biogas energy in Uzbekistan focused on 726 large poultry and livestock farms, where biogas installations were introduced. The share of such facilities increased from 0.7% in 2017 to 11.2% in 2019, allowing for the annual production of up to 60.8 million m<sup>3</sup> of biogas. Additionally, 170,000 tons of eco-friendly organic fertilizers (in dry weight) were produced for use in farming.

The methodology for creating alternative energy resource maps is based on a five-stage process (Figure 3).

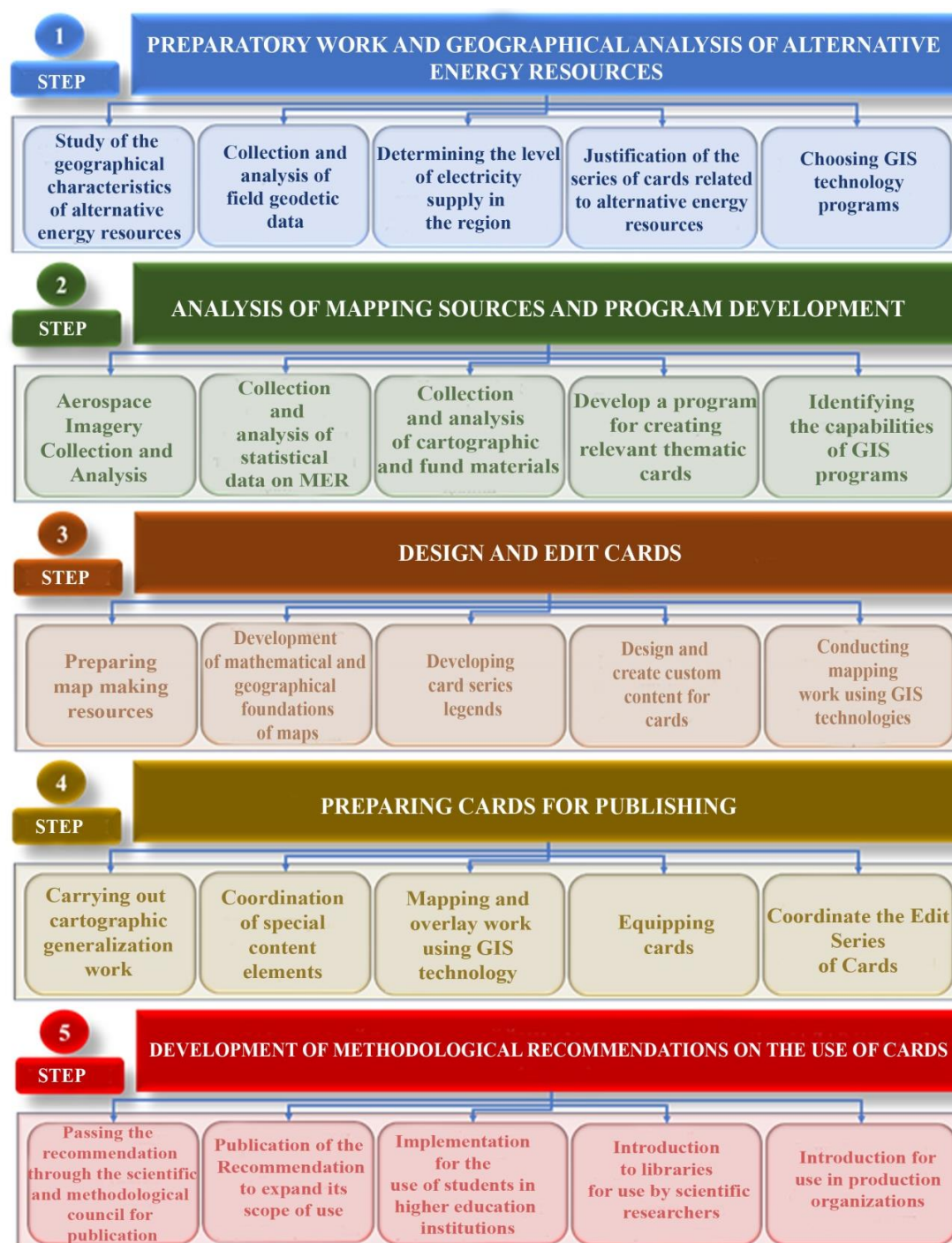


**Figure 3. Methodology for creating maps of alternative energy resources**

Data Collection and Analysis - the first stage involves gathering, analyzing, and classifying data to reveal the geographical distribution characteristics of alternative energy resources. This is followed by field geodetic data collection and analysis. The study assesses the electricity supply status of

the research areas and selects GIS software based on the justification of alternative energy resource maps.

**Cartographic Data Processing** – This second stage includes the collection and analysis of aerospace images, preparation of geographic foundations, and statistical and cartographic data analysis. Thematic map creation software is developed, and the capabilities of GIS software such as ArcGIS, AutoCAD, and MapInfo are determined.

**Thematic Map Creation** – The third stage focuses on the design, compilation, and editing of thematic maps for alternative energy resources. This includes gathering map sources, developing mathematical and geographic foundations, and defining map legends. Thematic content is designed, and maps are created using GIS technologies.

**Map Finalization and Publication** – At fourth stage, cartographic generalization is performed, content elements are refined, and the maps are created using GIS technologies. The series of maps is edited and formatted for publication.

**Methodological Guidelines for Usage** – In the final fifth stage, guidelines for the practical use of the developed maps are prepared and distributed in an illustrative manner, following a specific sequence and detailed instructions.

After determining the patterns of territorial location of alternative energy sources using appropriate maps, a sequence of geodetic works, i.e. methodology, for surveying and construction of each selected facility is developed. These geodetic works will be carried out in 3 stages. In the first desk phase, data on alternative energy resource sites (Figure 4) will be collected, surveyed and a large-scale topographic base will be created. Then, geologic and lithologic surveys and studies were conducted on the geologic and lithologic base of the site where the energy facilities will be located.

Depending on the size of the plant to be constructed, a cross section of its deep layers is made and the mechanical stability of the rocks is determined. Geodetic surveys of energy facilities are carried out and methods of surveying for alternative energy sources are determined. Based on the results of the preparation, GIS Technologies was selected to carry out geodetic works.



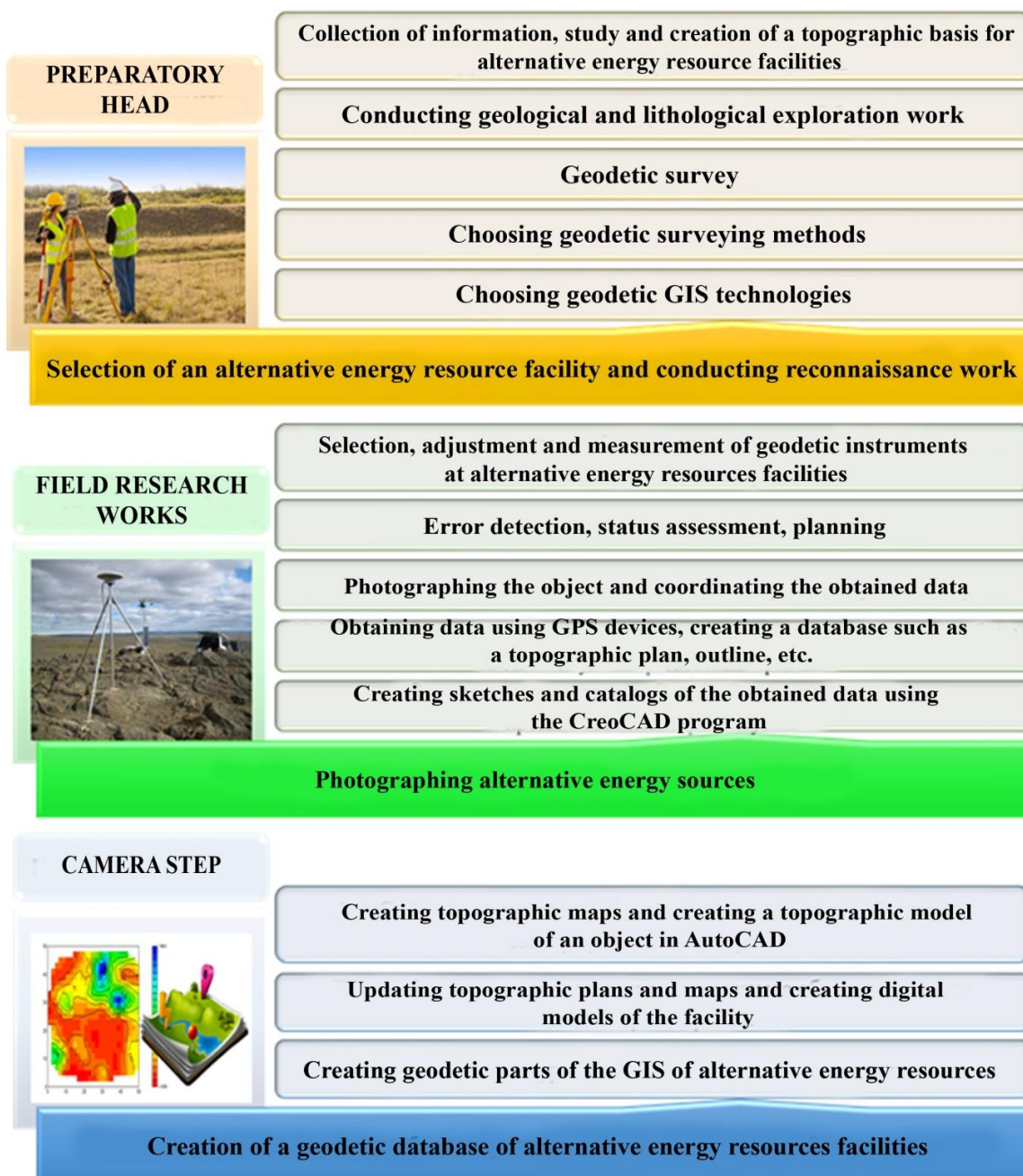


**Figure 4. Methodology for conducting geodetic surveying work in the construction of alternative energy resources**

After the preparatory stage is completed, field surveys are conducted, geodetic instruments are selected, set up and measurements are taken to accurately record the data required for measurements and design of alternative energy source stations at construction sites. Possible errors in surveying are identified and the real situation is assessed. The selected object is photographed and the obtained data are aligned according to a single criterion. Additional data are obtained using GPS devices, a large-scale topographic map of the area is made, and a database is created. Based on the obtained information, schemes and catalogs were created using CredoCAD program.

After completion of field work, large-scale topographic maps were created in camera using AutoCAD program and a topographic model of the selected object was created. By generalizing and coordinating the data, the previously made topographic plans and maps were updated, digital models of the object and geodetic basis of the geoinformation system of alternative energy resources were created.

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## **RAQAMLI TA'LIM MUHITI VA UMUMKASBIY FANLARNI O'QITISH METODIKASINING NAZARIY ASOSLARI**

**Annotatsiya:** Mazkur maqolada raqamli ta'lim muhitining mohiyati, tuzilmasi va funksional xususiyatlari hamda umumkasbiy fanlarni o'qitish metodikasini takomillashtirishdagi nazariy asoslari ilmiy jihatdan tahlil qilinadi. Tadqiqotda raqamli pedagogika, kompetensiyaviy yondashuv, tizimli va integrativ metodologiyalar asosida ta'lim jarayonini tashkil etish masalalari yoritilgan. Shuningdek, raqamli texnologiyalarning umumkasbiy fanlar mazmuni, o'qitish shakllari va baholash mexanizmlariga ta'siri ilmiy jihatdan asoslab berilgan.

**Kalit so'zlar:** raqamli ta'lim muhiti, umumkasbiy fanlar, pedagogik metodika, kompetensiyaviy yondashuv, raqamli pedagogika, ta'lim texnologiyalari.

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## **THEORETICAL FOUNDATIONS OF A DIGITAL EDUCATIONAL ENVIRONMENT AND METHODOLOGY FOR TEACHING PROFESSIONAL SUBJECTS**

**Abstract:** This article provides a scientific analysis of the essence, structure, and functional characteristics of a digital educational environment, as well as the theoretical foundations for improving teaching methods for professional subjects. It examines the organization of the educational process based on digital pedagogy, a competency-based approach, and systematic and integrative methods. The impact of digital technologies on the content, forms of instruction, and assessment mechanisms for professional subjects is also scientifically substantiated.

**Keywords:** digital educational environment, professional subjects, pedagogical methods, competency-based approach, digital pedagogy, educational technologies.

**Kirish.** XXI asrda jamiyatning barcha sohalarida kechayotgan raqamli transformatsiya jarayonlari ta'lim tizimiga ham tub o'zgarishlar olib kirmoqda. Axborot-kommunikatsiya texnologiyalarining jadal rivojlanishi natijasida ta'lim jarayonining mazmuni, shakli va metodlari qayta ko'rib chiqilmoqda. An'anaviy ta'lim modeli o'rnini bosqichma-bosqich raqamli ta'lim muhiti asosidagi moslashuvchan, ochiq va interaktiv o'qitish tizimi egallamoqda.

Raqamli ta'lim muhiti nafaqat texnologik infratuzilma, balki pedagogik, metodik va psixologik omillar majmuasidan iborat murakkab tizim hisoblanadi. Ushbu muhitda umumkasbiy fanlarni o'qitish metodikasini zamonaviy talablar asosida tashkil etish, talabalarda kasbiy kompetensiyalarni shakllantirish muhim ilmiy-amaliy vazifalardan biridir [1].

Umumkasbiy fanlar oliy ta'lim tizimida talabalarning kasbiy tayyorgarligini ta'minlovchi, nazariy bilimlarni amaliy faoliyat bilan integratsiyalovchi fanlar guruhi hisoblanadi. Shu sababli ularni o'qitishda raqamli ta'lim muhitining didaktik imkoniyatlaridan samarali foydalanish dolzarb ahamiyat kasb etadi.

Mazkur maqolada raqamli ta'lim muhiti sharoitida umumkasbiy fanlarni o'qitish metodikasining nazariy asoslarini ilmiy jihatdan tahlil qilish va tizimlashtirishdan iborat [2].

Adabiyotlar tahlili. Zamonaviy pedagogika va ta'lim nazariyasida raqamli ta'lim muhiti masalasi keng qamrovli ilmiy tadqiqot obyekti sifatida qaralmoqda. Ilmiy manbalarning tahlili shuni ko'rsatadiki, raqamli ta'lim muhiti nafaqat texnologik infratuzilma, balki didaktik, metodik va psixologik komponentlarning integratsiyasiga asoslangan murakkab pedagogik tizim hisoblanadi. Tadqiqotchilarning fikricha, raqamli ta'lim muhitining samaradorligi uning pedagogik maqsadlar bilan uyg'unlashuv darajasiga bevosita bog'liq (Bates, 2019) [3].

Bir qator ilmiy ishlarda raqamli ta'lim muhiti ta'lim jarayonini tashkil etish, boshqarish va baholashni avtomatlashtirish orqali o'quv faoliyati samaradorligini oshiruvchi muhim omil sifatida talqin etiladi. Masalan, Anderson (2018) raqamli ta'lim muhitida interaktivlik va moslashuvchanlik o'quvchilarning bilimlarni chuqurroq o'zlashtirishiga xizmat qilishini ta'kidlaydi. Ushbu yondashuv mazkur tadqiqotdagi birinchi ilmiy faraz — raqamli ta'lim muhiti ta'lim sifati va natijadorligiga ijobiy ta'sir ko'rsatadi — bilan to'liq uyg'unlashadi [4].

Umumkasbiy fanlarni o'qitish metodikasiga oid ilmiy adabiyotlar tahlili shuni ko'rsatadiki, kompetensiyaviy yondashuv ushbu fanlarning mazmunini kasbiy faoliyat bilan bog'lashda yetakchi metodologik asos hisoblanadi. Xususan, Mulder (2017) kompetensiyaga asoslangan ta'lim modeli talabalarda nazariy bilimlar bilan bir qatorda amaliy ko'nikmalarni ham shakllantirishga xizmat qilishini ilmiy asoslab bergan. Raqamli ta'lim muhiti bu jarayonni qo'llab-quvvatlovchi qulay didaktik sharoitlarni yaratadi, bu esa ikkinchi ilmiy farazning nazariy asoslanganligini tasdiqlaydi [5].

Konstruktivistik ta'lim nazariyasiga oid tadqiqotlarda (Jonassen, 2015) bilimlar tayyor shaklda berilmasligi, balki talabaning faol bilish jarayonida shakllanishi lozimligi ta'kidlanadi. Raqamli ta'lim muhitida muammoli vaziyatlar, loyihaviy topshiriqlar va virtual laboratoriyalar orqali talabalarning mustaqil fikrlashi va kasbiy muammolarni hal qilish qobiliyatlari rivojlantiriladi. Bu esa umumkasbiy fanlarni o'qitishda faoliyatga yo'naltirilgan va muammoli ta'lim texnologiyalarining ustuvor ahamiyatga ega ekanligini ko'rsatadi [6].

O'qituvchining raqamli ta'lim muhitidagi roli masalasiga bag'ishlangan adabiyotlar tahlili ham muhim ilmiy xulosalarni beradi. Mishra va Koehler (2006)

tomonidan ishlab chiqilgan TPACK modeli o'qituvchining texnologik, pedagogik va predmet bilimlarini integratsiyalash zarurligini asoslaydi. Ushbu yondashuv mazkur tadqiqotdagi uchinchi ilmiy faraz — o'qituvchi rolining transformatsiyasi — uchun nazariy asos bo'lib xizmat qiladi [6].

Baholash va monitoring masalalariga oid tadqiqotlarda raqamli texnologiyalar ta'lim jarayonining shaffofligi va obyektivligini ta'minlovchi vosita sifatida talqin etiladi. Redecker (2017) raqamli baholash tizimlari individual o'quv trayektoriyalarini shakllantirishga xizmat qilishini ta'kidlaydi. Bu holat to'rtinchi ilmiy faraz — baholash jarayonining obyektivligi va shaffofligi — ni ilmiy jihatdan asoslaydi [7].

Shunday qilib, adabiyotlar tahlili shuni ko'rsatadiki, raqamli ta'lim muhiti va umumkasbiy fanlarni o'qitish metodikasi masalasi bo'yicha olib borilgan ilmiy tadqiqotlar mazkur ishda ilgari surilgan ilmiy farazlarning dolzarbligi va nazariy asoslanganligini tasdiqlaydi. Raqamli pedagogika sharoitida umumkasbiy fanlarni o'qitish metodikasini takomillashtirish ta'lim sifatini oshirishga xizmat qiluvchi muhim ilmiy-amaliy yo'nalish hisoblanadi.

### **Tadqiqot metodologiyasi.**

Tadqiqot jarayonida quyidagi ilmiy metodlardan foydalanildi:

➤ Nazariy tahlil metodi — raqamli ta'lim muhiti va pedagogik metodikaga oid ilmiy manbalarni o'rganish;

➤ Tizimli yondashuv — ta'lim jarayonini yaxlit pedagogik tizim sifatida tahlil qilish;

➤ Kompetensiyaviy yondashuv — umumkasbiy fanlar mazmunini kasbiy kompetensiyalar bilan bog'lash;

➤ Taqqoslash metodi — an'anaviy va raqamli ta'lim metodlarini solishtirish;

➤ Pedagogik modellashtirish — raqamli ta'lim muhitida o'qitish metodikasining nazariy modelini ishlab chiqish.

Mazkur metodlar yordamida raqamli ta'lim muhitining nazariy asoslari va uning umumkasbiy fanlarni o'qitish metodikasiga ta'siri ilmiy asosda yoritildi.

### **Natijalar.**

Raqamli ta'lim muhiti — bu o'quv jarayonini tashkil etish, boshqarish va baholashni raqamli texnologiyalar asosida amalga oshirishga mo'ljallangan integratsiyalashgan pedagogik tizimdir. U quyidagi asosiy komponentlardan iborat:

❖ texnologik infratuzilma (platformalar, dasturiy vositalar);

❖ axborot-resurs bazasi;

❖ pedagogik metodlar va didaktik vositalar;

❖ o'qituvchi va talaba o'rtasidagi interaktiv muloqot mexanizmlari.

Mazkur komponentlarning o'zaro uyg'unligi ta'lim jarayonining samaradorligini belgilaydi.

Raqamli ta'lim muhiti umumkasbiy fanlarni o'qitishda quyidagi didaktik imkoniyatlarni yaratadi:

➤ ta'lim mazmunini vizuallashtirish;

➤ mustaqil ta'lim faoliyatini faollashtirish;

➤ individual o'quv trayektoriyalarini shakllantirish;

- nazariy bilimlarni amaliy mashg'ulotlar bilan integratsiyalash;
- baholash jarayonini avtomatlashtirish.

Natijada talabalarning kasbiy tayyorgarlik darajasi va o'quv motivatsiyasi oshadi.

Raqamli ta'lim muhitida umumkasbiy fanlarni o'qitish metodikasi quyidagi nazariy asoslarga tayanadi:

- ✓ konstruktivistik ta'lim nazariyasi;
- ✓ faoliyatga yo'naltirilgan yondashuv;
- ✓ muammoli va loyihaviy ta'lim texnologiyalari;
- ✓ refleksiv va interaktiv o'qitish metodlari.

Ushbu yondashuvlar talabalarda kasbiy fikrlash, muammo yechish va mustaqil qaror qabul qilish ko'nikmalarini rivojlantiradi [8, 9].

**Muhokama.** O'tkazilgan nazariy tahlil shuni ko'rsatadiki, raqamli ta'lim muhiti umumkasbiy fanlarni o'qitish metodikasini sifat jihatidan yangi bosqichga olib chiqadi. Biroq raqamli texnologiyalarni joriy etish jarayoni faqat texnik vositalar bilan cheklanmasligi, balki pedagogik maqsad va metodlar bilan uzviy bog'liq holda amalga oshirilishi zarur. Raqamli muhitda o'qituvchi roli ham o'zgarib, u bilim manbaidan ko'ra, ta'lim jarayonini boshqaruvchi va yo'naltiruvchi subyektga aylanadi. Bu esa o'qituvchilarning raqamli pedagogik kompetensiyalarini rivojlantirishni talab etadi. Shuningdek, raqamli ta'lim muhitida umumkasbiy fanlarni o'qitishda metodik ta'minot, elektron o'quv resurslari va baholash mezonlarini takomillashtirish muhim ahamiyatga ega [10, 11].

**Xulosa.** Xulosa qilib aytganda, raqamli ta'lim muhiti umumkasbiy fanlarni o'qitish metodikasini rivojlantirishda strategik ahamiyatga ega bo'lgan pedagogik tizim sifatida namoyon bo'ladi. Ilmiy tadqiqotlar va nazariy tahlillar shuni ko'rsatadiki, agar ta'lim jarayoni raqamli texnologiyalar, pedagogik metodlar va didaktik tamoyillarning uzviy integratsiyasi asosida tashkil etilsa, umumkasbiy fanlarni o'zlashtirish samaradorligi sezilarli darajada oshadi. Ushbu holat birinchi ilmiy faraz sifatida qaralib, raqamli ta'lim muhitining ta'lim sifati va natijadorligiga ijobiy ta'sirini asoslaydi.

Ikkinchi ilmiy farazga ko'ra, raqamli ta'lim muhiti sharoitida umumkasbiy fanlarni o'qitishda kompetensiyaviy yondashuvga asoslangan metodikaning qo'llanilishi talabalarda kasbiy bilim, ko'nikma va malakalarni tizimli ravishda shakllantirishga xizmat qiladi. Raqamli platformalar, interaktiv o'quv resurslari va virtual amaliy mashg'ulotlar yordamida nazariy bilimlar amaliy faoliyat bilan uyg'unlashadi, bu esa talabalarning kasbiy tayyorgarlik darajasini oshiradi hamda ularni mehnat bozorining zamonaviy talablariga moslashuvchan mutaxassis sifatida shakllantiradi.

Uchinchi ilmiy faraz shundan iboratki, raqamli pedagogika sharoitida umumkasbiy fanlarni o'qitish metodikasini takomillashtirish o'qituvchining pedagogik rolini sifat jihatidan o'zgartiradi. O'qituvchi bilim manbai sifatidagi an'anaviy funksiyadan voz kechib, ta'lim jarayonini loyihalovchi, boshqaruvchi va refleksiv faoliyatni tashkil etuvchi subyektga aylanadi. Bu esa o'qituvchilardan

yuqori darajadagi raqamli va metodik kompetensiyalarni talab etib, ta'lim tizimida uzluksiz kasbiy rivojlanish zaruratini yuzaga keltiradi.

To'rtinchi ilmiy farazga muvofiq, raqamli ta'lim muhiti asosida umumkasbiy fanlarni o'qitish metodikasini joriy etish ta'lim jarayonining shaffofligi va baholashning obyektivligini ta'minlaydi. Raqamli monitoring, avtomatlashtirilgan baholash va o'quv faoliyati natijalarini tahlil qilish imkoniyatlari talabalarning o'zlashtirish darajasini aniq aniqlash hamda individual o'quv trayektoriyalarini shakllantirishga xizmat qiladi.

Umuman olganda, mazkur maqolada asoslab berilgan nazariy qoidalar va ilmiy farazlar raqamli ta'lim muhiti sharoitida umumkasbiy fanlarni o'qitish metodikasini takomillashtirishning ilmiy-metodik asoslarini belgilaydi. Ushbu yondashuv ta'lim jarayonining samaradorligini oshirish, kasbiy kompetensiyalarni barqaror shakllantirish hamda ta'lim sifatini ta'minlashda muhim ilmiy-amaliy ahamiyatga ega bo'lib, raqamli pedagogika rivojiga xizmat qiladi.

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## DRAMALARNING SAHNA TALQINIDAGI FOLKLORIZMLAR LINGVOTRANSFORMATSIYASI

**Annotatsiya.** Folklorizm lingvopoetik tadqiqotlarda badiiy matn tarkibiga kiritilgan xalq og'zaki ijodiga xos barqaror va yaxlit birliklarni anglatadi. Ushbu birliklar matnda milliy-madaniy kodni aktuallashtirish, jonli nutq koloritini yaratish, ekspressivlikni kuchaytirish va personaj nutqini individuallashtirish vazifasini bajaradi. Qo'shiqlar, laparlar, latifalar, maqol-matallar, aforizmlar hamda an'anaviy o'yin shakllari muayyan badiiy-estetik maqsad asosida qo'llanib, asarning intertekstual tabiatini ta'minlaydi. Maqolada dramatik asarlardagi folklorizmlarning sahna talqinida yuz beradigan transformatsion jarayonlar haqida so'z yuritiladi.

**Kalit so'zlar:** folklorizm, lingvotransformatsiya, dramatik asar, sahna talqini, intertekstuallik.

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## LINGUISTIC TRANSFORMATION OF FOLKLORISMS IN THE STAGE INTERPRETATION OF DRAMAS

**Abstract.** In linguopoetic studies, folklore means stable and integral units inherent in folk oral creativity included in the composition of a literary text. These units perform the function of actualizing the national-cultural code in the text, creating a lively speech color, enhancing expressiveness, and individualizing the character's speech. Songs, rhymes, anecdotes, proverbs, aphorisms, and traditional game forms are used based on a certain artistic and aesthetic goal, ensuring the intertextual nature of the work. The article discusses the transformation processes that occur in the stage interpretation of folklore in dramatic works.

**Keywords:** folklore, linguistic transformation, dramatic work, stage interpretation, intertextuality.

Folklorizm atamasi lingvopoetik tadqiqotlarda, badiiy matnga olib kirilgan xalq og'zaki ijodiga xos yaxlit birliklarga nisbatan ishlatiladi. Folklorizmlar odatda matnga jonli nutqqa xoslikni, ta'kidlash uchun olib kiriladi. Qo'shiq, lapar, latifalar, xalq donoligini ifodalovchi aforizmlar, turli o'yinlar badiiy matnga muayyan

maqsad bilan olib kiriladi va ular asarning intertekstualligini ta'minlashga ham xizmat qiladi. Tilshunos A. Azizova folklorizmlarning adabiyotshunoslik va folklorshunoslik nuqtai nazaridan keng o'rganilganligini aytib o'tadi rus tilshunoslari tomonidan bu masalaning chuqur o'rganilganligini ta'kidlaydi va u quyidagicha yozadi: A.G. Kostina "folklorizm" tushunchasi keng qamrovli ekanligini, folklor matnlarining o'ziga xos folklor formulasi va folkloremadan iborat bo'lishini ta'kidlaydi. A.G. Kostina fikriga ko'ra, folklorema an'anaviy ma'noga ega bo'lgan obrazli, ramziy leksema, ibora (shu jumladan folklor formulasi ham), folklor matnining bir qismi yoki kichik folklor janri matnidan iborat. Bu ma'no matn yaratuvchisining mifologik tafakkuri, marosim yoki ideallashtirilgan folklor voqeligining o'ziga xos xususiyatlari bilan belgilanadi. Folkloremaning asosiy mohiyati shundaki, u ijodkorning dunyoqarashini aks ettiradi va folklorning chuqur ma'nosini ochib beradi. Folklorema maqol yoki matal bilan ifodalanishi mumkin.

Y. Xushvaqto'v qalamiga mansub "Chimildiq" asari boshdan oxiriga qadar folklorizmga xos materiallarga boy. Asar avvalida kelinni o'lan qo'shig'i jo'rligida olib kirishi tasvirlanadi. Sahna talqinida ham mazkur epilog bor, lekin asardagi kabi to'liq shaklda emas, balki bir qismi tushirilib o'rniga yor-yor ohangida takrorlanuvchi aytimlar bilan to'ldirilgan holda ijro etiladi. Ayrim satrlar esa ijroga mos ravishda o'zgartiriladi. Masalan: "*Bodom shoxi singanda- yo, bolam desin yor-yor, bolam desin yor-yor*" satri "*Bodom shoxi qayrilganda, bolam desin yor-yor, bolam desin yor-yor*" tarzida transformatsiya qilingan.

Matnda kuyovnavkarlar doira chalib ijro etadigan "*Yor-yor yoroney*" qo'shig'ining matni asarning sahna talqinida butunlay o'zgartirilgan. Asosiy matnda quyidagi lapar berilgan:

*Beda bersang toyga ber yor-yor yoroney*

*Kasir-kusir chaynasin yor-yor yoroney.*

*qizni bersang yoshga ber yor-yor yoroney,*

*Ishqi bilan o'ynasin yor-yor yoroney.*

Sahna talqinida esa uning o'rniga shu ohangdagi boshqa bir qo'shiq qo'llanilgan. Ijroda mazkur qo'shiqni xalq og'zaki ijodida kengroq tarqalgan, nisbatan aytishga qulay bo'lgan versiyasiga almashtirish maqsad qilingan.

Yana bir o'rinda checha (momo) obrazi tilidan aytiladigan: "*Oftobi anbarim xush keldingiz, Yurtimning sarvari xush keldingiz*" satrlari bilan boshlanuvchi laparda "*yurtimning sarvari*" birikmasi o'rnida "*yigitlarning sardori*" birikmasi qo'llanadi va bu transformatsiyaning "leksik tanlash" tamoyiliga juda mos keladi. Bu transformatsiyada kuyovni "*yurt sarvari*" sifatida baholashdan ko'ra "*yigitlarning sardori*" sifatida baholashning ma'qul va mubolag'asiz bo'lishi sahna ijrochilari tomonidan to'g'ri sezilgan. Mazkur parcha ijrosi oldidan matnda "*Ey to'xtang, voy esim qursin, bu o'ris zamonida urf-odatlarimiz ham esdan chiqib ketyapti. Odatimiz bo'yicha kuyov kelinning qo'lidan ro'molchani olmaguncha o'tirmaydi*" gapi aytilishi kerak. Biroq, birinchi gap, ya'ni "*Ey to'xtang, voy esim qursin, bu o'ris zamonida urf-odatlarimiz ham esdan chiqib ketyapti*" qismi sahna talqinidan tushirilgan. E'tiborga molik joyi shundaki, urf-odatlarining esdan chiqishiga "o'ris

*zamoni*” matnda alohida ta’kidlangan bo’lib, sahnada tilga olinmaydi. Bu esa o’z navbatida, aynan, “*o’ris zamoni*” ta’kidlangani uchun ham tushirilganmidi, degan savolni paydo qiladi.

“Chimildiq” folklor-etnografik dramasida folklorizmlarning turli ko’rinishlari uchraydi. Ular ichida *duo* folklorizmi lingvopoetik jihatdan alohida ahamiyatga ega nutqiy birliklar hisoblanadi. Duolar xalq og’zaki ijodiga xos muayyan qoliplar asosida tuziladigan nutq shaklidir. Duo folklorizmi tuzilish jihatidan ko’p qatlamli bo’lib, an’anaviylik, marosimlarga xoslanganlik, barqarorlik xususiyatlariga ega nutq hisoblanadi. Badiiy matnda qo’llanilganda vazifa jihatidan, jamiyatdagi axloqiy me’yor, kolektiv ong va qadriyatlarga e’tibor qaratish, diniy-ijtimoiy birdamlikni ta’kidlash hamda matnning lingvopoetik qatlamdorligini oshirish maqsad qilingan bo’ladi. “Chimildiq” spektakli tilida ham duolar kommunikativ, ritual-performativ, ijtimoiy-axloqiy funksiyalarda qo’llanilgan bo’lib, lingvopoetik jihatdan alohida tadqiqot olib borishni talab qiladi.

Asardagi checha (momo) nutqida duo folklorizmidan bir necha maqsadlarda foydalanilgan. Bunday ritual nutq semantikasida “ezgu tilaklar tilash”, “ilohiy olam bilan ruhiy aloqa o’rnatish”, “himoya maydonini hosil qilish” kabilar yetakchilik qiladi. Duolar shu kabi ma’nolar asosida shakllanganligi uchun ularning shakliy tuzilishi ham barqaror holga kelgan. Biz tadqiqotimizda lingvotransformatsiyani asos matn va sahna talqini o’rtasidagi aloqadorlik doirasida ko’rib chiqyapmiz. Bu jihatdan qaralganda ham jiddiy transformatsion holatlar majudligi kuzatildi. Masalan, matndagi “Omin, qo’shgani bilan qo’sha qarib, uvali-juvali bo’lishsin” gapi ijroda “Qani iloho omin, qo’shgani bilan qo’sha qarib, uvali juvali, serfarzand serdavlat bo’lishsin, qadamalari tekkan joy gulu nurga to’lsin, rizqlari hamisha butun bo’lsin” tarzida o’zgartirilgan. Semantik jihatdan matndagi duo nutqi saqlangan, struktur jihatdan ham bir qadar saqlangan, biroq og’zaki nutqda faol qo’llanadigan duo qoliplaridan ham erkin foydalanilgan. Natijada duo nutqining musiqiyiligi oshgan, ta’sirchanlik kuchaygan va ijro bilan bog’liq “kommunikativ bo’shliq” o’rni xalqona iboralar bilan to’ldirilgan.

“Chimildiq” asari matnida folklorizmlar ritual-etnografik va ramzlar majmui sifatida namoyon bo’ladi. Shu tarzda asar lingvopoetik tadqiqotlar uchun ahamiyatli manbaga aylangan. Matndagi olqish-duolar, hazil-mutoyibalar, jest-mimikalar, dekoratsiyadagi bezaklar, aktyor va aktrisalarning milliy-marosim liboslari va boshqa omillar lingvopoetik jihatdan tadqiq qilishga arzirli materiallar hisoblanadi. Avvalo, asar nomining o’zi etnografizm sifatida e’tiborni jalb qiladi. Asarning markaziy ob’ekti bo’lgan chimildiqning sahna o’rtasiga o’rnatilishi ham juda muhim yechim sanaladi. U shunchaki bir makonni ifodalovchi unsur emas, balki sakral makon, ya’ni nikohning muqaddas ekanligini ta’kidlash va yangi hayot bosqichiga o’tish ramzi hisoblanadi. Quyidagi parchada ayni ma’no nihoyatda ta’sirchan tarzda ifodalangan:

“- Otam orzu-umidlarimni o’ldirib, chimildiq deb atalmish qafasga tiqib qo’yдилar!

- Hay-hay, chimildiq qafas emas, muqaddas joy, bolam!

- Qafas! Uyga qaytib borib otamning boshini xam qilaman!

- Kapalagimni uchirma, otangning boshini xam qilib, baxtli bo'lolmayсан. Chimildiqqa xiyonat qilib, qochib, armon bilan yurganlar chimildiq ko'rmay, nikohsiz farzand ko'rib, uzoqlarda yurganlarning taqdiriga havas qilma!"

Dialogdan ma'lum bo'ladiki, chimildiq ramziy ma'nolarni o'zida mujassam qilgan ikki qutbli obraz sifatida tasvirlangan. Kelin uchun "qafas, cheklov, jazo" bo'lgan bu makon momo uchun "muqaddas va shu bois muhokama qilish mumkin bo'lmagan kollektiv ong mahsli." Unga xiyonat qilganlar umr bo'yi armon va afsusda hayot kechiradilar. Momo nutqidagi quyidagi jumlar ham chimildiqning muqaddas maskan sifatida talqin qilinganligini dalillaydi: "Xayriyat, muqaddas chimildiqqa, urf-odatimizga xiyonat qilishmadi. Yaratganning buyurgani bilan bino bo'lgan uya buzilmadi."

Asardagi marosimlar ham folklor-etnografik formulalarga boyligi bilan e'tiborni jalb qiladi. Masalan: *"Urf-odatimizni oxirigacha qilaylik. Nonni kelingizning qo'ltig'iga qistirib, suprangizni yoying, qo'lingizda 3 marta olib kelingizga undan tuting. Kelingizning suprasidan don-dun arimasin! Endi bir dona qandni og'zingizda kelingiz kelingizni og'ziga tuting."* Mazkur parchada qaynona-kelinning ilk muloqoti maxsus ritual asosida amalga oshiriladi. Undagi *"Kelingizning suprasidan don-dun arimasin!"* gapi duo-olqish sintaktik formulalariga muvofiq tarzda shakllantirilgan. Shuningdek, *"Turmushlari novvotday shirin bo'lsin. Ilohim rizqli-nasibali bo'lishsin"* olqish-duolari ham semantik jihatdan rizq, baraka va totuvlik konseptlarini ifodalaydi.

*"- Tuflab qo'yinglar, ko'z tegmasin!"*

*- Tuf-tuf, ko'z tegmasin!"*

*- Suqlaringiz ham tegmasin!"*

*- Tuf-tuf, suqumiz ham kirmasin!"*

Ayollar nutqidagi suq-nazar tegmasin mazmunida "tuf-tuf"lash folklor-etnografik formulasi ham "himoya magyasi"ni yaratish, "yomonliklardan muhofaza qilish" maqsadini ifodalovchi verbal-ritual akt hisoblanadi. Bunday vazifaga xoslangan formulalar folklorshunoslikda apotropey (yun. *apotropaio* - "qaytaruvchi", "baloni daf etuvchi") termini bilan izohlanadi. Mazkur ifodalar asarning sahna talqinida ayol aktrisalarning tomonidan mazmuni saqlangan holda shakliy o'zgarishlar bilan ijro etilgan.

Asar yakunida 24 misradan iborat "Kelin salom" matni ham berilgan bo'lib, yakunlovchi funksiyani bajaradi.

*Xashladig-u, xashladik,*

*O'rtaq gilam tashladik.*

*Qabul aylang qudalar,*

*Kelin salomimni boshladik.*

Nikoh marosimi tarkibida aytiladigan, kelinning yangi ijtimoiy maqomga o'tishi, oila a'zolariga ehtirom ko'rsatishi kabi ma'nolarni ifodalovchi mazkur aytim ham sahna talqinida aktrisalarning improvizatsiyasi asosida muayyan transformatsiyalarga uchragan holda ijro etilgan.

Bu holatni asar matniga xiyonat deb baholab bo'lmaydi. Agar tarixiy voqelik qalamga olingan asar bo'lganida edi, matnga sodiq qolishni talab qilish mumkindir.

Biroq, xalqona mavzudagi, folklor-etnografik materiallarga boy asarga aktyorlar ham o'z tajribasi, saviyasi va mahoratiga ko'ra dahl qilishlari mumkin bo'ladi. Bunda sahna ijrosidagi vaqt oralig'ida "kommunikativ bo'shliq" yuzaga kelmasligi, hududiy xosliklarni neytrallashtirish, nutq uslubini asar voqeligiga moslashtirish kabi bir qator omillarga alohida e'tibor beriladi.

"Chimildiq" dramasiidagi folklorizmlar lisoniy jihatdan milliy-madaniy kodni ifodalasa, marosim nuqtayi nazaridan o'tish ritualini, semiotik jihatdan esa taqdir, hayotning davomiyligi, oila, himoya, baraka kabi konseptlar tizimini ramziylik asosida ifodalaydi. Shu bois, mazkur asardagi folklorizmlar oddiy etnografik ma'lumotlar emas, balki asar badiiyatini ta'minlovchi lingvopoetik vositadir.

Xulosa sifatida aytish mumkinki, folklorizm atamasi lingvopoetik tadqiqotlarda badiiy matn tarkibiga kiritilgan xalq og'zaki ijodiga xos barqaror va yaxlit birliklarni izohlash uchun ishlatiladi. Mazkur birliklar matnda milliy-madaniy kodni faollashtirish, jonli nutq koloritini yaratish, ekspressivlikni kuchaytirish va personaj nutqini individuallashtirish vazifasini bajaradi. Qo'shiq, lapar, latifa, maqol-matal, aforizm hamda milliy o'yin shakllari muayyan badiiy-estetik maqsad asosida qo'llanilib, asarning intertekstualligini ta'minlaydi. Shu tarzda folklorizmlar matnning semantik qatlamini boyituvchi va milliy-madaniy xotira bilan bog'lovchi muhim lingvopoetik vosita sifatida namoyon bo'ladi.

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### 3D BIOPRINT TEXNOLOGIYASINING GISTOLOGIYAGA KIRITGAN YANGILIKLARI

**Annotatsiya.** 3D bioprint texnologiyasi gistologiya faniga ham o'z ta'sirini ko'rsatmasdan qolmadi, chunki u hujayra va to'qimalarning murakkab fazoviy tuzilishini an'anaviy ikki o'lchamli preparatlardan farqli ravishda uch o'lchamda yaratish va o'rganish imkonini berdi. Bu innovatsion texnologiya yordamida tirik hujayralar, biomateriallar va biofaol moddalar qatlam-qatlam aniq joylashtirilib, to'qimalarning tabiiy mikromuhitiga yaqin bo'lgan modellari hosil qilinmoqda.

**Kalit so'zlar:** 3D bioprint, Bioprint bosqichlari, Yutuqlar

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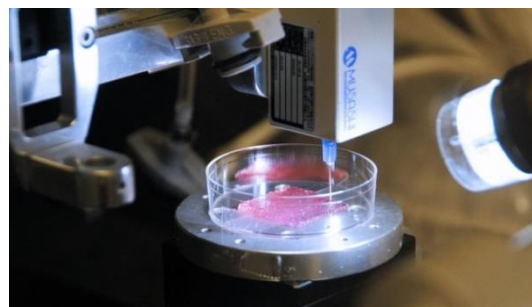
### INNOVATIONS INTRODUCED BY 3D BIOPRINTING TECHNOLOGY INTO HISTOLOGY

**Annotation.** 3D bioprinting technology has significantly influenced the field of histology, as it enables the creation and study of the complex spatial structure of cells and tissues in three dimensions, unlike traditional two-dimensional preparations. Using this innovative technology, living cells, biomaterials, and bioactive substances are precisely arranged layer by layer, resulting in tissue models that closely resemble the natural microenvironment.

**Key words:** 3D bioprinting, stages of bioprinting, achievements.



**Актуальность.** 3D bioprinting texnologiyasi tirik hujayralar va biomateriallar (bioink) yordamida inson to'qimalarini taqlid qiluvchi uch o'lchamli tuzilmalar yaratishga imkon beradi. Hozirda teri, suyak, qon tomirlari, jigar va



1-rasm

a buyrakning soddalashtirilgan modellarini hosil qilish mumkin. Asosan ildiz, fibroblast, epitelial va endotelial

hujayralar jelatin, alginat hamda kollagen bilan birgalikda qo'llaniladi.

To'liq funksional organlar hali klinik transplantatsiyaga tayyor emas, biroq texnologiya gistologiya, dori sinovlari va kasallik modellarini o'rganishda keng qo'llanilmoqda. Jarayon steril sharoitda amalga oshirilib, olingan to'qimalar gistologik tahlildan o'tkaziladi.

### **Bioprintingning asosiy bosqichlari.**

I-bosqich. Tayyorgarlik.

3D bioprint jarayoni KT va MRT ma'lumotlari asosida biologik tuzilmalarni 3D tasvirlashdan boshlanadi. Olingan ma'lumotlar yordamida maxsus dasturiy ta'minot orqali qatlamma-qatlam ishlab chiqarish tamoyiliga mos uch o'lchamli model yaratiladi. So'ng bioprinterning texnologiyasiga qarab mos biosiyoh tayyorlanadi: ekstruziya usulida yuqori yopishqoqlik, inkjet yoki mikrofluidik usullarda esa suyuqroq konsistensiya talab etiladi.

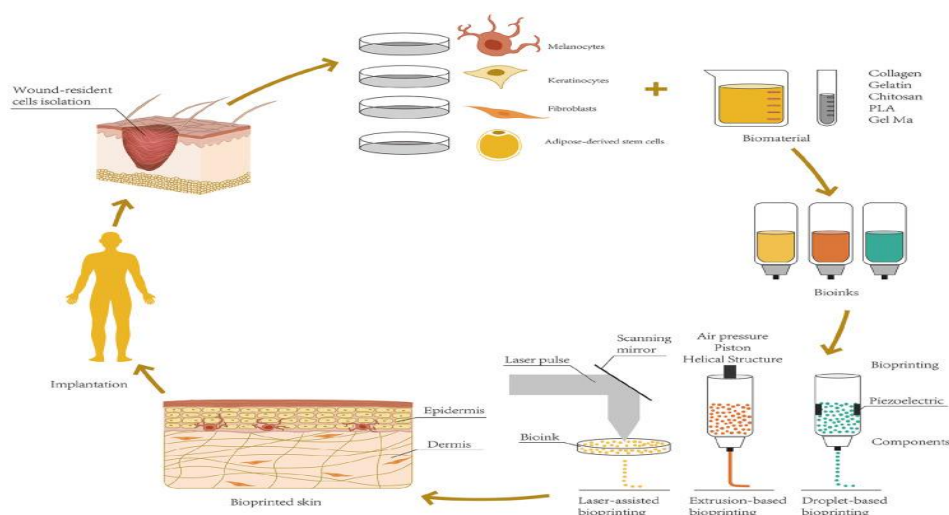
II-bosqich. Qurilish (3D bosib chiqarish).

Jarayon materialni qatlamma-qatlam joylashtirishga asoslanadi; ayrim usullarda bir hujayra darajasidagi yuqori aniqlikka erishish mumkin.

III-bosqich. Bioprintdan keyingi jarayon.

Bosilgan struktura o'zaro bog'lash (UV nurlari, harorat yoki kimyoviy omillar yordamida) orqali mustahkamlanadi. Keyinchalik inkubatsiya bosqichida hujayralar ko'payib, to'qima shakllanishi bioreaktorlarda davom etadi.

3D bioprint texnologiyasi rivojlanishi bilan gistologiya sohasida ko'plab muhim ilmiy tadqiqotlar amalga oshirilmoqda.



2-rasm. Teri 3D bioprintingining sxematik ko'rinishi.

AQShda Harvard University va Wake Forest Institute for Regenerative Medicine tadqiqotchilari teri, xaftaga va yurak mushagi to'qimalarini 3D bioprint qilish orqali ularning gistologik jihatdan tabiiy to'qimaga yaqinligini isbotladilar, bu esa transplantatsiya imkoniyatlarini kengaytirdi.

Organovo kompaniyasi tomonidan sun'iy jigar to'qimasi modeli yaratildi. Ushbu to'qima ustida dorilarning toksik ta'siri gistologik usulda o'rganildi va hujayralarning nekrozi, fibrozga o'xshash o'zgarishlar mikroskopik darajada baholandi. Bu izlanishlar muvaffaqiyatli yakunlanib, dori sinovlarini hayvonlarsiz o'tkazish mumkinligini ko'rsatdi.

Yevropada (Germaniya va Niderlandiya) 3D bioprint asosida o'sma to'qimalari modellarini yaratish orqali ularning o'sish dinamikasi, angiogenezga o'xshash tuzilma hosil qilishi va metastatik xususiyatlari gistologik jihatdan baholandi. Natijalar modellar real o'sma arxitekturasiga yuqori darajada yaqinligini ko'rsatdi.

Janubiy Koreya va Yaponiyada buyrak hamda ichak epiteliysi modellarida hujayralar differensiasiyasi va qatlamlanish jarayoni sun'iy sharoitda ham fiziologik holatga yaqin kechishi isbotlandi.

O'zbekiston Fanlar akademiyasi O'simlik moddolari kimyosi instituti tomonidan mahalliy polisaxaridlar asosidagi gidrogel bioink ishlab chiqilib, u iMSC hujayralari uchun qulay muhit yaratishi bilan bioprint texnologiyasida muhim yutuq sifatida baholanmoqda.

### **Xulosa.**

3D bioprint texnologiyasi gistologiyani yangi bosqichga olib chiqdi: u tirik hujayralar asosida sun'iy to'qimalar yaratish va ularni fiziologik sharoitga yaqin modellashtirish imkonini berdi. Natijada fan eksperimental yo'nalishda rivojlanib, kasalliklarni modellashtirish hamda dori ta'sirini baholash imkoniyatiga ega bo'ldi.

Texnologiya regenerativ tibbiyot bilan integratsiyalashib, to‘qimalarni tiklash va organlar yaratish istiqbollari kengaytirmoqda. O‘zbekistonda bio-siyoh va biomateriallar sohasidagi tadqiqotlar ushbu yo‘nalishning muhim ilmiy salohiyatini tasdiqlaydi.

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## **METALLAR XOM ASHYOSINING RESIKLINGINI RIVOJLANTIRISH**

**Annotatsiya.** *O'zbekiston sharoitida hozirgi kunda tabiiy resurslar va sanoat chiqindilaridan unumli va oqilona foydalanish dolzarb muammolardan biri hisoblanadi. Ushbu maqolada O'zbekistonda metallarni qayta ishlashda amalga oshirilayotgan ishlar, ilmiy yangiliklar va kamchiliklar to'g'risida ilmiy tahlil natijalari, hamda takliflar keltirilgan.*

**Kalit so'zlar:** metal, resikling, sanoat chiqindilari, kimyoviy texnologiya, qora metal va rangli metal.

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## **DEVELOPMENT OF RECYCLING OF METAL RAW MATERIALS**

**Abstract.** *In the conditions of Uzbekistan, the efficient and rational use of natural resources and industrial waste is currently one of the pressing problems. This article presents the results of a scientific analysis of the work being carried out in Uzbekistan in the field of metal recycling, scientific innovations and shortcomings, as well as proposals.*

**Keywords:** metal, recycling, industrial waste, chemical technology, ferrous and non-ferrous metals.

Metallarni qayta ishlash eski jihozlar, avtomobillar, qurilish maydonchalari va sanoat korxonalari kabi turli manbalardan metall parchalarini yig'ishni o'z ichiga oladi. Keyin metallolomlar turi va tarkibiga qarab turli toifalarga ajratiladi. Keyin u yangi mahsulotlar yoki mavjud mahsulotlar uchun qismlarni yaratish uchun pechda eritiladi. Metallni qayta ishlash xom ashyodan yangi qotishmalar ishlab chiqarish uchun zarur bo'lgan energiya miqdorini kamaytirishga yordam beradi, bu esa ishlab chiqarish jarayonlaridan atrof-muhit ifloslanishini kamaytiradi. Shuningdek, u atrof-muhitga salbiy ta'sir ko'rsatishi mumkin bo'lgan tog'-kon sanoatiga bo'lgan ehtiyojni kamaytiradi.

Maishiy, sanoat va transport chiqindilaridan metallolom hosil bo'ladi. Oxirgi guruh hajmi bo'yicha boshqalardan sezilarli darajada oldinda - bu ishlatilgan samolyotlar, kemalar, temir yo'l lokomotivlari va vagonlari, avtomobillar va boshqa

jihozlarni utilizatsiya qilishdan olingan mahsulotlar. Avtotransport vositalarini demontaj qilish va birlamchi qayta ishlash odatda alohida uchastkalarda amalga oshiriladi. Metallurgiya zavodlari tashqi ko'rinishi har qanday texnologik jarayonga hamroh bo'ladigan sanoat chiqindilarining manbalariga aylanadi. Bunday chiqindilarni qayta ishlash yoki yo'q qilish uchun tanlash va jo'natish odatda korxona zimmasiga yuklanadi. Maishiy metall chiqindilarini tayyorlash va saralash ixtisoslashtirilgan punktlar tomonidan amalga oshiriladi.

Qayta ishlash punktlariga kelgan metall chiqindilari saralanadi, bu metallni begona qoldiqlardan ajratish uchun zarur bo'lib, parchalarni keyingi qayta ishlash bosqichlariga tarqatish imkonini beradi.

Xom ashyolar uch turga bo'linadi va quyidagilar bo'lishi mumkin:

- qora - bularning barchasi temir o'z ichiga olgan qotishmalar;
- rangli – mis, alyuminiy, titan va boshqalar;
- qimmatbaho – oksidlanish va korroziyaga uchramaydigan qimmatbaho nodir metallarning parchalari.

Metall chiqindilarni saralash ham quyidagi xususiyatlarga ko'ra amalga oshiriladi:

1. massa;
2. o'lchamlar;
3. birlamchi qo'llanish sohalari.

Tanlash vaqtida metallning holatiga, aralashmalar mavjudligiga va metallarni ajratish imkoniyatiga e'tibor berish kerak. Saralash mumkin bo'lmasa, geterogen elementlarni o'z ichiga olgan aralash alohida shakllangan zonalarda saqlanadi.

Metall parchalarini qabul qilish va birlamchi saralash punktlari quyidagilar bilan jihozlangan bo'lishi kerak:

- tarozilar;
- o'lchash asboblari - o'lchagichlar, o'lchovli ramkalar;
- radiatsiya monitoringi qurilmalari.

Ushbu qurilmalar va jihozlarning barchasi qabul qilingan qoldiqlarning aniq hisobini va xavfli elementlarning mavjudligini tekshirishni ta'minlaydi. Chiqindilarni tuproq bilan aloqa qilishiga yo'l qo'ymaslik uchun yig'ish punktlari kamida 1000 m<sup>2</sup> mustahkam poydevorga ega bo'lgan joylarda joylashgan bo'lishi kerak va ochiq havoda saqlash muddati 10 kundan oshmasligi kerak.

Barcha metallolom yig'ish punktlari metall turlari yoki bajariladigan operatsiyalar bo'yicha ma'lum bir ixtisoslikka ega. Bunday korxonalar quyidagilar bilan shug'ullanishlari mumkin:

- metall chiqindilarini saqlash;
- metallolomlarni to'liq yoki qisman qayta ishlash;
- keyingi qayta ishlash uchun saralash va tashish;
- metallolomlarni faqat jismoniy yoki yuridik shaxslardan qabul qilish va hokazo.

Metallni o'z ichiga olgan ba'zi chiqindilarni qayta ishlashga ruxsat berilmaydi va shuning uchun tegishli punktlar tomonidan qabul qilinmaydi. Ko'pincha muammolar korroziya tufayli yuzaga keladi. Jiddiy zanglagan metallolom ko'p

nuqtalarda qabul qilish rad etiladi. Radioaktiv ifloslanish izlari bo'lgan xom ashyo ham qayta ishlashga qabul qilinmaydi - bunday chiqindilar maxsus poligonlarga ko'milishi kerak.

Quyidagi holatlarda jismoniy shaxslardan metallolom qabul qilish taqiqlanadi:

1. harbiy texnikaga oid buyumlar (o'q qutilari, qurol qismlari, jihozlar va boshqalar);
2. qabul qilish punktiga mustaqil ravishda yetib borishga qodir bo'lgan xizmat ko'rsatadigan transport vositalari;
3. kesilmagan silindrlar va tanklar;
4. temir yo'l uskunolari;
5. elektr jihozlari - kabellar, transformator sariqlari va boshqalar.

Ushbu turdagi chiqindilar qayta ishlash uchun metallolomlarni qayta ishlash bilan shug'ullanuvchi korxonalar bilan tegishli shartnomalar tuzgan tashkilotlarga topshiriladi. Metall chiqindilarni qabul qilish, shuningdek, og'irligi (0,5 t) va maksimal hajmi - 1500 mm gacha (har qanday o'lchamda) bilan cheklangan.

Texnologik taraqqiyot tufayli metallni qayta ishlashning yangi usullari paydo bo'ldi. Sanoat miqyosida bir nechta usullar qo'llaniladi:

**Termik usul.** Metall chiqindilarni mahalliy eritish uchun maxsus uskunalar qo'llaniladi. Kesish quyidagi turdagi qurilmalar yordamida amalga oshiriladi:

1. quduqlar;
2. kislorod-yoy;
3. plazma;
4. kislorod.

Kesish paytida metall +1000 °C gacha qiziydi. Ushbu usul qalin qatlamli chiqindilarni - asosan turli xil transport vositalarining (kemalar, samolyotlar, avtomobillar va boshqalar) korpusini parchalash uchun ishlatiladi.

Portlovchi maydalash usuli. Portlatish massiv (1500 kg dan ortiq) va yirik o'lchamdagi metall chiqindilarini bo'laklarga ajratish uchun ishlatiladi. Ushbu texnologiya bir qator shartlarga rioya qilishni talab qiladi:

- boshqariladigan portlashlarni amalga oshirish uchun maxsus chuqurlardan foydalaniladi;
- chuqurning devorlarini mustahkamlash uchun qalinligi 1500 mm gacha bo'lgan temir-beton ishlatiladi;
- parchalar uchib ketmasligi uchun chuqur gaz teshiklari bo'lgan qopqoq bilan qoplangan.

Qoziqni maydalash. Bu usul maxsus yuk yordamida metall parchalarini maydalashni o'z ichiga oladi - qoziq haydovchi, odatda relsli massiv ustun bo'lgan maxsus konstruktsiya (qoziq haydovchi) balandligidan tushadi. Bosh ramkalar yo'l o'tkazgich, minora, mobil va kichik bo'lishi mumkin.

Mexanik kesish. Metall chiqindilarni alligator yoki gantry arra yordamida parchalashning bu usuli juda mashhur. Birinchisi dumaloq kesimli metall parchalarini kesish uchun ishlatiladi, ikkinchisi odatda to'rtburchaklar kesimli metallni kesish uchun ishlatiladi.



### Qirindini maydalash

Metallni kukunga qayta ishlash frezalash zavodlari yoki maydalagichlar yordamida amalga oshiriladi. Ishlash printsiptiga ko'ra qirindi maydalagichlar quyidagilarga bo'linadi.

- rolikli;
- rotorli;
- bolg'ali.

Bitta maydalagichga 0,3 tonnagacha metall qirindisini yuklash mumkin.

### **Foydalanilgan adabiyotlar**

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## QANDLI DIABET BILAN OG'RIGAN BEMORLAR UCHUN DIYETOTERAPIYA TIZIMINING ILMIY-NAZARIY ASOSLARI VA AMALIY SAMARADORLIGINI BAHOLASH

***Annotatsiya.** Ushbu maqolada qandli diabet bilan og'rigan bemorlar uchun diyetoterapiya tizimining ilmiy-nazariy asoslari hamda uning amaliy samaradorligi tahlil qilinadi. Tadqiqot davomida qandli diabet kasalligida to'g'ri ovqatlanish tartibining ahamiyati, energiya balansini saqlash, uglevodlar almashinuvi nazorati va glyukozaning qondagi darajasini barqarorlashtirishdagi o'rni yoritib berilgan. Shuningdek, diyetoterapiya orqali metabolik jarayonlarni me'yorlashtirish, asoratlar xavfini kamaytirish hamda bemorlarning hayot sifatini yaxshilash imkoniyatlari ilmiy jihatdan asoslab beriladi. Tadqiqot natijalari diyetoterapiya tizimini to'g'ri tashkil etish qandli diabet bilan og'rigan bemorlarning klinik holatini yaxshilashga, qondagi glyukoza miqdorini nazorat qilishga hamda kasallikning uzoq muddatli asoratlarini kamaytirishga ijobiy ta'sir ko'rsatishini ko'rsatadi. Maqola natijalari tibbiyot amaliyotida va profilaktik choralarni ishlab chiqishda muhim ahamiyatga ega.*

***Kalit so'zlar:** qandli diabet, diyetoterapiya, terapevtik ovqatlanish, glyukoza nazorati, uglevod almashinuvi, metabolik jarayonlar, parhez terapiyasi, glikemik indeks, sog'lom ovqatlanish, diabet asoratlari profilaktikasi.*

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## ASSESSMENT OF THE SCIENTIFIC AND THEORETICAL BASIS AND PRACTICAL EFFECTIVENESS OF THE DIETOTHERAPY SYSTEM FOR PATIENTS WITH DIABETES MELLITUS

***Abstract.** This article analyzes the scientific and theoretical foundations of the dietotherapy system for patients with diabetes mellitus, as well as its practical*

effectiveness. During the study, the importance of proper nutrition in diabetes mellitus, the maintenance of energy balance, control of carbohydrate metabolism and the role of glucose in stabilizing blood levels were highlighted. Also, the possibilities of normalizing metabolic processes through dietotherapy, reducing the risk of complications and improving the quality of life of patients are scientifically substantiated. The results of the study show that the correct Organization of the dietotherapy system has a positive effect on improving the clinical condition of patients with diabetes mellitus, controlling blood glucose levels, and reducing long-term complications of the disease. The results of the article are important in medical practice and the development of preventive measures.

**Keywords:** diabetes mellitus, dietotherapy, therapeutic nutrition, glucose control, carbohydrate metabolism, metabolic processes, dietary therapy, glycemic index, healthy eating, prevention of diabetes complications.

Kirish. Bugungi kunda qandli diabet dunyo miqyosida keng tarqalgan surunkali kasalliklardan biri hisoblanadi. Ushbu kasallik organizmda uglevod almashinuvi buzilishi, qonda glyukoza miqdorining ortib ketishi va turli asoratlarning rivojlanishi bilan tavsiflanadi. Qandli diabet nafaqat bemorning sog'lig'iga, balki uning hayot sifati va mehnat faoliyatiga ham sezilarli ta'sir ko'rsatadi. Shu sababli kasallikni davolash va nazorat qilishda kompleks yondashuv muhim ahamiyat kasb etadi.

Qandli diabetni davolash jarayonida dori vositalari bilan bir qatorda to'g'ri tashkil etilgan ovqatlanish tartibi, ya'ni diyetoterapiya muhim o'rin tutadi. Diyetoterapiya qondagi glyukoza darajasini barqarorlashtirish, metabolik jarayonlarni tartibga solish, tana vaznini me'yorlashtirish hamda kasallikning asoratlarini oldini olishda samarali vosita hisoblanadi. Ayniqsa, ovqat tarkibidagi uglevodlar, yog'lar va oqsillarning muvozanatini saqlash, mahsulotlarning glikemik indeksini hisobga olish va ovqatlanish rejimini to'g'ri tashkil etish qandli diabet bilan og'rigan bemorlar uchun muhimdir.

Adabiyotlar tahlili; Qandli diabet bugungi kunda eng keng tarqalgan surunkali endokrin kasalliklardan biri bo'lib, u organizmda uglevod, yog' va oqsil almashinuvinin buzilishi hamda qonda glyukoza miqdorining ortishi bilan tavsiflanadi. Ilmiy adabiyotlarda ushbu kasallikning etiologiyasi, patogenezini, klinik kechishi hamda davolash usullari keng o'rganilgan. Tadqiqotchilar qandli diabetni samarali boshqarishda farmakoterapiya bilan bir qatorda sog'lom turmush tarzi, ayniqsa diyetoterapiyaning muhim o'rin tutishini ta'kidlaydilar.

Ko'plab ilmiy tadqiqotlarda qandli diabet kasalligining rivojlanishi insulin yetishmovchiligi yoki to'qimalarning insulina sezuvchanligining pasayishi bilan bog'liq ekani qayd etilgan. Natijada glyukoza hujayralarga yetarli darajada kirib bormaydi va qonda giperglikemiya holati yuzaga keladi. Bu jarayonlar metabolik o'zgarishlarga olib kelib, uzoq muddatda turli mikro va makrovaskulyar asoratlarning rivojlanishiga sabab bo'lishi mumkin. Ilmiy manbalarda qandli diabetni davolashda kompleks yondashuv muhim ekani qayd etilgan. Bunda insulin terapiyasi, og'iz orqali qabul qilinadigan gipoglikemik

preparatlar, jismoniy faollik va parhez terapiyasi o‘zaro uyg‘un holda qo‘llanilishi kerakligi ta’kidlanadi. Parhez terapiyasi bemor organizmida uglevod almashinuvini tartibga solish, glyukoza darajasini nazorat qilish hamda tana vaznini me’yorlashtirishda muhim omil hisoblanadi.

Bir qator tadqiqotlarda diabet bilan og‘rigan bemorlarning ovqatlanish tarkibi va mahsulotlarning glikemik indeksini hisobga olish muhimligi ko‘rsatib o‘tilgan. Masalan, o‘simlik yog‘lari, yong‘oqlar va biologik faol moddalarga boy mahsulotlar insulin sezuvchanligini oshirishi, qondagi glyukoza darajasini barqarorlashtirishi hamda yurak-qon tomir tizimi faoliyatini qo‘llab-quvvatlashi mumkinligi aniqlangan.

Shuningdek, zamonaviy ilmiy tadqiqotlarda qandli diabetni nazorat qilishda glyukozaning uzoq muddatli ko‘rsatkichlarini baholash muhimligi ta’kidlanadi. Jumladan, HbA1c ko‘rsatkichi oxirgi 2–3 oy davomida o‘rtacha glikemik nazorat darajasini aniqlash imkonini berib, davolash strategiyasining samaradorligini baholashda keng qo‘llaniladi. Yuqoridagi ilmiy manbalar tahlili shuni ko‘rsatadiki, qandli diabet bilan og‘rigan bemorlarni davolash va profilaktika qilishda diyetoterapiya muhim ahamiyatga ega bo‘lib, u metabolik jarayonlarni me’yorlashtirish, glyukozani nazorat qilish va kasallik asoratlarini kamaytirishda samarali usullardan biri hisoblanadi. Shu sababli diyetoterapiya tizimining ilmiy-nazariy asoslarini o‘rganish hamda uning amaliy samaradorligini baholash dolzarb ilmiy masala hisoblanadi.

Tadqiqot metodlari; Mazkur tadqiqotda qandli diabet bilan og‘rigan bemorlar uchun diyetoterapiya tizimining ilmiy-nazariy asoslari hamda uning amaliy samaradorligini baholash maqsadida bir qator ilmiy tadqiqot usullaridan foydalanildi. Tadqiqot jarayonida avvalo mavzuga oid ilmiy adabiyotlar, monografiyalar, ilmiy maqolalar hamda zamonaviy tibbiy tavsiyalar tahlil qilindi. Adabiyotlarni tahlil qilish usuli orqali qandli diabetning kelib chiqish sabablari, patogenezi, klinik belgilari hamda uni davolashda diyetoterapiyaning o‘rni o‘rganildi. Shuningdek, kuzatuv (observatsion) usuli yordamida qandli diabet bilan og‘rigan bemorlarning ovqatlanish tartibi, kundalik ratsioni va metabolik ko‘rsatkichlari o‘rganildi. Tadqiqot davomida bemorlarning qondagi glyukoza darajasi, tana vazni, umumiy holati hamda davolash jarayonidagi o‘zgarishlari muntazam ravishda kuzatib borildi.

Tadqiqotda qiyosiy tahlil usulidan ham foydalanildi. Bunda diyetoterapiya asosida davolanayotgan bemorlarning ko‘rsatkichlari an’anaviy ovqatlanish tartibiga amal qilayotgan bemorlar natijalari bilan solishtirildi. Ushbu usul diyetoterapiya tizimining amaliy samaradorligini baholash imkonini berdi. Bundan tashqari, statistik tahlil usullari yordamida olingan natijalar qayta ishlanib, ularning ishonchliligi baholandi. Statistik ma’lumotlar tahlili orqali diyetoterapiyaning qondagi glyukoza miqdorini barqarorlashtirish, metabolik jarayonlarni yaxshilash hamda kasallik asoratlarini kamaytirishga ta’siri aniqlab berildi. Mazkur metodlar majmuasi tadqiqot natijalarining ilmiy asoslanganligini ta’minlash hamda qandli diabet bilan og‘rigan bemorlar uchun samarali diyetoterapiya tizimini ishlab chiqish imkonini berdi.

Muhokama; Tadqiqot natijalari qandli diabet bilan og‘rigan bemorlarni davolash va nazorat qilish jarayonida diyetoterapiya muhim o‘rin tutishini ko‘rsatdi. Olingan ma‘lumotlar shuni tasdiqlaydiki, to‘g‘ri tashkil etilgan ovqatlanish tartibi qondagi glyukoza miqdorini barqarorlashtirish, metabolik jarayonlarni me‘yorlashtirish hamda bemorlarning umumiy sog‘liq holatini yaxshilashda muhim ahamiyatga ega. Tadqiqot davomida diyetoterapiya asosida tuzilgan ovqatlanish rejimiga amal qilgan bemorlarda qondagi glyukoza darajasining nisbatan barqarorlashgani, tana vaznining me‘yorlashgani hamda umumiy holatning yaxshilangani kuzatildi. Ayniqsa, uglevodlar miqdorini nazorat qilish, glikemik indeks past bo‘lgan mahsulotlardan foydalanish va ovqatlanish tartibining muvozanatli tashkil etilishi ijobiy natijalarni ta‘minladi. Bu esa diyetoterapiyaning qandli diabetni boshqarishdagi samaradorligini yana bir bor tasdiqlaydi.

Shuningdek, tadqiqot natijalari ko‘rsatishicha, parhezga qat‘iy amal qilgan bemorlarda kasallikning uzoq muddatli asoratlari rivojlanish xavfi kamayishi mumkin. Chunki ratsionni to‘g‘ri tashkil etish organizmda uglevod, yog‘ va oqsil almashinuvining muvozanatini saqlashga yordam beradi. Natijada metabolik jarayonlar yaxshilanadi va organizmning umumiy funksional holati barqarorlashadi. Muhokama jarayonida olingan natijalar boshqa ilmiy tadqiqotlar bilan ham mos kelishi aniqlandi. Ko‘plab ilmiy manbalarda ham qandli diabet bilan og‘rigan bemorlarni davolashda farmakologik davolash bilan bir qatorda diyetoterapiya muhim ahamiyatga ega ekanini ta‘kidlanadi. Ayniqsa, individual yondashuv asosida tuzilgan ovqatlanish rejimi bemorning yoshiga, kasallik darajasiga va organizmning metabolik xususiyatlariga mos bo‘lishi kerakligi qayd etiladi.

Shu bilan birga, diyetoterapiya samaradorligi ko‘p jihatdan bemorlarning parhezga rioya qilish darajasi, sog‘lom turmush tarziga amal qilishi hamda jismoniy faollik bilan ham bog‘liq ekanligi kuzatildi. Shuning uchun qandli diabet bilan og‘rigan bemorlar uchun kompleks yondashuvni qo‘llash, ya‘ni parhez terapiyasi, dori vositalari va jismoniy faollikni uyg‘unlashtirish muhim hisoblanadi. Umuman olganda, tadqiqot natijalari qandli diabet bilan og‘rigan bemorlar uchun diyetoterapiya tizimi ilmiy jihatdan asoslangan va amaliy jihatdan samarali usullardan biri ekanligini ko‘rsatdi. Bu esa ushbu yo‘nalishda qo‘shimcha ilmiy izlanishlar olib borish va diyetoterapiya tizimini yanada takomillashtirish zarurligini ko‘rsatadi.

Natija; O‘tkazilgan tadqiqotlar natijasida qandli diabet bilan og‘rigan bemorlar uchun diyetoterapiya tizimi kasallikni nazorat qilishda muhim va samarali usullardan biri ekanligi aniqlandi. Tadqiqot davomida to‘g‘ri tashkil etilgan parhez rejimi qondagi glyukoza miqdorini barqarorlashtirish, metabolik jarayonlarni me‘yorlashtirish hamda bemorlarning umumiy sog‘liq holatini yaxshilashga ijobiy ta‘sir ko‘rsatishi kuzatildi. Shuningdek, ratsionda uglevodlar miqdorini nazorat qilish, glikemik indeks past bo‘lgan mahsulotlardan foydalanish hamda ovqatlanish tartibiga qat‘iy rioya qilish qandli diabet bilan og‘rigan bemorlarda glyukozaning keskin o‘zgarishlarini

kamaytirishga yordam berishi aniqlangan. Natijalar shuni ko'rsatdiki, diyetoterapiyaga amal qilgan bemorlarda tana vaznining me'yorlashuvi, umumiy holatning yaxshilanishi hamda kasallik asoratlari rivojlanish xavfining kamayishi kuzatildi.

Tadqiqot natijalari shuni ko'rsatadiki, diyetoterapiya qandli diabetni kompleks davolash tizimining ajralmas qismi hisoblanadi. To'g'ri tashkil etilgan ovqatlanish rejimi dori vositalari bilan birgalikda qo'llanganda davolash samaradorligini oshiradi va bemorlarning hayot sifatini yaxshilashga xizmat qiladi. Umuman olganda, olib borilgan tadqiqotlar qandli diabet bilan og'riqan bemorlar uchun ilmiy asoslangan diyetoterapiya tizimini qo'llash kasallikni nazorat qilishda samarali natijalar berishini tasdiqlaydi. Bu esa diyetoterapiyani tibbiyot amaliyotida keng qo'llash hamda bemorlar o'rtasida sog'lom ovqatlanish madaniyatini shakllantirish muhim ekanligini ko'rsatadi.

Xulosa; Qandli diabet bilan og'riqan bemorlar uchun diyetoterapiya tizimining ilmiy-nazariy asoslari va amaliy samaradorligini o'rganish natijalari shuni ko'rsatdiki, to'g'ri tashkil etilgan ovqatlanish rejimi kasallikni nazorat qilishda muhim omillardan biri hisoblanadi. Dietoterapiya qondagi glyukoza miqdorini barqarorlashtirish, metabolik jarayonlarni me'yorlashtirish hamda bemorlarning umumiy sog'liq holatini yaxshilashga ijobiy ta'sir ko'rsatadi. Tadqiqot natijalari shuni tasdiqlaydiki, ovqat tarkibidagi uglevodlar, oqsillar va yog'larning muvozanatini saqlash, glikemik indeksi past bo'lgan mahsulotlardan foydalanish hamda ovqatlanish tartibiga qat'iy rioya qilish qandli diabet bilan og'riqan bemorlarning holatini yaxshilashga yordam beradi. Shuningdek, diyetoterapiya kasallikning uzoq muddatli asoratlari rivojlanish xavfini kamaytirishda ham muhim ahamiyat kasb etadi.

Bundan tashqari, qandli diabetni samarali boshqarish uchun kompleks yondashuv zarur bo'lib, bunda diyetoterapiya, dori vositalari bilan davolash hamda jismoniy faollikni uyg'unlashtirish muhim hisoblanadi. Bemorlar uchun individual yondashuv asosida tuzilgan parhez rejimi davolash samaradorligini oshirishga xizmat qiladi. Umuman olganda, ilmiy tadqiqot natijalari qandli diabet bilan og'riqan bemorlar uchun diyetoterapiya tizimini qo'llash kasallikni nazorat qilish, bemorlarning hayot sifatini yaxshilash va sog'lom turmush tarzini shakllantirishda muhim ahamiyatga ega ekanligini ko'rsatadi. Bu esa diyetoterapiya tizimini tibbiyot amaliyotida yanada keng qo'llash va ushbu yo'nalishda ilmiy tadqiqotlarni davom ettirish zarurligini tasdiqlaydi.

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## **THE USE OF SAFFRON EXTRACT IN THE TREATMENT OF PLEURISY IN TRADITIONAL MEDICINE**

**Abstract:** *The article compares the effects of drugs and natural herbs used in the treatment of pleurisy in modern medicine and folk medicine. The article discusses the negative side effects of some synthetic drugs. The possibilities of using saffron (*Crocus sativus* L.) in the treatment of pleurisy are considered.*

**Key words:** *pleurisy, saffron, sugar content, crocin, crocetin, safranal, zeaxanthin.*

Pleurisy is an inflammation of the lungs, sometimes caused by rheumatism, tuberculosis, infectious and allergic diseases, and in some cases, chest trauma. Pleurisy is not usually considered an independent disease, so it has infectious and non-infectious forms. A distinction is made between dry and exudative pleurisy, with exudative pleurisy occurring after dry pleurisy. Symptoms of this disease include hot flashes, sweating, muscle spasms, weakness, loss of appetite, and shortness of breath. Acute pleurisy often begins with chest pain, which intensifies with coughing or deep breathing. The patient begins to feel unwell and develops a fever [1].

Modern medicine uses various synthetic drugs to treat pleurisy. These include isoniazid, streptomycin, ethambutol, rifampicin, analgin, and aspirin. Although these and similar pharmaceuticals are considered effective in treating the condition, there is evidence that their use can cause a number of harmful side effects that pose a threat to human health and life.

Below we will consider some of them: Isoniazid - isonicotinic acid hydrazide is widely used in the treatment of tuberculous pleurisy. However, in studies, patients taking this drug experienced rashes, headaches, sleep disturbances, hallucinations, and gastrointestinal disturbances [2].

There are warnings that streptomycin may cause hearing loss, ethambutol may cause nausea, headache, and fatigue, liver problems, allergic reactions, and serious kidney problems, rifampin may cause congestive heart failure, nausea, vomiting, diarrhea, and loss of appetite, and analgin may cause kidney failure, red urine, leukopenia, and thrombocytopenia. Patients who are allergic to aspirin, ibuprofen, or naproxen, or who have asthma, stomach ulcers, diabetes, or gastritis are advised to consult a doctor before taking aspirin [3].

Given the above information, when treating pleurisy, it's probably best to resort to folk remedies, which are relatively safe and harmless.

In folk medicine, various infusions and ointments made from natural products such as mustard, camphor, lavender, and eucalyptus oils, turnip, centipede, butterfly pea, reed, marvak, wild carrot seeds, grapes and grape juice, honey, and grape leaves are used to treat pleurisy [1].

Given the attention paid to the cultivation and use of saffron in our country in recent years, it is appropriate to consider its potential use in folk medicine for the treatment of pleurisy.

The anti-inflammatory effect of saffron is undoubtedly due to its powerful antioxidant and free radical scavenging properties, which are primarily attributed to crocetin and crocin. Radical scavenging properties are found not only in crocin but also in safranal. All tested samples demonstrated a concentration-dependent effect and a synergistic effect between these two saffron components [4].

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## **USING GAMES WHEN TEACHING A NON-NATIVE LANGUAGE AT A UNIVERSITY**

**Abstract.** *The article considers the possibilities of using word games in the process of teaching a non-native language at a university. The main classifications of games are given, with the main focus on lexical games. The article justifies the conditions that allow you to make the most of verbal games in non-native language classes, and also provides examples of games at different stages of working with students.*

The solution of this complex, "global" problem occurs throughout the entire period of teaching a non-native language at the university and requires the use of rational and effective approaches and technologies, forms and methods of teaching. In this context, it is customary to talk about the use of new information and communication technologies, active teaching methods, and a differentiated approach. However, the "basic element" is the methods and techniques of teaching a non-native language, which the teacher uses in the classroom, directly working with students. Knowledge and mastery of language tools by students, their application in communication depends on how effectively this material was presented, fixed, worked out.

The method that allows: a) motivate students to study the subject, b) contributes to the development of language and speech competence, c) contributes to a faster and more durable assimilation of material, is play. Is the use of games in a student audience justified? And if so, which games will best contribute to the development of language skills?

In modern science, games are considered as a method that can be effectively used in teaching a non-native language to both children and adults. It would be appropriate to give classifications of games that will allow you to navigate which games can contribute to the development of certain language skills.

So, the famous teacher M.F. Stronin distinguishes the following types of games: 1. Lexical. 2. Grammatical. 3. Phonetic. 4. Orthographic. 5. Creative [1]. The first four can be attributed to the so-called language, the purpose of which is to form appropriate skills. Creative games are complex in nature, imply the creative application of the acquired knowledge and skills in a game situation.

There are other classifications of games. A.V. Konyshcheva divides games according to their purpose into language and speech (communicative). E.V. Dushina talks about linguistic games and divides them into non-communicative, pre-communicative and communicative, depending on the competencies formed [2]. Obviously, in all classifications we are talking about 1) games, in the process of which the assimilation of material (new lexical units, grammatical constructions),

the development of individual language skills (phonetic, grammatical) and 2) games aimed at transferring the studied material and practiced skills to non-standard situations, to communication within the game. In this case, it is important to take into account the principle of didactic sequence: first, tasks are performed for memorization, for reproduction (including by sample), and then for the creative application of the studied material.

For the games discussed in the article, we propose the name "word games" - all of them are associated with the word, its spelling, meaning, compatibility with other words (in Stronin's terminology, lexical and spelling games can be attributed here). Word games allow learners to:

- expand the vocabulary, getting acquainted with new lexical units;
- more strongly assimilate already familiar lexical units;
- work out the spelling of words;
- to intensify river-thinking activities;
- gets acquainted with the compatibility of lexical units, stable expressions, phraseological units.

Word games include the following: 1. Anagrams 2. Crosswords 3. Searching for words amid letter chaos 4. "Gallows" 5. "Balda" (a word game in which it is necessary to compose words using letters added to a square playing field in a certain way). 6. "Words" (composing shorter words from one long, often for a while). 7. Decoding (compiling a word from an existing set of letters). 8. A chain of words (compiling a list of words by replacing one letter in each subsequent word, possibly based on definitions). 9. Constructor (compilation of words from morphemes presented on separate cards). 10. "One letter is many words" (students call the words known to them on a certain letter of the alphabet). 11. "Last letter" (name the word starting with the last letter of the previous one; 12. "Missing letters" (guess the word only by vowels/consonants). 13. Guess the word by its definition, synonyms, antonyms, etc. and others.

Some of the games involve group work, team competition, some involve working in pairs; games such as "Gallows," "Anagrams," it is appropriate to spend frontally, presenting material on the board

Of course, a verbal game in Russian classes at a university should not be an end in itself, although in some cases it can serve as its own "detente" after hard work. When organizing a game in a non-native language lesson at a university, the teacher should take into account the general methodological principles, as well as the principles of pedagogy of adult education (after all, the student audience often claims to be "adult," and at the same time equally willingly responds to techniques and methods used with children):

- adults need to know why they teach this or that material. Therefore, the teacher should be ready to explain how the game will help students learn a foreign language;

- adults see learning as a solution to problems, they learn, including from their own experience, "in practice," and the use of word games can present wider opportunities for this than simply doing exercises from a textbook;

- the game should be well thought out, have clear rules and simple conditions, controlled by a teacher;

- the game should be held in a friendly atmosphere, providing the student with opportunities for self-expression, self-development;
- the game should contain an element of competition (under the initial condition of equality of participants/teams), which can activate the mental activity of students, encourage their active participation.

Here are examples of using different games at different stages of organizing a lesson in a non-native language. At the initial stage, when the task of the teacher is to update the students' knowledge, experience on a certain topic, "setting up" for work, you can invite students to play "Missing Letters," "Decoding," "Designer." In this case, the word should either be already familiar to most students, or can be predicted based on the topic.

Games like "Crosswords," "Words," are often used when working out vocabulary on a specific topic. In school textbooks/workbooks, such an assignment is not uncommon, but textbooks for higher education do not often offer students such an exercise-game. The technique turns out to be quite effective when, as a creative task, students themselves create "letter chaos" /crossword puzzle and offer it in class to work in small groups.

The team game "Last Letter" can be offered to students when completing work on the topic, when lexical units/phrases have already been presented to students several times in texts and exercises. The essence of the game is as follows: the team representative needs to guess the word written on the board, which can be suggested by the teacher or another team, according to the tips and explanations of his team. The student sits with his back to the board and does not see the word. Associations and ways to explain the word that modern students come to mind sometimes amaze with originality and creativity, showing that students make an attempt to actualize and convey knowledge from other subject areas in a non-native language. It is necessary to encourage students to express ideas in a non-native language, thus they are involved in communication, practice the skills of constructing sentences, certain speech formulas. At the same stage, you can play "gallows"; usually students actively think, offer options, not wanting the game to end in a loss.

The teacher can be advised not to "take the whole blow" to compose the game for himself, but to delegate part of the work to students - for example, to choose lexical units in the game within the topic. Thus, they feel involved, responsible for the correct presentation of the material, for the success of the game. And in this case, using the game in a non-native language lesson actually becomes an effective technique.

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## **TURIZMNI GEOGRAFIK REJALASHTIRISHDA ETNOGRAFIK USULLARNING O‘RNI SURXONDARYO VILOYATI MISOLIDA**

**Annotatsiya.** Maqolada etnografik usullar asosida turizmni o‘rganishning geografik jihatlari tahlil qilinadi. Hududiy farqlar, madaniy makon, aholi joylashuvi va resurslar baholanadi. Surxondaryo viloyati asosiy misol sifatida tanlanadi.

**Kalit so‘zlar.** Etnografik usullar, Turizm geografiyasi, Geografik rejalashtirish, Etnoturizm, Madaniy landshaft, Surxondaryo viloyati, Hududiy tahlil, Barqaror turizm, Mahalliy aholi ishtiroki, Turizm resurslari

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## **THE ROLE OF ETHNOGRAPHIC METHODS IN GEOGRAPHICAL PLANNING OF TOURISM. (CASE STUDY OF THE SURKHANDARYA)**

**Abstract.** The article analyzes the geographical aspects of tourism studies based on ethnographic methods. Territorial differences, cultural space, population distribution, and resources are evaluated. The Surkhandarya region has been selected as the main case study.

**Keywords:** Ethnographic methods, Geographical tourism, Geographical planning, Ethnotourism, Cultural landscape, Surkhandarya region, Territorial analysis, Sustainable tourism, Local community participation, Tourism resources.

**Kirish.** Turizm hudud bilan bog‘liq hodisa. Geografik rejalashtirish esa hududning tabiiy, ijtimoiy va madaniy resurslarini aniqlash, ularning imkoniyatlari va cheklovlarini baholaydi. Etnografik usullar bu jarayonda muhim ahamiyatga ega, chunki ular aholi turmush tarzi, marosimlar, an‘analar va madaniy landshaftni chuqur anglashga yordam beradi. Bu holat, xususan, Surxondaryo viloyati misolida aniq ko‘rinadi.

Etnografik usullar va geografik rejalashtirish: nazariy asoslari qo‘yidachicha aniqlanadi.

**Etnografik usullar** Etnografik usullar quyidagilarni o‘z ichiga oladi:

Mahalliy aholi bilan suxbat, kuzatuv, marosim va urf-odatlarini tahlil, turmush tarzi. Bu usullar xudud va madaniyatni bog‘lab beradi.

Geografik rejalashtirishda ularning roli quyidagicha:

| № | Etnografik usul        | Geografik rejalashtirishga ta’siri      |
|---|------------------------|-----------------------------------------|
| 1 | Suhbat                 | Mahalliy resurs qiymatini aniqlash      |
| 2 | Kuzatuv                | Turistik jozibador joylarni tanlash     |
| 3 | Marosimlarni o‘rganish | Mavsumiy turizm rejalarini tuzish       |
| 4 | Turmush tarzi tahlili  | Mehmonxona, xizmatlar talabini baholash |

*Jadval muallif tomonidan ishlan chiqilgan*

So‘nggi yillarda O‘zbekistonda (va Markaziy Osiyoda) etnoturizm bo‘yicha tadqiqotlar. Quyida yaqin yillarda etnoturizm bo‘yicha qilingan ilmiy ishlar misollari. O‘zbekiston miqyosida misollar jumladan Surxondaryo, Rishton, Chust va Yangikurgan misollari. Tadqiqot etnoturizm imkoniyatlarini tahlil qiladi va amaliy yo‘nalishlar taklif qiladi. Bu maqola etnoturizm salohiyatini tahlil qiladi hamda hududiy imkoniyatlar bo‘yicha tahlil qilingan. Savitskiy nomidagi Karakalpakstan davlat san’at muzeyi. Muzey O‘zbekiston etnoturizmida muhim rol o‘ynaydi. Ekspонатlar milliy madaniyatni aks ettiradi va turistlarni jalb qiladi. Etnografik resurslarni turizm samaradorligini oshirish: Bu maqola O‘zbekiston etnografik resurslarini turizmni rivojlantirishda qanday samarali ishlatish mumkinligini tahlil qiladi. Etnografik turizmning rivojlanish bosqichlari. O‘zbekiston hududida etnoturizmning yo‘nalishlari va faoliyatlar tahlil qilingan, jumladan Surxondaryo va boshqa viloyatlar misollari. Etno-folklor turizmi Xorazm misolida. Xorazm hududidagi folklor an‘analar va madaniy meros etnoturizm uchun resurs sifatida tahlil qilingan. Buxoro vohasida ziyoratgohlar va etnoturizm. Buxoro vohasidagi ziyoratgohlar etnoturizm rivojiga ijobiy ta’sir ko‘rsatadi. Bu tadqiqotlar O‘zbekiston turizm geografiyasida etnoturizm resurslari va ularni rejalashtirish ahamiyatini ko‘rsatadi. Surxondaryo viloyati etnoturizmni geografik rejalashtirish uchun namuna bo‘la oladi. Sabab oddiy.



1-rasm. Boysun “Bahori” folklor festivali jarayoni

**Hududiy xilma-xillik mavjud.** Viloyat tog‘, adir, vodiy va cho‘l zonalarini birlashtiradi. Boysun tog‘lari, Sherobod adirlari, Amudaryo bo‘yi hududlari turli

etnografik makonlar yaratadi. Har bir tabiiy zona alohida xo‘jalik va turmush tarzini shakllantirgan.

**An'anaviy turmush saqlangan.** Boysun, Sariosiyo, Denov qishloqlarida urf-odatlar kundalik hayotda yashab qolgan. Milliy kiyim, hunarmandchilik, marosimlar namoyish uchun emas, hayotiy zarurat sifatida mavjud. Bu holat etnoturizmga "sun'iy sahna" muammosini kamaytiradi. Siz turistga real tajriba taklif qilasiz. Boysun bahor marosimlari va xalq o'yinlari.

**Madaniy landshaft faol.** Viloyatda etnografik usullar amaliy rejalashtirishda bevosita qo'llanilmoqda. Madaniy landshaft faqat obida emas, balki faol makon.

Qadimiy qishloq tuzilishi, sug'orish tizimlari, yaylov madaniyati saqlangan. Arxeologik va etnografik obyektlar zamonaviy hayot bilan uyg'un. Siz geografik rejalashtirishda tabiiy makonni hisobga olish, Jumladan Jarqo'rg'on minorasi atrofidagi tarixiy-madaniy muhit.

### **Surxondaryo viloyatida etnoturizmni geografik rejalashtirish**

| № | Hudud    | Etnografik xususiyat   | Rejalashtirish yondashuvi | Natija          |
|---|----------|------------------------|---------------------------|-----------------|
| 1 | Boysun   | An'analar saqlangan    | Kichik guruhli turizm     | Barqarorlik     |
| 2 | Sherobod | Ommaviy urf-odatlar    | Qishloq turizmi           | Daromad oshishi |
| 3 | Termiz   | Ko'rgazmaviy madaniyat | Festival modeli           | Turist oqimi    |

Quyidagi hududlar berilgan bo'lib, ularning har biri etnoturizmning muayyan yo'nalishlari bilan mashg'ul.

#### **Boysun hududi berilgan bo'lib, u asosan:**

An'anaviy marosimlar va urf-odatlarni saqlash bilan mashg'ul. Kichik guruhli etnoturistik tashriflarni qabul qilishga yo'naltirilgan. Nomoddiy madaniy merosni avaylab rivojlantirish bilan shug'ullanadi. Mahalliy aholining bevosita ishtirokini ta'minlaydi.

**Sherobod hududi berilgan bo'lib, asosan.** Qishloq turizmi va kundalik turmush tajribasini namoyish etish bilan mashg'ul. Ommaviy urf-odatlarni turizm mahsulotiga aylantirishga yo'naltirilgan. Dehqonchilik va hunarmandchilik asosida daromad yaratadi. Aholi bandligini oshirish vazifasini bajaradi. Termiz hududi berilgan bo'lib, u asosan: Ko'rgazmaviy va shahar madaniyatiga tayangan turizm bilan mashg'ul. Festival va madaniy tadbirlar orqali turistlarni jalb qiladi. Tarixiy obidalar va muzeylar asosida ishlaydi. Qisqa muddatda katta turist oqimini shakllantiradi. Turizmni geografik rejalashtirishda etnografik tahlil jarayoni Quyidagi jadval rejalashtirish bosqichlarida etnografik ma'lumotlarning qo'llanilishini ko'rsatadi:

## 2-jadval. Etnografik tahlil bosqichlari va rejalashtirishda qo'llanilishi

| № | Tahlil bosqichi           | Etnografik ma'lumot turi  | Qanday ishlatiladi                   |
|---|---------------------------|---------------------------|--------------------------------------|
| 1 | Resurs inventarizatsiyasi | Hunarmandchilik, obidalar | Xarita tuzish                        |
| 2 | Ijtimoiy intervyu         | Aholi fikri               | Xizmatlarni rejalashtirish           |
| 3 | Marosim tahlili           | Turizm mavsumi            | Turizm taqvimini tuzish              |
| 4 | Hududiy tajriba           | Mahalliy madaniyat        | Marshrutlar belgilash                |
| 5 | Foydalanish modeli        | Aholi ishtiroki           | Barqaror boshqaruv modelini yaratish |

**Resurs inventarizatsiyasi.** Hududdagi hunarmandchilik markazlari, tarixiy va madaniy obidalar tizimli ravishda aniqlanadi. Ularning geografik joylashuvi va holati batafsil qayd etiladi. Aniqlangan obyektlar turizm salohiyati nuqtai nazaridan tasniflanadi. Resurslarning turli turlari (madaniy, tarixiy, tabiiy) alohida guruhlariga ajratiladi. Ushbu ma'lumotlar asosida etnoturistik resurslar xaritasi tuziladi. Xaritadan hududning rivojlanish potentsialini baholashda foydalaniladi. Natijada turizm infratuzilmasini rejalashtirish uchun aniq baza yaratiladi.

**Xulosa.** Etnografik usullar geografik rejalashtirishda asosiy tarkibiy qismidir. Mahalliy madaniyat, marosimlar va an'analar turizm resurslarini aniqlaydi. So'nggi yillarda O'zbekiston miqyosida etnoturizm bo'yicha ko'plab ilmiy tadqiqotlar amalga oshirilgan. Surxondaryo tajribasi etnografik ma'lumotlarni rejalashtirish jarayonida qanday integratsiya qilish mumkinligini ko'rsatadi.

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## **BIG DATA TA'LIM JARAYONIDA GOOGLE COLABORATORY PLATFORMASIDAN FOYDALANISH METODIKASI VA SAMARADORLIGI**

**Annotatsiya** Mazkur maqolada oliy ta'lim tizimida Katta hajmli ma'lumotlar (Big Data) bo'yicha mutaxassislar tayyorlashning dolzarb muammosi — resurs talabchan hisoblash infratuzilmasi yetishmovchiligi ko'rib chiqilgan. Ushbu muammoni hal etish vositasi sifatida bepul, bulutga asoslangan Google Colaboratory (Colab) platformasidan foydalanish metodikasi taklif etilgan. Tadqiqotda Apache Spark kabi Big Data texnologiyalarini Colab muhitida sozlash, ma'lumotlarni qayta ishlash va tahlil qilish bo'yicha amaliy mashg'ulotlarni o'tkazishning bosqichma-bosqich yondashuvi ishlab chiqilgan.

**Kalit so'zlar:** Big Data, Google Colaboratory, ta'lim metodikasi, Apache Spark, PySpark, ma'lumotlar tahlili, bulutli hisoblashlar, raqamli savodxonlik, pedagogik eksperiment, Python, ta'limda innovatsiyalar, resurs tejamkor ta'lim.

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## **METHODOLOGY AND EFFECTIVENESS OF USING THE GOOGLE COLABORATORY PLATFORM IN THE BIG DATA EDUCATIONAL PROCES**

**Abstract** This article addresses a pressing issue in higher education for Big Data specialists: the lack of resource-intensive computing infrastructure. As a solution, a methodology using the free, cloud-based Google Colaboratory (Colab) platform is proposed. The study develops a step-by-step approach for configuring Big Data technologies like Apache Spark within the Colab environment and conducting practical sessions on data processing and analysis.

**Keywords:** Big Data, Google Colaboratory, teaching methodology, Apache Spark, PySpark, data analysis, cloud computing, digital literacy, pedagogical experiment, Python, educational innovation, resource-efficient education.



## Kirish (Introduction)

“Sanoat 4.0” va raqamli iqtisodiyot sharoitida Katta hajmli ma’lumotlar (Big Data) global miqyosda eng qimmatli aktivlardan biriga aylandi. Biznes, fan, tibbiyot va davlat boshqaruvida to’g’ri qarorlar qabul qilish uchun ulkan ma’lumotlar oqimini yig’ish, qayta ishlash va tahlil qilish qobiliyati strategik ahamiyat kasb etmoqda. Bu esa, o’z navbatida, mehnat bozorida Big Data texnologiyalari (Hadoop, Spark) bilan ishlay oladigan malakali mutaxassislariga bo’lgan talabni keskin oshirdi.

Ushbu tadqiqotning maqsadi — bepul, resurslarga oson kirish imkonini beruvchi Google Colaboratory platformasi yordamida Big Data texnologiyalarini o’qitishning samarali metodikasini ishlab chiqish va uning natijalarini baholashdan iborat.

Big Data’ni o’qitish muammolari ko’plab ilmiy ishlarda ko’tarilgan. Asosiy qiyinchilik sifatida “resurslar tafovuti” (resource gap) keltiriladi, ya’ni talabalarga real loyihalardagidek katta hajmdagi ma’lumotlar va taqsimlangan hisoblash muhitini taqdim etishning imkonsizligi ta’kidlanadi (Fox & Patterson, 2012). Ushbu muammoni yechish uchun virtualizatsiya va bulutli texnologiyalar (Amazon Web Services, Microsoft Azure) taklif etilgan, biroq ular ham ko’pincha tijoriy hisoblanadi va ta’lim muassasalari uchun ma’lum bir xarajatlarni talab qiladi.

Google Colaboratory (Colab) esa bu borada inqilobiy yechim taklif etadi. U Jupyter Notebook formatiga asoslangan bo’lib, brauzer orqali Python kodini yozish va ishga tushirish imkonini beradi. Eng muhimi, Colab bepul GPU va TPU resurslarini taqdim etadi va murakkab sozlashlarni talab qilmaydi (Carneiro et al., 2018). Dastlab asosan mashinaviy o’qitish va neyron tarmoqlar sohasida qo’llanilgan Colab, to’g’ri yondashuv orqali Big Data texnologiyalarini o’qitish uchun ham kuchli vositaga aylanishi mumkin. Biroq, Apache Spark kabi taqsimlangan hisoblash tizimlarini Colabning yagona mashina (single-node) muhitida o’rnatish va undan ta’lim metodikasi sifatida foydalanish bo’yicha tizimli tadqiqotlar yetarli emas.

Tadqiqotning maqsadi — Google Colab platformasi asosida Big Data texnologiyalarini o’qitish metodikasini ishlab chiqish va uning samaradorligini pedagogik eksperiment orqali tekshirishdan iborat.

Taklif etilayotgan metodika quyidagi bosqichlarni o’z ichiga oladi:

1. **Muhitni sozlash:** Talabalarga Colab muhitida Apache Sparkni ishga tushirish o’rgatiladi. Buning uchun pypark kutubxonasi pip yordamida o’rnatiladi va Spark sessiyasi yaratiladi. Bu jarayon talabalardan murakkab tizim administratorligi bilimlarini talab qilmaydi va bir necha qator kod bilan amalga oshiriladi.

2. **Ma’lumotlar bilan ishlash:** Amaliy mashg’ulotlar uchun ochiq, katta hajmli ma’lumotlar to’plamlari (masalan, Kaggle platformasidagi aviaparvozlar yoki onlayn-do’kon tranzaksiyalari ma’lumotlari) tanlanadi. Ma’lumotlar Google Drive orqali Colabga yuklanadi yoki to’g’ridan-to’g’ri internetdan o’qiladi.

Metodikaning samaradorligini baholash uchun Toshkent axborot texnologiyalari universitetining "Kompyuter injiniringi" yo’nalishi bo’yicha tahsil

olayotgan 60 nafar 3-kurs talabasi ishtirokida eksperiment o'tkazildi. Talabalar tasodifiy ravishda ikki guruhga bo'lindi:

- **Nazorat guruhi (30 nafar talaba):** "Big Data" fanini an'anaviy usulda o'rgandi (nazariy ma'ruzalar, shaxsiy kompyuterga o'rnatilgan kichik hajmli ma'lumotlar bilan ishlaydigan standart kutubxonalar).

- **Eksperimental guruh (30 nafar talaba):** Xuddi shu fanni yuqorida taklif etilgan Google Colab asosidagi metodika bo'yicha o'rgandi.

**Jadval 1. Eksperiment natijalarining qiyosiy tahlili**

| Ko'rsatkich                              | Nazorat guruhi | Eksperimental guruh | Farq                  |
|------------------------------------------|----------------|---------------------|-----------------------|
| Loyihani bajarish vaqti (o'rtacha, soat) | 15.2           | 9.1                 | <b>40.1% tezroq</b>   |
| Loyihadagi aniqlik (o'rtacha, %)         | 70.4%          | 88.2%               | <b>25.3% yuqori</b>   |
| Test natijalarining o'sishi              | +22%           | +45%                | <b>23% punkt ko'p</b> |

Natijalardan ko'rinib turibdiki, eksperimental guruh talabalari amaliy loyihani ancha tezroq va sifatliroq bajargan. Buning asosiy sababi, ular nazariyani darhol Colab muhitida real, katta hajmli ma'lumotlar bilan sinab ko'rish imkoniga ega bo'lganligidir. An'anaviy guruh esa infratuzilma cheklovlari tufayli asosan kichik ma'lumotlar bilan ishlashga majbur bo'lgan.

So'rovnoma natijalari ham bu xulosalarni tasdiqladi. Eksperimental guruh talabalarining 95%i Colabdan foydalanish o'quv jarayonini "qiziqarli va tushunarli" qilganini ta'kidlagan. Ularning eng ko'p qayd etgan afzalliklari: "dasturiy ta'minotni o'rnatish va sozlash bilan bog'liq muammolarning yo'qligi" va "istalgan joydan, faqat brauzer yordamida amaliy mashg'ulotlarni bajarish imkoniyati".

Olingan natijalar Google Colab platformasining nafaqat qulay vosita, balki Big Data ta'limidagi "resurslar tafovuti"ni bartaraf etuvchi kuchli pedagogik instrument ekanligini isbotlaydi. Ushbu metodika ta'lim jarayonini demokratizatsiya qiladi, ya'ni barcha talabalarga, ularning shaxsiy kompyuterlarining quvvatidan qat'i nazar, zamonaviy texnologiyalar bilan ishlash uchun teng imkoniyat yaratadi. Biroq, Colabning ba'zi cheklovlari ham hisobga olish lozim: sessiya vaqtining chegaralanganligi va uning haqiqiy ko'p tugunli (multi-node) klaster emasligi. Shunga qaramay, ta'lim maqsadlari uchun, ya'ni Big Data'ning fundamental konsepsiyalarini va dasturlash modellarini o'rgatish uchun uning imkoniyatlari to'liq yetarli.

Tadqiqot natijasida Katta hajmli ma'lumotlarni o'qitishda Google Colaboratory platformasidan foydalanishga asoslangan samarali va resurs tejankor metodika ishlab chiqildi va uning amaliy afzalliklari isbotlandi. Ushbu yondashuv universitetlarga qimmatbaho infratuzilmaga sarmoya kiritmasdan,

talabalarga zamonaviy va mehnat bozorida talab yuqori bo'lgan amaliy ko'nikmalarni berish imkonini yaratadi.

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## **DALACHOY, GAZANDA VA ERMON O`SIMLIKLARINING SUVLI EKSTRAKSIYALARINING ANTIRADIKAL FAOLLIGINI BAHOLASH**

**Annotatsiya.** Maqolada dalachoy, gazanda va ermon o'simliklarining yer ustki qismining suvli ekstraktlarining antiradikallik faolligini 2,2-difenil-1-pikrilgidrazil (DPPH) erkin radikallarini so'ndirish usulida spektrofotometrik baholash tadqiqot natijalari keltirilgan. Bu ekstraktlarning 1:1:1 hajmiy nisbatdagi antiradikal faolligi 100 mkl miqdori 30-daqiqada erkin radikallarni 76.17% ga kamaytirgani aniqlandi,  $IC_{50}$  ko'rsatkich qiymati esa 58.44 mkl ni tashkil etdi

**Kalit so'zlar:** antiradikal, dalachoy, gazanda, ermon, ingibirlash,  $IC_{50}$ , ARF%

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## **EVALUATION OF ANTI-RADICAL ACTIVITY OF AQUEOUS EXTRACTIONS OF HYPERICUM PERFORATUM L, URTICA DIOICA L AND ARTEMISIA ABSINTHIUM L PLANTS**

**Abstract.** The article presents the results of a study on the spectrophotometric assessment of the antiradical activity of aqueous extracts of the above-ground parts of the plants of dalacoy, gazanda and ermon by the method of quenching 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radicals. The antiradical activity of these extracts in a 1:1:1 volume ratio was found to be 76.17% reduction of free radicals in 30 minutes, and the  $IC_{50}$  value was 58.44  $\mu$ l.

**Key words:** antiradical, dalachoy, gazanda, ermon, ingibirlash,  $IC_{50}$ , ARF%

**Kirish.** O'zbekistonning barcha tumanlarida o'sadigan dalachoy, gazanda va ermon dorivor o'simliklar qatoriga kiradi. Dalachoy (*Hypericum perforatum*

l) hypericaceae oilasiga mansub ko'p yillik o'simlik. Bu o'simlik iyun-avgust oylarida gullab, mevasi iyul-sentyabr oylarida pishib yetiladi. Gazanda (*Ultica dioica* l) asteraceae (Qaychi-gul yoki Kauchinlar) oilasiga mansub ko'p yillik o'simlik. May-iyun oylarida gullab mava tugadi, o'simlikni hamma qismi achituvchi tuklar bilan qoplangan. Ermon (*Artemisia absinthium* l) asteraceae (Murakkabguldoshlar) ko'p yillik o'simlik bolib, iyun-may oylarida gullab, sentyabr-oktyabr oylarida mevasi yetiladi. Yuqorida keltirilgan dorivor o'simliklar xalq tabobatida jigar yallig'lanishi, jigar sirrozi hamda virusli gepatit kasalliklarini davolashda qo'llaniladi[1].

Ushbu maqolada dalachoy (*Hypericum perforatum* l), gazanda (*Ultica dioica* l), ermon (*Artemisia absinthium* l) o'simliklarining yer ustki qismlarining suvdagi 1:1:1 nisbatdagi ekstraksiyalarining antiradikallik faolligi tahlil qilingan. Erkin radikallar organizmda lipidlarni, oqsillarni hamda DNK strukturasini salbiy o'zgartirishi mumkin, bu erta qarishga va shu bilan birga bir qator kasalliklarining kelib chiqishiga asos bo'lishi mumkindir [2]. Erkin radikallarni katalitik so'ndiruvchi antiradikal yoki antioksidant faol birikmalarga xelat birikmalari, gormonlar, suvda va yog'da eriydigan vitaminlar, tiol guruhli aminokislotalar va polipeptidlar, fenolli birikmalar, flavonoidlar, karotinoidlar va boshqalar kiradi. Ushbu birikmalarning ko'pchiligi organizmda erkin radikal hosil bo'lishining zanjirli reaksiyasini to'xtatib, oksidlovchi stressning rivojlanishiga to'sqinlik qiladi. [3].

#### **Materiallar va metodlar.**

Binafsha rangli 2,2-difenil-1-pikrilgidrazil (DPPH) eritmasining rangsizlanishi vodorod atomi yoki elektronni beruvchi xususiyatlarga ega bo'lgan ba'zi sof antioksidant birikmalar mavjudligini aniqlash imkonini beradi. Barqaror DPPH bu spektrofotometrik tahlilda ishlatiladigan reagentdir [4]. Mazkur tajribada Blois [5] tomonidan amalga oshirilgan usul DPPH• erkin radikallarini ingibirlash xususiyatini baholash usuli kichik o'zgartirishlar bilan foydalanildi [6].

Hajmi 100 ml hajmli o'lchov kolbasida etanolda 7.92 mM DPPH eritmasi tayyorlanib, alyuminiy qog'ozga o'ralib 30 daqiqa xona haroratida qorong'i joyda saqlandi.

**Ekspremental qism.** Dalachoy, gazanda, ermon o'simliklaridan 1:1:1 nisbatlarda suvli ekstrakt tayyorlandi.

Ushbu na'munani tayyorlashda har bir o'simlikdan 1 gr dan tortib 25 ml distillangan suvda 20 daqiqa ultratovushli vannada ekstraksiya tayyorlandi va ular 1:1:1 hajmiy nisbatda aralashtirildi. Olingan ekstrakt 0,45 mkm li shpritsli filtrdan o'tkazilib, analiz uchun foydalanildi. [4]. 4 ml hajmli kvarts kyuvetaga 3 ml DPPH eritmasi va 100 mkl etanol (bo'sh namuna) qo'shib, spektrofotometrda joylashtirildi hamda 30 daqiqa davomida har 5 daqiqada 517 nm to'lqin uzunligida nur yutilishi ( $D_1$ ) YOKE (Xitoy) tomonidan ishlab chiqarilgan K7000 spektrofotometrda o'lchandi. Namunaning antiradikallik xususiyatini baholash uchun 25, 50, 75, 100 mkl namuna 3 ml DPPH eritmasi bilan aralashtirilib, yuqoridagi tartibda 517 nm dagi nur yutilishi ( $D_2$ ) o'lchandi.

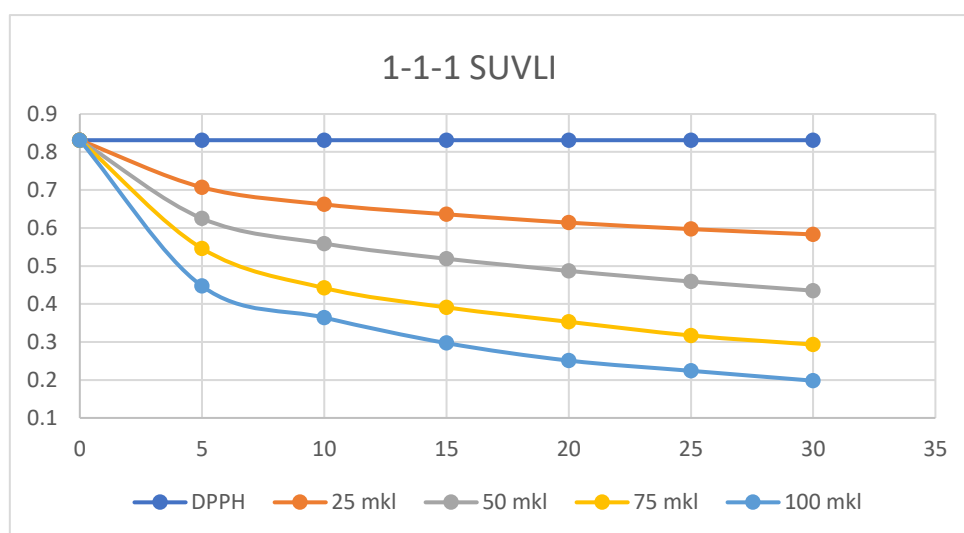
Kyuvetadagi eritmaning umumiy hajmini 3,1 ml ga yetkazish uchun qolgan qismiga etanol qo'shildi. Namunalarning antiradikallik xususiyati quyidagi formula bilan hisoblandi:

$$ARF\% = \frac{D_1 - D_2}{D_1} \cdot 100\%$$

1-jadval.

DPPH eritmasiga qo'shilgan bo'sh va tekshiriladigan **Dalachoy-Gazanda-Ermon(1:1:1)nisbatdagi** suvli ekstraksiya qilingan namunalarning o'lchangan nur yutilishi va hisoblangan antiradikallik faollik qiymatlari.

| Hajm, mkl | Vaqt, daq. | Namuna |       |     |            |        |       |
|-----------|------------|--------|-------|-----|------------|--------|-------|
|           |            | Abs, D | ARF%  |     | Vaqt, daq. | Abs, D | ARF%  |
| 25        | 0          | 0,831  | 0,00  | 75  | 0          | 0,831  | 0,00  |
|           | 5          | 0,707  | 14,92 |     | 5          | 0,546  | 34,30 |
|           | 10         | 0,662  | 20,34 |     | 10         | 0,442  | 46,81 |
|           | 15         | 0,636  | 23,47 |     | 15         | 0,391  | 52,95 |
|           | 20         | 0,614  | 26,11 |     | 20         | 0,353  | 57,52 |
|           | 25         | 0,597  | 28,16 |     | 25         | 0,317  | 61,85 |
|           | 30         | 0,583  | 29,84 |     | 30         | 0,293  | 64,74 |
| 50        | 0          | 0,831  | 0,00  | 100 | 0          | 0,831  | 0,00  |
|           | 5          | 0,625  | 24,79 |     | 5          | 0,447  | 46,21 |
|           | 10         | 0,559  | 32,73 |     | 10         | 0,364  | 56,20 |
|           | 15         | 0,519  | 37,55 |     | 15         | 0,297  | 64,26 |
|           | 20         | 0,487  | 41,40 |     | 20         | 0,251  | 69,80 |
|           | 25         | 0,459  | 44,77 |     | 25         | 0,224  | 73,04 |
|           | 30         | 0,435  | 47,65 |     | 30         | 0,198  | 76,17 |

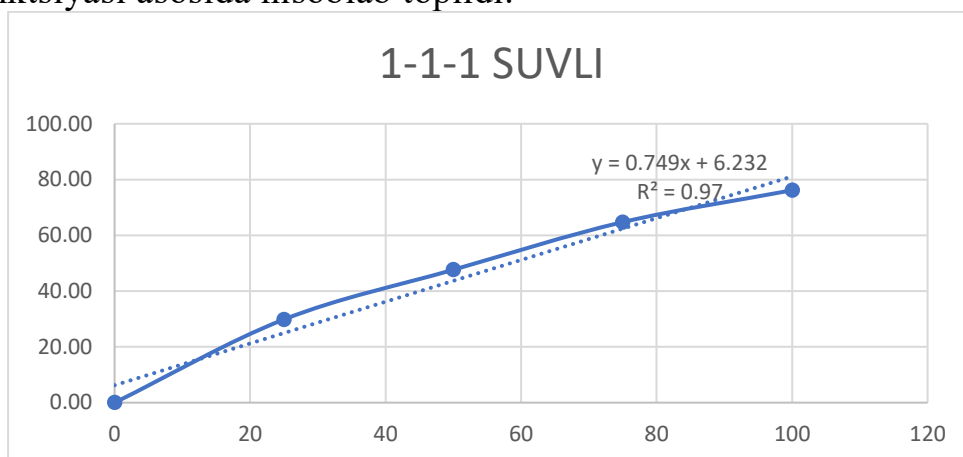


1-rasm. DPPH eritmasiga qo'shilgan bo'sh va tekshirilgan spirtli ekstraksiya qilingan namunalarning eritmalarining o'lchangan nur yutilishining grafikda ko'rinishi.

1-rasmda 25 mkl, 50 mkl, 75 mkl va 100 mkl li na'munalarni nur yutish ko'rsatkichlari keltirilgan. Namunalarning IC<sub>50</sub> – DPPH eritmasining 50 % gacha ingibirlash konsentratsiyasini hisoblash uchun har bir tajribada 30-daqiqadagi antiradikallik faolliklari (ARF%) qiymatlari va qo'shilgan spirtli



namunalar hajmi asosida quyidagi grafik tuzildi hamda unga o'tkazilgan trend chizig'i funktsiyasi asosida hisoblab topildi.



2-rasm. Spirtli ekstraksiya qilingan namunaning 10-daqiqada aniqlangan ARF% lari va hajmlari o'rastidagi bog'liqlik grafiki.

2-rasmdan ko'rishimiz mumkinki, grafikga o'tkazilgan trend chizig'i funktsiya formulasi  $y=mx+b$  dan 50 % ARF% namoyon qiluvchi hajmni ( $IC_{50}$ )  $x=(y-b)/m$  formulasi asosida hisoblanadi:

$$IC_{50} = \frac{(50 - 6.232)}{0.749} = 58.44 \text{ mkl}$$

**Xulosa.** Ushbu tadqiqot natijalari shuni ko'rsatdiki, tekshirilgan namuna asosida tayyorlangan suvli ekstrakt yuqori antiradikal faollikni namoyon etdi. Suvli ekstraktning 100 mkl miqdori 30-daqiqada erkin radikallarni **Dalachoy-Gazanda-Ermon (1:1:1) 76.17 %** ga kamaytirgani aniqlandi. Mazkur ekstraktning  $IC_{50}$  qiymati suvli ekstrakda **Dalachoy-Gazanda-Ermon (1:1:1) 58.44 mkl** ni tashkil etdi. Natijalar **Dalachoy-Gazanda-Ermon** o'simliklarining 1:1:1 suvli ekstraktlari tabiiy antioksidant manbai sifatida istiqbolli ekanligini ko'rsatadi.

Bu o'simliklar asosida tayyorlangan oziq-ovqat qo'shilmalari xalq tabobatida kuchli antiradikallik xususiyatiga ega bo'lib, erkin radikallarni neytrallab, jigar hujayralarini zarardan himoya qiluvchi, virusli gepatit, jigar fibrozi, jigar sirozi kabi kasalliklarini davolashda foyda beradi.

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## **EFFECTIVENESS OF SMALL BUSINESS SUPPORT INFRASTRUCTURE: STRATEGY AND MANAGEMENT**

**Abstract:** *The problems in a comprehensive strategy to support the development of small business and entrepreneurship from the perspective of the institutional approach are explained.*

**Key words:** *small business, private business, efficiency of an infrastructure, employment, system of support of business, factors of an infrastructure.*

Despite the intensification of activities to stimulate the private enterprise sector, the effectiveness of government actions to support small businesses does not always correspond to the efforts made. The uncoordinated focus of actions related to meeting the needs of the region determined the task of forming a management system for small business support bodies, the solution of which is necessary for the successful development of this sector of the economy.

- The following conceptual approaches that stimulate the formation and development of small businesses should be taken into account:

- provide not only conditions for the functioning of the system of small enterprises operating on the basis of various forms of ownership, but also their effective and sustainable development;

- be a dynamic system that promotes the emergence and establishment of new partnerships interacting with its components;

- be adequate to the level of development of small businesses and the needs of business structures, taking into account their sectoral and functional specialization;

- be accessible to all business structures (in terms of location, cost of business services and their quality, awareness of real opportunities, etc.) and provide opportunities to solve the most important problems of small business development (access to information networks, provision of property and information support, solving personnel problems, financial and tax consulting, etc.) [1. 116-117].

Based on this, we have formulated a strategy for the management system of small business support bodies, which consists of creating favorable conditions for the development of small business in Uzbekistan. Based on business process reengineering, we will determine the conditions and factors that have a direct impact on the successful development of small businesses.

The function of researching and updating the regulatory framework is carried out by the small business support infrastructure bodies. Management is carried out on the basis of current legislation, small business support programs and methods of

analysis and research. The result of performing the function is a developed strategy and an updated regulatory framework.

At the first stage, accumulated information is used to formulate a strategy. The periodically adjusted regulatory framework and action strategy guide the remaining functions. The strategy represents the most fundamental and important guidelines, plans, and intentions aimed at the development of small business.

The function of coordinating and motivating the activities of small business support bodies involves the development of a motivating model of their activities. At this stage, missing, weak, and duplicating functions are identified. The identified support functions and activities are then coordinated, taking into account horizontal and vertical integration, resulting in a modified structure. In addition, it is necessary to motivate entrepreneurship support bodies. This should be facilitated by a motivating model. The model represents the influence of motivating factors on improving the activities of small business support bodies. In this regard, coordination and motivational policies should be aimed at the development of small businesses.

The function of promoting the attraction of innovation is carried out by entrepreneurship support bodies. In addition to the above regulatory factors, there are criteria for evaluating investment projects. The result of this function is new products, goods and services. Profits are generated through the commercialization of innovative ideas.

The main direction of integrating the interests of small business and the banking sector should be strengthening their relations on a bilateral basis. The model we propose requires a change in the traditional ideology of relations between a bank and a small enterprise. These relations presuppose the presence of clearly formulated and formally enshrined principles and obligations at all points of intersection of economic interests [2].

Any process of successful regional development of small business does not happen on its own. Both successes and failures hide, in addition to aggressive factors of external influence, specific decisions that reflect the strategy and tactics of change management chosen by the leadership of the fog, the city and the region as a whole.

Taking into account the need to bring the research as close as possible to the practical result, we will consider the process of regional development in the context of the accompanying management process. In this context, the development process is understood as repeating cycles of four key stages:

- assessments of the current economic situation;
- developing strategic goals and objectives for the development of small businesses; identifying factors limiting the development of small businesses;
- development and implementation of strategies and measures for the sustainable development of small businesses.

The first stage includes:

1. Analysis of available information on the state of the economy and the small business sector, obtained both on the basis of secondary data (using the analysis of

state statistics, legal framework, etc.), and on the basis of sociological research carried out using survey technologies and qualitative methods.

However, it is important not so much to collect huge amounts of information and accurately describe them quantitatively, but to critically approach the assessment of even limited information, as well as qualitative trends in the observed processes that are available. A critical approach to assessing the system as a whole and its ability to fulfill its target functions is important.

In this regard, the disadvantage of the republic's typical approaches to planning and evaluating socio-economic programs in the field of supporting small business is their obvious inclination towards the traditional type. When assessing the state of the small business sector, it is important to use a comparative research method, which allows the heads of khokimiyats (local authorities) to understand the real situation, as well as critically evaluate the structural elements of the organizational infrastructure for supporting small businesses.

2. Determining priorities for the development of small business and its support system. To solve this problem, it is advisable to use qualitative research methods, such as direct interviewing, and conducting special focus group seminars. Within the framework of such seminars, joint discussions should be held on issues related to the development of entrepreneurship by representatives of the three stakeholders (state structures for supporting and controlling business activities, organizations of the business community and structures of the non-profit and public sector).

An important part of such seminars is the development of various options for the "problem tree" of entrepreneurship development in the region and their wide open discussion. Let us especially emphasize the importance of this work in anticipation of the construction of the "tree of goals". Building a "goal tree" without a "problem tree" easily turns into formal procedures for allocating resources to what can be done by certain service providers for small businesses, instead of what is a priority in light of limited resources.

One of the important factors for the success of the implementation of the second stage is the clear formulation of goals and objectives in relation to their specificity, measurability, achievability, reality and time limitation. Thus, as a result of the implementation of the above measures, the efficiency of the system for supporting small enterprises will increase, which will lead to an increase in the number of small enterprises, an increase in employment and their effective development.

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## **FINANCIAL MANAGEMENT AND FUNDING MECHANISMS FOR ENHANCING THE PROFESSIONAL SKILLS OF ECONOMISTS IN UZBEKISTAN: NEW 2025 STRATEGIES AND REFORMS**

**Abstract:** *This article analyzes the financing mechanisms and financial management issues related to the training and professional development of economists in Uzbekistan, incorporating the latest 2025 statistical data on education expenditure and national economic reforms. Given the ongoing institutional reforms and increased public investment in human capital, this study examines internal and external factors influencing resource allocation, evaluates current funding models, and proposes strategic recommendations for improving efficiency and sustainability. The findings highlight that effective financial management and diversified funding sources are crucial for meeting the growing demand for skilled economists and enhancing national economic performance.*

**Keywords:** *professional training, financial management, professional development, self-financing, efficiency, financial mechanism, financial governance concept, 2025 reforms.*

Market reforms emphasize the critical role of human capital in economic transformation. The effectiveness of reforms largely depends on the quality of professionals, particularly economists, who contribute to policy analysis, planning, and implementation. Thus, improving the financial governance of economist training systems has become a national priority. In 2025, Uzbekistan continued expanded investments in education and professional development as a core component of socio-economic strategy, with education spending significantly increasing compared to previous periods.

Previous research on education financing emphasizes the influence of both external (macroeconomic) and internal (institutional) factors on training outcomes. Financial governance in education affects resource mobilization, allocation, and effectiveness (Invest Uzbekistan, n.d.). However, dedicated studies on economist training financing in Uzbekistan remain limited, necessitating updated analysis in light of 2025 reforms.

In the context of the liberalization of the national economy, the need to develop training and retraining institutions, to improve the financial management of this sector, to scientifically study its problems in depth, and to search for ways to increase the efficiency of the use of funds allocated for training remain one of the urgent issues of today.

Improving the qualifications of economic personnel has a direct impact on the country's economy. The development or decline of the economy depends on the level of knowledge of economic personnel.

It should be noted that the amount of expenses in financing the system of training of economic personnel directly depends on the price of educational services. Its development is influenced by a number of factors, characterized by its character, level of difficulty, and different validity periods.

This study employs a descriptive analytical approach using secondary data from national statistics on education expenditure and economic performance in 2025. It identifies financial factors affecting professional development systems and compares financing mechanisms to propose improvements.

### 2025 Statistical Overview of Education Expenditure

In 2025, Uzbekistan recorded a significant increase in education spending across the country. Preliminary data show that total market-based education service spending in 2025 amounted to **39.6 trillion Uzbek soums**, representing a **10.4% increase compared to 2024**. Table 1 presents key education spending statistics for 2025.

**Table 1**  
**Education Expenditure in Uzbekistan (2025) (UZS Trillion Soums)**

| Category                                              | Amount (Trillion UZS) | Percentage Change vs 2024 |
|-------------------------------------------------------|-----------------------|---------------------------|
| <i>Total education services spending (2025)</i>       | 39.6                  | +10.4%                    |
| <i>Education spending as share of GDP (approx.)</i>   | ≈3.8%–4.0%            | —                         |
| <i>Total market education services (Jan-Nov 2025)</i> | 34.2                  | +8.8%                     |
| <i>Education spending Jan-Oct 2025</i>                | 30.4                  | +6.8%                     |
| <i>Education services 1Q25</i>                        | 8.1                   | +7.6%                     |

Sources: National Statistics Committee data (2025).

### Analysis of Financial Governance Mechanisms

Effective financial governance in professional development centers involves the systematic formation, allocation, and utilization of funds. This includes budgeting, performance-based financing, and diversified revenue sources such as:

1. **Public funding through state budget allocations** targeting strategic training initiatives;
2. **Market-based financing** through loans and service fees;
3. **Mixed financing** involving sponsorship and public-private cooperation.

These mechanisms are influenced by macroeconomic conditions, such as GDP growth and inflation, which in 2025 was notable with national economic growth of **7.7%**, indicating favorable conditions for increased public investment in human capital.



### Internal and External Financial Factors

As identified, funding for economist professional development depends on both external and internal factors. External factors include macroeconomic stability (inflation, wage levels), while internal factors cover curriculum design, training facilities, and instructor qualifications. These combined influences determine the effectiveness of financial governance and the long-term sustainability of training programs.

### Implications for Policy and Practice

Given the 2025 context, the article suggests:

- Implementing **voucher-based financing** schemes to empower learners and increase competition among training providers;
- Enhancing **performance-based budgeting** for institutions emphasizing outcomes like job placement and productivity improvements;
- Strengthening **public-private partnerships** to attract additional financial resources;
- Ensuring **regional equity** in funding to address geographic disparities in training access.

In conclusion, we believe that it is appropriate to pay special attention to the following in training and retraining of economic personnel in our republic, as in developed western countries, financing of educational centers for training and retraining of economic personnel in our country should be carried out at the expense of mandatory payments of enterprises and employers to the benefit of the state budget or a special fund.

The analysis reveals that Uzbekistan's education expenditure significantly increased in 2025, creating new opportunities to support professional development systems for economists. Enhanced financial management and diversified funding mechanisms are essential to meeting the growing demand for skilled professionals, aligning training programs with labor market needs, and sustaining economic growth.

As a result of improving the financial management of the system of professional development in training and retraining centers of economic personnel, the use of new forms and methods of increasing the efficiency of the allocation and use of budget funds will serve to stabilize the process of strengthening the statehood of the Republic of Uzbekistan, and will allow to find new and additional opportunities for financing the growing needs of professional development.

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## **STRATEGIC MANAGEMENT AND INSTITUTIONAL REFORM OF SMALL BUSINESS DEVELOPMENT IN UZBEKISTAN**

**Abstract:** *This paper examines the strategic management and institutional reform of the small business support system in Uzbekistan in the context of 2025 economic transformations. From an institutional perspective, the study analyzes the effectiveness of infrastructure bodies, innovation policy, financial mechanisms, and regional governance models in supporting entrepreneurship. Special attention is given to the modernization of banking mechanisms, the transformation of the Business Development Bank, expanded state co-financing instruments, digitalization of services, and innovation-driven growth strategies. The research substantiates that improving coordination, motivation, and integration between public institutions, financial organizations, and business entities increases the efficiency of small business support and contributes to sustainable economic growth, employment expansion, and competitiveness.*

**Key words:** *small business, institutional reform, entrepreneurship support system, infrastructure efficiency, innovation policy, business development bank, employment, digital transformation.*

Despite the intensification of activities to stimulate the private enterprise sector, the effectiveness of government actions to support small businesses does not always correspond to the efforts made. The uncoordinated focus of actions related to meeting the needs of the region determined the task of forming a management system for small business support bodies, the solution of which is necessary for the successful development of this sector of the economy.

The following conceptual approaches should be taken into account to stimulate the formation and development small business ties:

- provide not only conditions for the functioning of the system of small enterprises operating on the basis of various forms of ownership, but also their effective and sustainable development;
- to be a dynamic system that promotes the emergence and establishment of new partnerships interacting with its components;
- be adequate to the level of development of small businesses and the needs of business structures, taking into account their sectoral and functional specialization;
- be accessible to all business structures (according to location the cost of business services and their quality, awareness of real opportunities, etc.) and provide opportunities to solve the most important problems of small business development

(access to information networks, to provision of property and information support, personnel decisions problems, financial and tax consulting, etc.)

Based on this, we have formulated a strategy for the management system of small business support bodies, which consists in creating providing favorable conditions for the development of small businesses in Uzbekistan. Based on business process reengineering, we will determine the conditions and factors that have a direct impact on the successful development of small businesses.

The function of researching and updating the regulatory framework is carried out by the small business support infrastructure bodies. Management is carried out on the basis of current legislation, small business support programs and methods of analysis and research. The result of performing the function is a developed strategy and an updated regulatory framework. At the first stage, accumulated information is used to formulate a strategy. The periodically adjusted regulatory framework and action strategy govern the remaining functions. The strategy represents the most fundamental and important guidelines, plans, intentions aimed at the development of small businesses.

The function of coordinating and motivating the activities of small business support bodies involves the development of a motivating model for their activities. At this stage, missing, weak, and duplicating functions are identified. The identified functions and activities of the support bodies are then coordinated, taking into account horizontal and vertical integration, resulting in a modified structure. In addition, it is necessary to motivate business support bodies. This should be facilitated by a motivating model. The model represents the influence of motivating factors on improving the activities of small business support bodies. In this regard, coordination and motivation

Innovation policy should be aimed at the development of small businesses.

The function of promoting the attraction of innovation is carried out by entrepreneurship support bodies. In addition to the above regulatory factors, there are criteria for evaluating investment projects. The result of this function is new products, goods and services. Profit is generated through the commercialization of innovative ideas.

Function of protecting the interests of entrepreneurs. This function is carried out by the regional branch of the chamber of commerce and industry. Small business support infrastructure bodies must be involved in the implementation of all functions. Thus, taking into account the structure of a detailed model for supporting small businesses, it is possible to develop programs of priority measures aimed at creating favorable conditions for the development of small businesses.

The main direction of integrating the interests of small business and the banking sector should be strengthening their relations on a bilateral basis. The model we propose requires a change in the traditional ideology of relations between a bank and a small enterprise. These relationships presuppose the presence of clearly formulated and formally closed captive principles and obligations at all points of intersection of economic interests.

Any process of successful regional development of small business does not happen on its own. Both successes and failures hide, in addition to aggressive factors of external influence, specific decisions that reflect the strategy and tactics of change management chosen by the leadership of the fog, the city and the region as a whole.

Taking into account the need to bring the research as close as possible to the practical result, we will consider the process of regional development in the context of the accompanying management process. In this context, the development process is understood as repeating cycles of four key stages:

- assessments of the current economic situation;
- developing strategic goals and objectives for the development of small businesses; identifying factors limiting the development of small businesses;
- development and implementation of strategies and measures for the sustainable development of small businesses.

In 2025, Uzbekistan continues large-scale institutional reforms aimed at strengthening the private sector and increasing the contribution of small business to national economic growth. Despite significant efforts to stimulate entrepreneurship, challenges remain in ensuring coordination among support institutions and aligning strategic goals with regional needs.

The comprehensive strategy for small business development is based on:

- creating a sustainable and innovation-oriented institutional ecosystem;
- digital integration of support services;
- expanding access to financial resources through public-private partnership mechanisms;
- strengthening accountability and performance measurement of support bodies.

In 2025, special emphasis is placed on digital governance, simplification of regulatory procedures, and introduction of performance-based evaluation mechanisms for entrepreneurship support institutions.

Therefore, the development of private entrepreneurship is not only an important factor of economic efficiency, but also of social well-being. In our opinion, the benefits given to entrepreneurs on the provision of labor resources, providing them with the necessary resources for their work process and receiving benefits through this will greatly contribute to the satisfaction and initiative in their work, and to the provision of an active way of life to all layers of the population. In addition to the benefits provided, it is necessary to mention the following suggestions:

- raising the level of knowledge and education of the population to a high level,
- high use of foreign experiences,
- creation and export of new intellectual goods,
- the formation of modern, comfortable and well-being industries can also be the basis for the development of business activities and thereby increase the level of employment.

The conclusion is that through the development of entrepreneurship, the opportunities to ensure the level of employment of the population will increase, and it will create the basis for the improvement of economic well-being in the future.

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## **QASHQADARYO VILOYATI TEKISLIK NOZOGEOGRAFIK RAYONIDAGI KASALLILLARNING NOZOEKOLOGIK SABABLARI**

**Annotatsiya:** Mazkur maqolada Qashqadaryo viloyati tekislik nozogeografik rayonida uchraydigan kasalliklarning nozoekologik sabablari tahlil qilinadi. Tadqiqotda hududning tabiiy-geografik sharoiti, iqlim omillari, tuproq va suv resurslarining holati hamda antropogen ta'sirlarning aholi salomatligiga ta'siri ilmiy asosda yoritiladi. Shuningdek, ekologik muhitning o'zgarishi va resurslardan foydalanish darajasi ayrim kasalliklarning shakllanishi hamda hududiy tarqalishiga ta'sir etuvchi muhim omil sifatida baholanadi.

**Kalit so'zlar:** Qashqadaryo viloyati, nozogeografiya, nozoekologiya, kasalliklar geografiyasi, ekologik omillar, tekislik hududi, aholi salomatligi.

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## **NOZOEKOLOGICAL CAUSES OF DISEASES IN THE PLAIN NOZOGEOGRAPHICAL REGION OF KASHKADARYA REGION**

**Abstract:** This article analyzes the noso-geographical causes of diseases in the plain noso-geographical region of Kashkadarya region. The study scientifically covers the natural and geographical conditions of the region, climatic factors, the state of soil and water resources, and the impact of anthropogenic influences on the health of the population. Also, changes in the ecological environment and the level of resource use are considered important factors affecting the formation and territorial spread of certain diseases.

**Keywords:** Kashkadarya region, nosogeography, nosoecology, geography of diseases, ecological factors, plain area, public health.

Qashqadaryo viloyatining tekislik nozogeografik rayonida kasallik ko'rsatkichlari ancha yuqori ekanligi diqqatga sazovor. Ayniqsa, ovqat hazm qilish tizimi, qon aylanish tizimi, siydik tanosil tizimi va qand kasalligi kabi kasalliklarda tekislik hududi ko'p uchraydi. Bu hududning qurg'oqchil iqlimi, suv resurslarining cheklanganligi, ekotizimlarning zaifligi va sanitariya sharoitlarining pastligi bu kasalliklarning yuqori darajada tarqalishiga sabab bo'lmoqda. Shuningdek, tekislik rayonida aholi zichligi nisbatan past bo'lsa ham, sog'liqni saqlash xizmatlariga bo'lgan yetarli e'tibor va resurslarning cheklanganligi kasalliklar ko'rsatkichlarini oshirishga olib kelmoqda. Shunday qilib, tekislik rayonining ekologik sharoitlari va ijtimoiy-sanitariya muammolari

bu hududda kasalliklarning yuqori darajada tarqalishiga sabab bo'lgan asosiy omillar sifatida ko'rinadi.

Tekislik nozogeografik rayonida kasalliklar ko'rsatkichlari viloyat bo'yicha umumiy ko'rsatkichlardan ancha yuqori bo'lib, bu hududning ekologik, sanitariya va oziq-ovqat xavfsizligi bilan bog'liq omillar bilan izohlanadi. Masalan, Qon va qon yaratish tizimi kasalliklari ko'rsatkichi Tekislik rayonida 30 468,1 (har 100 000 aholiga) ni tashkil etsa, viloyat bo'yicha bu raqam 63 889,8 bo'lib, bu Tekislik rayonining viloyatga nisbatan 47,7% ko'proq ekanligini ko'rsatadi (3.4-jadval). Bunday yuqori ko'rsatkichlarning sabablaridan biri – hududdagi oziq-ovqat sifatining pastligi, qishloq xo'jaligi va tibbiy yordamning cheklanganligi hamda issiq iqlimning ta'siri. Ovqat hazm qilish tizimi kasalliklari ko'rsatkichi ham Tekislik rayonida 56 084,8 bo'lib, viloyat bo'yicha 114 648,8 dan ancha yuqori, ya'ni bu kasalliklar viloyatga nisbatan 48,9% yuqoriroq tarqalgan.

Bu hududda ichimlik suvi sifatining pastligi, oziq-ovqatning xilma-xilligining cheklanganligi va sanitariya sharoitlarining yomonligi ovqat hazm qilish tizimi kasalliklarining yuqori darajada tarqalishiga olib kelgan. Qon aylanish tizimi kasalliklari ko'rsatkichi ham yuqori bo'lib, Tekislik rayonida 46 963 (har 100 000 aholiga), viloyat bo'yicha esa 138 170 ni tashkil etadi, bu raqamlar viloyatga nisbatan 34,0% ko'proq ekanligini ko'rsatadi.

**Tekislik nozogeografik rayonidagi kasalliklar ko'rsatkichlari va nozoeologik sabablari**

| <b>Kasallik turi</b>                           | <b>Tekislik rayon (100 000 aholiga)</b> | <b>Niloyat bo'yicha (100 000 aholiga)</b> | <b>Niloyatga nisbatan, foizda</b> | <b>Rayon ichida eng yuqori</b>             | <b>Nozoeologik sabablari</b>                                                                                                                  |
|------------------------------------------------|-----------------------------------------|-------------------------------------------|-----------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Qon va qon yaratish tizimi kasalliklari</b> | 30 468,1                                | 63 889,8                                  | 47,7                              | <b>Mirishkor (10 234,7)</b>                | Tekislik hududlarda iqlimning quruqligi va issiqlik anemiyani kuchaytirishi mumkin. Oziq-ovqat sifatining pastligi ham ta'sir qilishi mumkin. |
| <b>Ovqat hazm qilish tizimi kasalliklari</b>   | 56 084,8                                | 114 648,8                                 | 48,9                              | <b>Mirishkor (13 189,3)</b>                | Tekislik hududlarda ichimlik suvi sifati past, oziq-ovqat xilma-xilligi kamroq, bu oshqozon-ichak kasalliklarini oshirishi mumkin.            |
| <b>Qon aylanish tizimi kasalliklari</b>        | 46 963                                  | 138 170                                   | 34,0                              | <b>Qarshi sh. (11 880), Koson (12 564)</b> | Issiq iqlim, harakatning kamligi va yog'li ovqat iste'moli yurak-qon tomir kasalliklarini kuchaytiradi.                                       |
| <b>Siydik-tanosil tizimi kasalliklari</b>      | 60 511                                  | 148 358                                   | 40,8                              | <b>Qarshi (13 155)</b>                     | Tekislik hududlarida suv sifati pastligi va tuz miqdorining yuqoriligi bu kasallikni kuchaytirishi mumkin.                                    |
| <b>Teri va teri osti to'qima kasalliklari</b>  | 22 014                                  | 45 270                                    | 48,6                              | <b>Nishon (7 324)</b>                      | Issiq va quruq iqlim teri kasalliklarini kamaytirsam ham,                                                                                     |

|                                   |       |        |      |                                      |                                                                                                                |
|-----------------------------------|-------|--------|------|--------------------------------------|----------------------------------------------------------------------------------------------------------------|
|                                   |       |        |      |                                      | chang va ifloslanish ba'zi kasalliklarni keltirib chiqaradi.                                                   |
| <b>Nirusli gepatit</b>            | 3 279 | 8 116  | 40,4 | <b>Koson (1 357)</b>                 | Tekislik hududlarida suv manbalari gigiyenik jihatdan xavfli bo'lishi mumkin.                                  |
| <b>Qand kasalligi</b>             | 7 773 | 15 558 | 50,0 | <b>Qarshi sh. (2 664)</b>            | Tekislik hududlarida yog'li va shirin ovqat iste'moli nisbatan yuqori bo'lib, qand kasalligi xavfini oshiradi. |
| <b>Brutsellyoz</b>                | 32    | 83     | 38,5 | <b>Muborak (8), Qarshi (4)</b>       | Tekislik hududlarida chorvachilik kamroq rivojlanganligi brutsellyoz kasalligini kamaytirgan.                  |
| <b>O'tkir ichak infeksiyalari</b> | 2 230 | 4 438  | 50,3 | <b>Koson (599), Qarshi sh. (567)</b> | Ichimlik suvi sifatining pastligi va sanitariya sharoitlari ichak infeksiyalarini kuchaytirishi mumkin.        |

*Jadval Qashqadaryo viloyati sanitariya-epidemiologik osoyishtalik va jamoat salomatligi xizmati ma'lumotlari asosida muallif tomonidan tuzilgan.*

Brutsellyoz kasalligi esa Tekislik hududida kamroq tarqalgan bo'lib, faqat 32 holat qayd etilgan, bu viloyatdagi 83 holatga nisbatan ancha past. Bu, o'z navbatida, chorvachilikning kam rivojlanishi va sanitariya sharoitlarining yomonligidan kelib chiqadi. Nihoyat, O'tkir ichak infeksiyalari ko'rsatkichi Tekislik hududida 2 230 bo'lib, viloyat bo'yicha esa 4 438 ni tashkil etadi, bu raqamlar viloyatga nisbatan 50,3% yuqoriligini ko'rsatadi.

Shunday qilib, Tekislik nozogeografik rayonidagi kasalliklar yuqori bo'lishi ekologik va ijtimoiy omillar, shu jumladan, past sanitariya sharoitlari, quruq iqlim, oziq-ovqat xavfsizligi va suv manbalarining sifati bilan bevosita bog'liq ekanligini ko'rsatadi. Suvning qattiqlik darajasi ham kasalliklarning tarqalishiga ta'sir ko'rsatadi, ayniqsa Cho'l hududida. Suvning qattiqligi, ya'ni undagi minerallar va tuz miqdorining yuqoriligi, ayrim kasalliklarni kuchaytirishi mumkin. Yuqori tuz miqdori va suvdagi minerallar bu kasalliklarni kuchaytirishi, bu hududda yashovchi aholi orasida siydik tizimi bilan bog'liq kasalliklarni ko'paytirishi ehtimoli mavjud.

**Xulosa:** O'tkazilgan tadqiqotlar natijalari shuni ko'rsatadiki, Qashqadaryo viloyati ning tekislik nozogeografik rayonida ayrim kasallik turlarining tarqalish darajasi viloyatning o'rtacha ko'rsatkichlariga nisbatan yuqoriroq ekanligi kuzatiladi. Ayniqsa, qon va qon yaratish tizimi, ovqat hazm qilish tizimi, qon aylanish tizimi, siydik-tanosil tizimi hamda qand kasalligi kabi kasalliklar ushbu hududda keng tarqalgan. Bu holat hududning tabiiy-geografik sharoiti, ekologik muhitning o'ziga xosligi hamda ijtimoiy-sanitariya omillari bilan bevosita bog'liq ekanligi aniqlanadi.

Tekislik hududlariga xos bo'lgan qurg'oqchil va issiq iqlim sharoiti, suv resurslarining cheklanganligi hamda ichimlik suvining mineral tarkibidagi tuz miqdorining yuqoriligi aholi salomatligiga sezilarli ta'sir ko'rsatadi. Xususan,

suvning qattiqligi va undagi mineral moddalarning yuqori konsentratsiyasi siydik-tanosil tizimi kasalliklari, ovqat hazm qilish tizimi buzilishlari hamda ayrim metabolik kasalliklarning ko'payishiga sabab bo'lishi mumkin. Bundan tashqari, hududda oziq-ovqat mahsulotlarining xilma-xilligi yetarli emasligi, ayrim mikroelementlarning yetishmasligi hamda ovqatlanish madaniyatining yetarli darajada shakllanmaganligi qon va qon yaratish tizimi kasalliklari, xususan, kamqonlik (anemiya) kabi kasalliklarning ko'payishiga olib kelmoqda.

Tadqiqot natijalari shuningdek, sanitariya-gigiyena sharoitlari va ichimlik suvi ta'minoti darajasining ham kasalliklar tarqalishiga sezilarli ta'sir ko'rsatishini ko'rsatadi. Ichimlik suvi sifatining pastligi, suv manbalarining gigiyenik jihatdan yetarli darajada muhofaza qilinmaganligi hamda maishiy sanitariya sharoitlarining yetarli emasligi ovqat hazm qilish tizimi kasalliklari, virusli gepatit hamda o'tkir ichak infeksiyalarining ko'payishiga sabab bo'lmoqda. Shu bilan birga, ayrim hududlarda urbanizatsiya jarayonlari, turmush tarzining o'zgarishi, jismoniy faollikning kamayishi va yuqori kaloriyali oziq-ovqat iste'molining ortishi yurak-qon tomir kasalliklari hamda qand kasalligining ko'payishiga zamin yaratmoqda.

Umuman olganda, tekislik nozogeografik rayonida kasalliklarning shakllanishi va hududiy tarqalishi tabiiy-geografik omillar (iqlim, suv va tuproq sharoiti), ekologik muhitning holati hamda ijtimoiy-sanitariya omillarining o'zaro ta'siri bilan belgilanadi. Shuning uchun ham hududda aholi salomatligini yaxshilash va kasalliklarning oldini olish maqsadida ichimlik suvi sifatini yaxshilash, sanitariya-gigiyena sharoitlarini takomillashtirish, ekologik muhitni muhofaza qilish hamda profilaktik tibbiy xizmatlarni kuchaytirish muhim ilmiy-amaliy ahamiyat kasb etadi.

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## **DALACHOY, GAZANDA VA ERMON O'SIMLIKLARINING SPIRTLII EKSTRAKSIYALARINING ANTIRADIKALLIK FAOLLIGINI BAHOLASH**

**Annotatsiya.** Ushbu maqolada dalachoy, gazanda va ermon o'simliklarinin g spirtli ekstraksiya-larining antiradikallik xususiyatlari 2,2-difenil-1-pikrilgidrozil (DPPH) erkin radikalini so'ndirish usulida spektrofotometrik baholash tadqiqot natijalari keltirilgan. Ekstraktlarning antiradikal faolligi 1:1:1 hajmiy nisbatdagisi eng yuqori bo'lib, aniqlangan  $IC_{50}$  ko'rsatkichi 218.17 mkl ni tashkil etdi.

**Kalit so'zlar:** antiradikal, dalachoy, gazanda, ermon, ingibirlash,  $IC_{50}$ , ARF%

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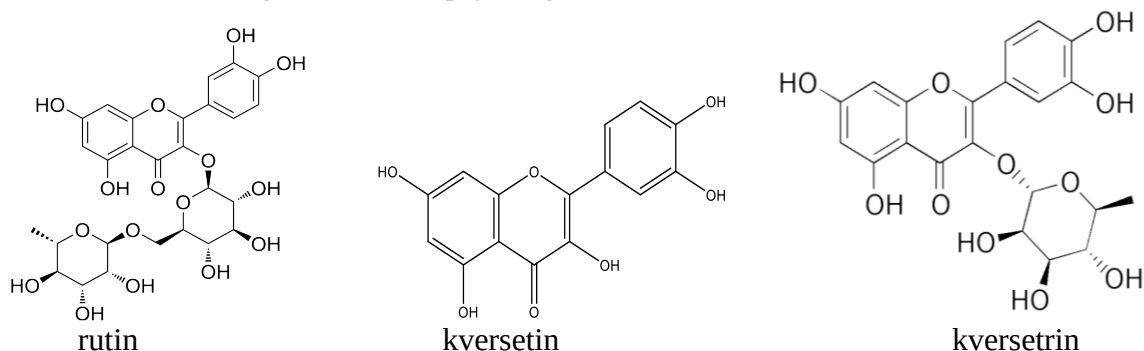
## **EVALUATION OF ANTI-RADICAL ACTIVITY OF ALCOHOLIC EXTRACTIONS OF HYPERICUM PERFORATUM L, URTICA DIOICA L AND ARTEMISIA ABSINTHIUM L PLANTS**

**Abstract.** This article presents the results of a study on the antiradical properties of alcoholic extracts of dalachai, gazanda and ermon plants using the 2,2-diphenyl-1-picrylhydrosyl (DPPH) free radical quenching method. The antiradical activity of the extracts was highest in the 1:1:1 volume ratio, and the determined  $IC_{50}$  index was 218.17  $\mu$ l.

**Key words:** antiradical, dalachoy, gazanda, ermon, ingibirlash,  $IC_{50}$ , ARF%

**Kirish.** Organizmda hosil bo'luvchi erkin radikallar asosan kislorod va azotning faol shakllaridan kelib chiqadi va organizmdagi turli endogen tizimlar, har xil fizik-kimyoviy sharoitlar yoki patofiziologik sharoitlar ta'sirida hosil bo'ladi. Erkin radikallar lipidlarni, oqsillarni va DNKni salbiy o'zgartirishi mumkin bu esa jigar, yurak-qon tomirlari kasalliklari, dibet va saraton kasalliklarini qo'zg'atadi. Organizmning radikallanish va oksidlanish jarayonini pasaytirishning eng muhim yo'llaridan biri, kelib chiqishi o'simlik bo'lgan foydali komponentlarga boy tabiiy, ekzogen oziq-ovqat qo'shilmalarini iste'mol qilishdir[1].

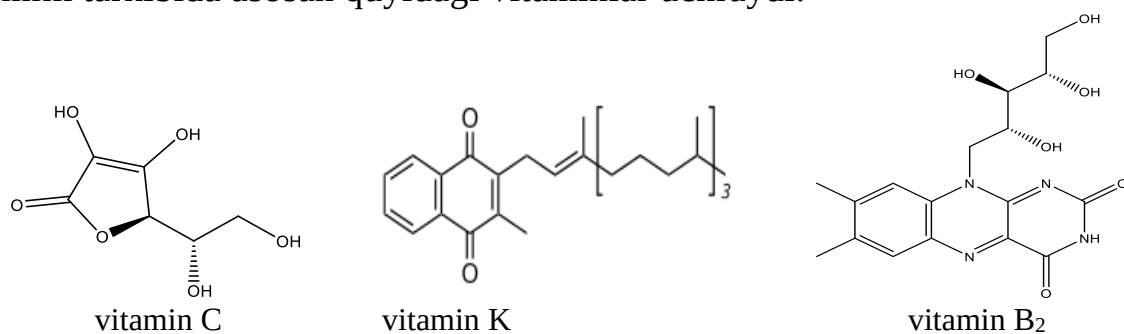
Dalachoy O'zbekiston hududining barcha joylarida o'suvchi, bo'yi 30-100 sm atrofida bo'lgan ko'p yillik o'simlik. Dalachoy jigar sirrozi davolashda ishlatiladi. Uning tarkibida quyidagi flavonoidlar uchraydi.



1-rasm. Dalachoy o'simligi tarkibida uchrovchi fenolli birikmalar.

1-ramda ko'rsatilgan dalachoy o'simligi tarkibidagi bu fenolli birikmalar antioksidantlik va antiradikallik xolatini namoyon qilishga asos bo'la oladi [2].

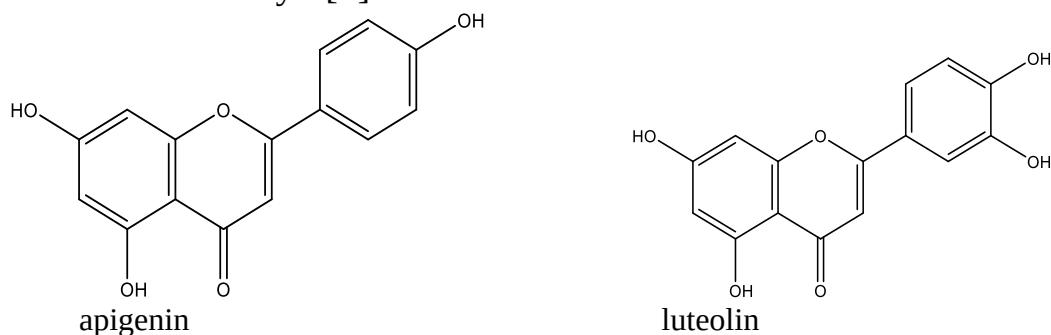
Gazanda mamlakatimizning barcha tumanlarida uchraydigan, bo'yi 60-150 sm bo'lgan ko'p yillik o'simlik. Uning maydalangan bargida jigar yallig'lanishi, ildizidan esa jigar sirrozi kasalliklarini davolashda ishlatiladi. Bu o'simlik tarkibida asosan quyidagi vitaminlar uchraydi.



2-rasm. Gazanda o'simligi tarkibida uchrovchi vitaminlar.

2-rasm gazanda o'simligining barg qismida uchrovchi biologik faol birikmalarga na'munalar ko'rsatilgan.

Ermon bo'yi 50-100 sm bo'gan ko'p yillik o'simlik. Bu o'simlikning yer ustki qismi jigar yallig'lanishiga qarshi ishlatiladi. Ermon poyasi va bargida asosan antioksidantlik xossasini namoyon qiluvchi, kversetin, apigenin, luteolin kabi flavonoidlar uchraydi [1].



3-rasm. Ermon o'simligi tarkibida uchrovchi ayrim flavonoidlar



3-rasmda ko'rsatilgan flavonoidlar organizmda erkin radikallarni neytrallaydi, **jigarni himoyalash (gepatoprotektiv)**, toksinlarni zararsizlantirish jarayonini qo'llab-quvvatlaydi va jigar hujayralarini tiklanishiga yordam beradi [3].

#### **Namunaning antiradikallik xususiyatini DPPH metodi bilan baholash**

Binafsha rangli 2,2-difenil-1-pikrilgidrazil (DPPH) eritmasining rangsizlanishi vodorod atomi yoki elektronni beruvchi xususiyatlarga ega bo'lgan ba'zi sof antioksidant birikmalar mavjudligini aniqlash imkonini beradi. Barqaror DPPH• bu spektrofotometrik tahlilda ishlatiladigan reagentdir [4]. Mazkur tajribada Blois [5] tomonidan amalga oshirilgan usul DPPH• erkin radikallarini ingibirlash xususiyatini baholash usuli kichik o'zgartirishlar bilan foydalanildi [6].

**DPPH• ishchi eritmasini tayyorlash.** 100 ml hajmli o'lchov kolbasida etanolda 7.92 mM DPPH• eritmasi tayyorlanib, alyuminiy qog'ozga o'ralib 30 daqiqa xona haroratida qorong'i joyda saqlandi.

**Tajriba qism.** Namunalarning ekstraktlarini tayyorlashda 1 g o'simlik namunasini 25 ml 96 % li etanolda 20 daqiqa ultratovushli vannada ekstraksiya qilish bilan amalga oshirildi. Olingan ekstrakt 0,45 mkm li shpirtsli filtrdan o'tkazilib, analiz uchun foydalanildi. Filtrlab olingan spirtli namunalar 10 barobar suyultirildi. Dalachoy, gazanda va ermon o'simliklarini na'munalardan foydalanib jami 6 xil hajmiy nisbatda 1:1:1, 3:1:1, 1:3:1, 1:1:3, 3:2:1, 2:3:1 ekstraksiyalar tayyorlab oldik.

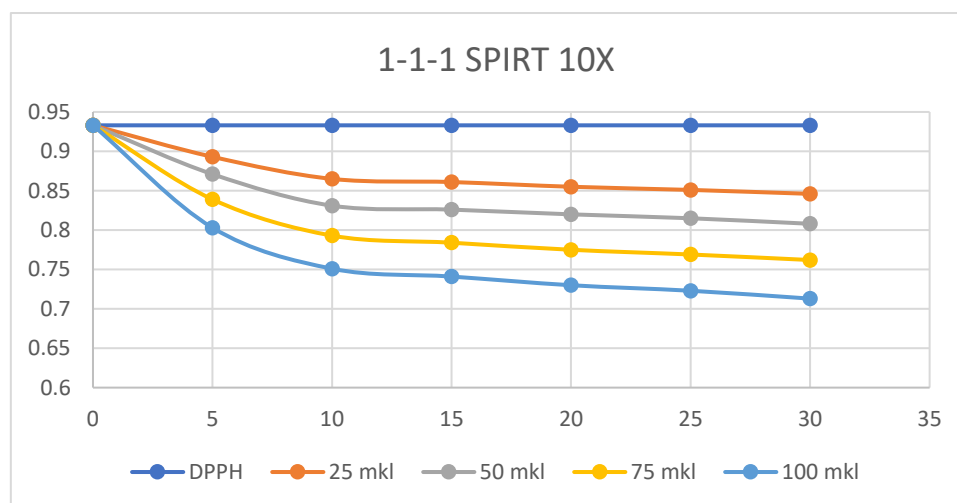
*Namunalarning antiradikallik xususiyatini aniqlash.* 4 ml hajmli kvarts kyuvetaga 3 ml DPPH eritmasi va 100 mkl etanol (bo'sh namuna) qo'shib, spektrofotometrda joylashtirildi hamda 30 daqiqa davomida har 5 daqiqada 517 nm to'lqin uzunligida nur yutilishi ( $D_1$ ) YOKE (Xitoy) tomonidan ishlab chiqarilgan K7000 spektrofotometrda o'lchandi. Namunaning antiradikallik xususiyatini baholash uchun 25, 50, 75, 100 mkl namuna 3 ml DPPH eritmasi bilan aralashtirilib, yuqoridagi tartibda 517 nm dagi nur yutilishi ( $D_2$ ) o'lchandi. Kyuvetadagi eritmaning umumiy hajmini 3,1 ml ga yetkazish uchun qolgan qismiga etanol qo'shildi. Namunalarning antiradikallik xususiyati quyidagi formula bilan hisoblandi:

$$ARF\% = \frac{D_1 - D_2}{D_1} \cdot 100\%$$

Olingan natijalar quyidagi jadvalda berildi:

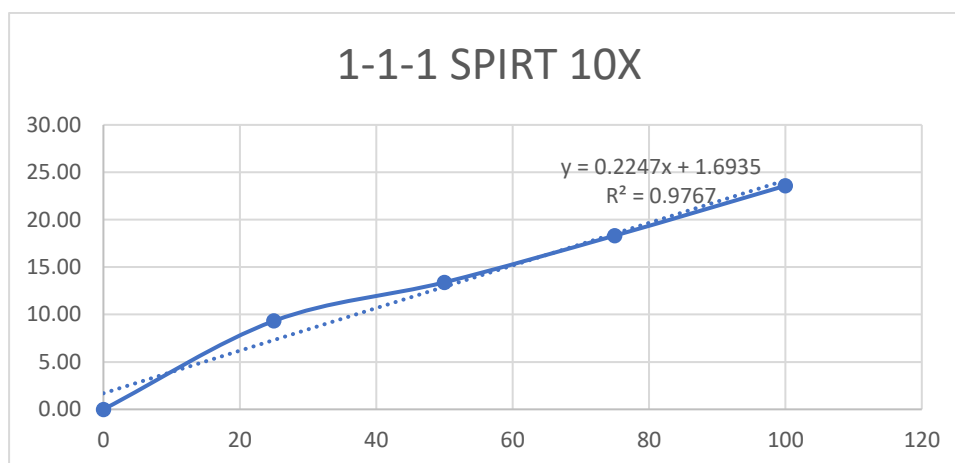
DPPH eritmasiga qo'shilgan bo'sh va tekshiriladigan **Dalachoy-Gazanda-Ermon(1:1:1)nisbatdagi** spirtli ekstraktsiya qilingan namunalarning o'lchangan nur yutilishi va hisoblangan antiradikallik faollik qiymatlari.

| Hajm, mkl | Vaqt, daq. | Namuna |              |     |            |        |              |
|-----------|------------|--------|--------------|-----|------------|--------|--------------|
|           |            | Abs, D | ARF%         |     | Vaqt, daq. | Abs, D | ARF%         |
| 25        | 0          | 0,933  | 0,00         | 75  | 0          | 0.933  | 0.00         |
|           | 5          | 0.893  | 4.29         |     | 5          | 0.839  | 10.08        |
|           | 10         | 0.865  | 7.29         |     | 10         | 0.793  | 15.01        |
|           | 15         | 0.861  | 7.72         |     | 15         | 0.784  | 15.97        |
|           | 20         | 0.855  | 8.36         |     | 20         | 0.775  | 16.93        |
|           | 25         | 0.851  | 8.79         |     | 25         | 0.769  | 17.58        |
|           | 30         | 0.846  | <b>9.32</b>  |     | 30         | 0.762  | <b>18.33</b> |
| 50        | 0          | 0.933  | 0.00         | 100 | 0          | 0.933  | 0.00         |
|           | 5          | 0.871  | 6.65         |     | 5          | 0.803  | 13.93        |
|           | 10         | 0.831  | 10.93        |     | 10         | 0.751  | 19.51        |
|           | 15         | 0.826  | 11.47        |     | 15         | 0.741  | 20.58        |
|           | 20         | 0.82   | 12.11        |     | 20         | 0.73   | 21.76        |
|           | 25         | 0.815  | 12.65        |     | 25         | 0.723  | 22.51        |
|           | 30         | 0.808  | <b>13.40</b> |     | 30         | 0.713  | <b>23.58</b> |



4-rasm. DPPH eritmasiga qo'shilgan bo'sh va tekshirilgan spirtli ekstraktsiya qilingan namunalar eritmalarining o'lchangan nur yutilishining grafikda ko'rinishi.

4-rasmdan ko'rishimiz mumkinki DPPH eritmasiga qo'shilgan spirtli ekstraktsiyalarning nur yutilishi ko'rsatkichlari keltirilgan bo'lib, namunalarning  $IC_{50}$  – DPPH eritmasining 50 % gacha ingibirlash konsentratsiyasini hisoblash uchun har bir tajribada 30-daqiqadagi antiradikallik faolliklari (ARF%) qiymatlari va qo'shilgan spirtli namunalarning hajmi asosida quyidagi grafik tuzildi hamda unga o'tkazilgan trend chizig'i funktsiyasi asosida hisoblab topildi.



5-rasm. Spirtli ekstraksiya qilingan namunaning 10-daqiqada aniqlangan ARF% lari va hajmlari o'rastidagi bog'liqlik grafiki.

5-rasmda ko'rsatilgan grafikga o'tkazilgan trend chizig'i funksiya formulasi  $y=mx+b$  dan 50 % ARF% namoyon qiluvchi hajmni ( $IC_{50}$ )  $x=(y-b)/m$  formulasi asosida hisoblandi:

$$IC_{50} = \frac{(50 - 0.9767)}{0.2247} = 218.17 \text{ mkl}$$

Huddi shunday metod bilan qolgan nisbatda olingan na'munalarni ham antiradikallik faoligi o'lchangan, olingan natijalar 2-jadvalda ko'rsatilgan.

2-jadval.

Namunalarning 10 barobar suyultirilgan spirtli ekstraktlarining  $IC_{50}$  – DPPH radikalining 50 % gacha ingibirlash konsentratsiyasi (mkl)

| Vaqt            | ARF%                                   |                                        |                                        |                                        |                                        |                                        |
|-----------------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
|                 | <i>Dalachoy-Gazanda-Ermon</i><br>1:1:1 | <i>Dalachoy-Gazanda-Ermon</i><br>3:1:1 | <i>Dalachoy-Gazanda-Ermon</i><br>1:3:1 | <i>Dalachoy-Gazanda-Ermon</i><br>1:1:3 | <i>Dalachoy-Gazanda-Ermon</i><br>3:2:1 | <i>Dalachoy-Gazanda-Ermon</i><br>2:3:1 |
| <b>30-minut</b> | 218.17                                 | 257.5                                  | 341.7                                  | 256.2                                  | 335.3                                  | 219.5                                  |

2-jadvaldan ko'rishimiz mumkinki, namunalarning  $IC_{50}$  – DPPH eritmasining 50 % gacha ingibirlash konsentratsiyasi 30-daqiqadagi antiradikallik faolliklari (ARF%) qiymatlari keltirilgan bo'lib, eng yuqori antiradikallik faollikni 1:1:1 hajmiy nisbatdagi ekstrakt namoyon qilmoqda.

**Xulosa.** sifatida shuni ta'kidlash mumkinki, tekshirilgan namunalar asosida tayyorlangan spirtli ekstraktning antiradikal faollik namoyon etgan. Spirtli ekstraktning 100 mkl miqdori 30 daqiqada erkin radikallarni (*Dalachoy-Gazanda-Ermon* 10 barobar suyultirilgan (1:1:1)) 23.58 % ga kamaytirdi. Mazkur ekstraktning  $IC_{50}$  qiymati spirtli ekstrakda (*Dalachoy-Gazanda-Ermon* -10x barobar suyultirilgan (1:1:1)) 218.17 mkl ni tashkil etdi. Natijalar *Dalachoy-Gazanda-Ermon* o'simliklarining 1:1:1 spirtli ekstraktlari tabiiy antioksidant manbai sifatida istiqbolli ekanligini ko'rsatadi. Bu nisbatda olingan na'munalar jigar toksinlardan tozalashda, jigar hujayralarini qayta tiklashda, jigar yallig'lanishida hamda jigar serrozi kasalliklarini davolashda biologik faol

oziq-ovqat qo'shilmasi sifatida xalq tabobati foydalanish mumkinligini ko'rsatadi.

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## **FACTORS INFLUENCING THE FORMATION OF MARGINAL STRATA IN THE PROCESSES OF URBANIZATION AND MIGRATION**

**Abstract:** *This article analyzes the factors influencing the formation of marginal groups in society as a result of urbanization and migration processes. The study highlights the role of economic inequality, employment problems, processes of social adaptation, the level of education, and cultural factors in the emergence of marginal groups. It also examines the social issues that arise during the process of adapting to the urban environment. The results of the research contribute to a deeper understanding of the role of marginal groups in society and the issues related to ensuring their social integration.*

**Key words:** *process, socialization, migration, urbanization, integration, economy, alienation, cultural identity, politics.*

**Marginality** is a condition of social exclusion that arises when an individual or a social group is not fully encompassed or is rejected by the dominant systems of society (economic, political, cultural, or religious). This condition emerges as a result of conflict or tension with the norms and dominant structures of society. Therefore, in socio-cultural processes, the formation of marginality is often associated with asymmetries of power within the system (imbalance or incompatibility between social forces), discrimination (unfair or unequal treatment of individuals based on race, gender, age, religion, nationality, language, belief, disability, origin, or other characteristics), inequality, and normative pressures.

According to the Uzbek scholar G. Akramov, “Marginalization is a phenomenon inherent in every society, and it possesses both positive and negative aspects.” [1]. In our view, this process is inextricably linked with the processes of horizontal and vertical social mobility. Accordingly, as the structure of society develops and becomes more complex, this process accelerates and intensifies. In particular, it further expands in connection with any socio-economic, political, or cultural changes. Indeed, an important characteristic of marginalization is its inherently “compulsory” nature in practice.

In socio-cultural processes, the formation of marginalization is associated with various factors, which can be grouped as follows:

1. Socio-economic factors:

a) Inequality. Property disparities, poverty, unemployment, and the weakness of the social protection system lead to the deprivation of certain groups from access to resources, resulting in their social exclusion.

b) Urbanization and migration. Individuals who move from rural to urban areas or migrate from other regions often face difficulties in adapting to the dominant social structures, which contributes to their marginalization.

2. Cultural and identity factors:

a) Language, religion, and ethnic differences. Groups that differ from the dominant culture in society (such as national minorities, religious communities, or migrants) are often culturally alienated.

b) Pressure of cultural assimilation. Groups compelled to adapt to the local culture face the risk of losing their identity or may resist assimilation, which further reinforces marginality.

### **3. Political and legal factors:**

a) **Lack of representation.** The exclusion of certain groups from political decision-making processes places them in a marginal position.

b) **Legal inequality.** External groups or socially vulnerable strata often do not enjoy equal protection within the judicial system, leading to their legal isolation. Groups restricted from political participation or unable to freely express their opinions become increasingly detached from the social system. They may experience dissatisfaction or, in some cases, adopt complete political passivity. "Groups whose voices are not heard and whose interests are ignored within the social system may feel alienated in society." [2].

### **4. Moral and psychological factors:**

a) Alienation (E. Fromm, V. Frankl). When an individual cannot find meaning, identity, or stability within their society, they experience internal marginality.

**Existential vacuum.** As Viktor Frankl defined, when purpose and meaning are lost, an individual feels alienated and experiences heightened psychological distress. Some individuals are psychologically unable to adapt to the demands of the social system. For example, among youth, social marginalization may arise due to identity crises and difficulties in self-understanding. "Marginality is influenced not only by external factors but also by the individual's internal state—identity, self-awareness, and psychological instability." [3].

### **5. Postmodern and deconstructive factors:**

J. Derrida's approach. Social structures formed around the concept of the "center" in society tend to marginalize certain groups. Through deconstruction, this condition is critically examined and reinterpreted. Thus, the socio-philosophical significance of the phenomenon of marginality is determined not only by socially and economically important, psychological, political, and legal factors, but also by cultural and identity-related factors.

In the contemporary world, the processes of urbanization and migration are among the main driving forces of global social change. These processes not only relocate individuals from one place to another or from one cultural environment to a different one, but also strongly influence their social status, identity, and social integration. In this sense, urbanization and migration often lead to the formation of new marginal strata. From a philosophical perspective, these phenomena are interpreted through concepts such as alienation and the crisis of modernity. The influence of the phenomena of migration and urbanization on social consciousness, particularly on the formation of ethnocultural identity, has been consistently studied in socio-philosophical thought from ancient times to the present day. This issue has



been analyzed in numerous religious, philosophical, ethical, cultural, and sociological sources and schools of thought, and understanding its complex, multifaceted philosophical essence helps to reveal the historical mechanisms of the formation of human worldview. For example, in early religious texts such as the Qur'an, the Torah, and the Gospel, the processes of people leaving their places of residence, encountering new cultures, and overcoming religious and ethical challenges are analyzed in detail. Specifically, in the Qur'an, the concept of "Hijrah" is presented as a means for spiritual purification and the attainment of moral maturity (Qur'an, 9:20–21) [4]. In these religious expressions, migration is interpreted not merely as a physical movement but also as a form of spiritual transformation.

The Greek philosopher **Plato** emphasized the importance of movement and change in society, particularly for the formation of human worldview, arguing that migration and urbanization serve as means for knowledge acquisition and intellectual awakening within society. In his work *The Republic*, he provides a profound philosophical analysis of how, in an ideal society, human movement contributes to the dynamics of consciousness and values.

In contrast, his student **Aristotle** viewed migration as a natural process that helps maintain social stability [6]. In our view, the perspectives of both philosophers-seeing migration as a process that transforms human consciousness and as a mechanism that ensures social stability-contribute to the social integration of migration.

In Eastern philosophy, migration has been philosophically analyzed in connection with the moral and ethical development of social consciousness. In particular, **Abu Rayhan Beruni** highlighted cultural interactions among different peoples as a form of social harmony emerging through migration [7]. In contrast, Abu Ali Ibn Sina analyzed migration as a necessary social movement in human life, influenced by living environment, health, and natural factors. In our view, for Eastern thinkers, migration represents a philosophical process that unites spiritual maturity, social balance, and natural necessity, serving as an important factor in the development of both society and the individual.

Moreover, in Eastern philosophy, migration is not simply a territorial relocation; it is a process that contributes to the moral development of the individual, the formation of social consciousness, and the emergence of harmony between societies.

Globally, migration-particularly labor migration-has become a polyattribute and multi-directional process, attracting the attention of numerous scholars and researchers. As a result, a number of notable scientific studies have been conducted, and their findings have been regularly published.

Specifically, studies published abroad by S. Castles, K. Kozer, E. Maxandra, M. Miller, M. Natter, M. Flahaux, and M. Chaika [9] have highlighted the global nature of migration and identified the main trends in international migration. Additionally, the works of S. Angenendt and F. Kastelli have substantiated that "irregular migration is becoming an international problem," [10] while research by

J. Jonson and J. Salt [11] has increasingly focused on the economic aspects of migration. Moreover, monographs by S. Djulyetti and A. Klemens [12] describe the social consequences of migration processes in developed countries.

The content and forms of migration, along with its causes and consequences, have been actively studied in prospective scientific research, with its demographic, historical, economic, legal, sociological, and psychological aspects gradually forming distinct areas of investigation. Consequently, in the context of migration, phenomena such as the increase in the number of labor migrants, the intensification of illegal labor migration, and the “brain drain” reflect economic backwardness, unemployment, instability, political restrictions, and inadequate approaches to science. These trends also contribute to urban overpopulation, increased vulnerability to extremist groups, and a higher risk of becoming victims of human trafficking [13]. Among such negative consequences, examining the positive aspects—such as the impact on scientific and intellectual potential, the assimilation of innovations, as well as the ideological, anthropological, and cultural diffusion functions—remains one of the most important issues of the present day.

The migration process has always impacted regions, countries, and territorial units, as well as demographic factors such as population composition, age, and other categories. According to **O. D. Vorobyova**, “migration is the permanent or temporary change of residence by a population, and any territorial relocation occurs under the influence of positive or negative factors.” [14]. In other words, an individual does not simply leave their birthplace, permanent residence, relatives, and acquaintances to move to another region. Various objective and subjective factors in a person’s life lead to migration. Therefore, “the intensification of migration is considered one of humanity’s fundamental problems, and it is not merely a simple mechanical movement of the population.” [15]. In our view, migration is a complex process that arises from natural and social challenges and is assessed in terms of its various positive or negative consequences.

Migration refers to the movement of people from one region to another for diverse reasons and purposes. The variety of these causes and objectives gives migration its multi-typed characteristics.

Specifically, migration can be categorized as follows:

- a) **Social migration** – the movement of people from one region to another in order to attain favorable social conditions;
- b) **Political migration** – the relocation of individuals from regions experiencing political crises, restrictions on political rights, or persecution for political beliefs to countries where political freedom is guaranteed;
- c) **Military migration** – the movement of people to other regions to preserve their own and their families’ lives in areas affected by military actions, war, civil conflict, or uprisings;
- d) **Cultural migration** – the relocation of individuals from one region dominated by a particular cultural environment to another;

e) **Environmental migration** – the movement of people from areas with poor or crisis-level ecological conditions to regions with satisfactory environmental conditions;

f) **Existential migration** – the relocation of individuals inclined to frequently change their lifestyle, actively adopt innovations, explore new conditions, and continuously expand their personal freedom from one region to another [16].

In the modern world, migration processes give rise to numerous new challenges. Analyzing these issues helps to clarify their social and philosophical significance. In particular, globalization is one of the main factors accelerating migration and expanding its scale. This process allows migration to be viewed not merely as an economic phenomenon, but as part of broader global social transformations.

Migration also intensifies the process of adapting to global culture. Issues of equality and justice remain pressing during migration, as migrants often face social and economic inequalities in the host society. This, in turn, leads to the emergence and expansion of marginal strata within the population.

In our view, migration can exacerbate conflicts and contradictions in the receiving society. Conversely, well-managed migration processes can contribute to strengthening the social stability of society.

The phenomenon of migration is one of the main driving forces of the modern world, exerting a significant impact on social, economic, and cultural processes. Philosophical analysis views migration as a means to understand the relationship between the individual and society, as well as their connections with space and time. As **I. T. Kasavin** emphasizes, “the flows and paths of migratory experience reflect discontinuity in human life, historical mobility, and cultural adaptability.” [17]. In our view, a thorough study of this process is of crucial importance for ensuring the sustainable development of society and minimizing social conflicts. As noted by the 20th-century Russian philosopher **A. N. Yurinsky**, “migration is connected not only with pedagogical movements but also with socio-political realities” [18]. Many countries attempt to integrate migrants into the national culture or to fully assimilate them. In the social acceptance of migration, migrants often encounter ethnocentrism and cultural conflicts, which can lead to their marginalization. In this context, the phenomenon of culture plays a crucial role in how migration is received. According to M. Blumenkranz, “an individual constantly participates in the process of change by developing their potential and connecting with different cultures.” From this perspective, a person is not a passive but an active participant in change. Through experience, cultural interactions, and self-awareness, the individual reconstructs their life. Indeed, human development is a continuous philosophical process associated with openness, dialogue, cultural experience, and self-renewal.

Accordingly, urbanization is a complex social process associated with the increasing population density in cities, migration from rural to urban environments, and the industrialization of production. The process of urbanization involves not only a change in geographical location but also a profound transformation in the

relationship between the individual and society. Moving to cities and entering new economic and cultural environments affects a person's social existence and identity.

While cities serve as centers of new opportunities and economic activity, they can also become spaces of social inequality, exclusion, and alienation. At the same time, urbanization represents the concentration of population and economic activity within urban areas.

According to our analysis, the 20th-century German philosopher Georg Simmel, in his work *The Metropolis and Mental Life*, argued that city life makes social interactions more superficial and impersonal, activating mechanisms of alienation and self-protection in individuals. The fast pace of urban life and the prevalence of impersonal social interactions create an environment in which individual existence is often unrecognized. In his philosophical analysis, Simmel described the psychological coldness, indifference, and weakening of personal connections in city life as the "metropolitan consciousness." This consciousness leads the individual toward isolation and a sense of separation from society. City life forces individuals to be cautious: excessive stimuli trigger personal emotional detachment as a defensive reaction. Consequently, urbanization, while contributing to social growth, also intensifies individual alienation and social separation. Simmel emphasized that urbanization compels individuals to view others with "objectivity" and "rationality." In this process, personal relationships are often replaced by superficial, functional, and utilitarian interactions.

Moreover, Georg Simmel philosophically analyzed the impact of urbanization on human psyche and social interactions. He noted that in metropolitan life, people develop a "blasé attitude" as a psychological defense mechanism, resulting from the constant influx and rapid change of stimuli. This leads to emotional blunting and indifference toward surrounding events. Simmel also concluded that in the metropolis, social relationships are characterized by "high quantity, low quality," meaning that interactions are superficial, temporary, and instrumental.

Such conditions weaken social cohesion and solidarity, causing individuals to feel isolated and detached. This results in social alienation, where people engage with others in formal, impersonal, and emotionally restrained ways, concealing their true feelings. Furthermore, the philosopher philosophically analyzed the impact of city life on human psychology. He emphasized that due to the anonymity of cities, their rapid changes, and the presence of large numbers of people, individuals are often compelled to adopt "hard" or superficial relationships as a form of self-protection.

In this context, migration is highlighted as a process through which individuals adapt to new conditions and redefine their identity. Urbanization and migration profoundly affect a person's social and psychological state, compelling them to form new relationships and patterns of identification.

Indeed, in our view, urbanization alienates individuals from others, while migration demonstrates the multifaceted and complex nature of this social transformation process.

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## **AKKLIMATIZATSIYA JARAYONLARINING BALIQ MAHSULDORLIGIGA TA'SIRI**

**Annotatsiya:** Mazkur maqolada baliqlarni yangi ekologik sharoitlarga moslashtirish, ya'ni akklimatizatsiya jarayonlarining baliq mahsuldorligiga ta'siri ilmiy manbalar asosida tahlil qilingan. Harorat, suvning gidrokimyoviy ko'rsatkichlari, ozuqa omillari hamda stress faktorlarining baliq o'sishi, omon qolishi va reproduktiv qobiliyatiga ta'siri yoritilgan. Chet el tadqiqotlari natijalariga tayanilgan holda, to'g'ri tashkil etilgan akklimatizatsiya baliqchilik xo'jaliklarida mahsuldorlikni oshirishning muhim omili ekani ko'rsatib berilgan.

**Kalit so'zlar:** akklimatizatsiya, baliq mahsuldorligi, stress, harorat, ozuqa samaradorligi.

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## **THE IMPACT OF ACCLIMATIZATION PROCESSES ON FISH PRODUCTIVITY**

**Annotation:** This article analyzes, based on scientific sources, the impact of fish acclimatization processes—namely, adaptation to new ecological conditions—on fish productivity. The effects of temperature, hydrochemical parameters of water, feeding factors, and stressors on fish growth, survival, and reproductive capacity are discussed. Drawing on the results of foreign studies, the article demonstrates that properly organized acclimatization is an important factor in increasing productivity in fish farming enterprises.

**Keywords:** acclimatization, fish productivity, stress, temperature, feed efficiency.



**Kirish:** So‘nggi yillarda O‘zbekiston Respublikasida oziq-ovqat xavfsizligini ta‘minlash, aholini sifatli va oqsilga boy mahsulotlar bilan barqaror ta‘minlash davlat siyosatining ustuvor yo‘nalishlaridan biri sifatida belgilab olingan. Xususan, baliqchilik va akvakultura tarmog‘ini jadal rivojlantirish, mavjud suv resurslaridan samarali foydalanish hamda baliq mahsulotlari ishlab chiqarish hajmini oshirish bo‘yicha O‘zbekiston Respublikasi Prezidentining, 06.04.2018 yildagi PQ-3657-sonli qarori ishlab chiqilgan. Bu qarorni ijrosini ta‘minlash borasida bir qancha ishlar amalga oshirilmoqda

Shu nuqtayi nazarda, intensiv akvakultura texnologiyalarini joriy etish, zamonaviy ilmiy yondashuvlarga asoslangan ishlab chiqarishni yo‘lga qo‘yish, shuningdek, baliqlarning biologik xususiyatlarini hisobga olgan holda mahsuldorlikni oshirish masalalariga alohida e‘tibor qaratilgan. Mazkur hujjatlarda baliqchilik xo‘jaliklarida ilmiy asoslangan boshqaruv tizimlarini joriy etish, seleksiya va naslchilik ishlarini takomillashtirish, hamda atrof-muhit omillariga moslashgan, yuqori mahsuldor baliq populyatsiyalarini shakllantirish muhim vazifa sifatida belgilangan.

Baliqlarning yangi ekologik sharoitlarga moslashuvi ya‘ni akklimatizatsiya jarayonlari baliqchilik xo‘jaliklarining iqtisodiy samaradorligini oshirishda muhim ilmiy-amaliy ahamiyat kasb etadi. Amaliyot shuni ko‘rsatadiki, suv havzalarining gidroekologik sharoiti, harorat rejimi, suvning gidrokimyoviy ko‘rsatkichlari va ozuqa bazasidagi farqlar baliq organizmlarining fiziologik holatiga bevosita ta‘sir ko‘rsatadi. Shu sababli, baliqlarni yangi suv havzalariga ko‘chirish yoki intensiv yetishtirish tizimlariga jalb etishda akklimatizatsiya jarayonlarini ilmiy asosda tashkil etish dolzarb masalaga aylanmoqda.

Akvakulturada yuqori mahsuldorlikka erishish nafaqat intensiv texnologiyalar, sifatli ozuqa bazasi va zamonaviy boshqaruv usullariga, balki baliq organizmlarining atrof-muhit omillariga moslashish darajasiga ham bevosita bog‘liq ekani ko‘plab tadqiqotlarda ta‘kidlangan (Wedemeyer, 1996; Jobling, 2003). Baliqlar poikiloterm organizmlar bo‘lganligi sababli, suv harorati, gidrokimyoviy ko‘rsatkichlar, eritilgan kislorod miqdori hamda ozuqa sharoitlaridagi o‘zgarishlarga nisbatan yuqori sezgirlikka ega (Brett, 1979). Iqlim o‘zgarishi sharoitida suv harorati va gidrologik rejimning beqarorlashuvi akklimatizatsiya jarayonlarini yanada dolzarb masalaga aylantirmoqda (Pörtner & Farrell, 2008). Shu sababli, akklimatizatsiya jarayonlarining baliq mahsuldorligiga ta‘sirini chuqur o‘rganish va amaliyotga joriy etish zamonaviy akvakulturaning muhim ilmiy-amaliy vazifalaridan biri hisoblanadi.

**Material va metodlar:** Tadqiqot ishlari 2024–2025 yillar davomida O‘zbekiston Respublikasi Baliqchilik ilmiy tadqiqot institutini tajriba maydonlarida amalga oshiridi (sun‘iy beton hovuz va yopiq suv aylanish tizimi sharoitida) olib borildi. Tadqiqot obyekti sifatida karpsimon baliqlar oilasiga mansub xo‘jalik ahamiyatiga ega baliq turi Nemis karp (*Cyprinus carpio*) tanlab

olindi. Tajriba uchun bir xil yosh va oʻrtacha tirik vaznga ega boʻlgan sogʻlom baliqlar ishlatildi. Baliqlar yoshini Lea, E. (1910) – metodi orqali aniqlandi

**Tadqiqot davomida baliqlar tasodifiy tanlash usuli asosida ikki guruhga ajratildi:**

**1-guruh baliqlarni morfometrik oʻlchamlari.**

1-jadval

| №  | Turi | Umumiy tana uzunligi<br>(L)sm | Massasi<br>(M)gr | Yoshi |
|----|------|-------------------------------|------------------|-------|
| 1  | Karp | 62                            | 2.2              | 2     |
| 2  | Karp | 50                            | 2.0              | 2     |
| 3  | Karp | 53                            | 2.1              | 2     |
| 4  | Karp | 48                            | 2.0              | 2     |
| 5  | Karp | 55                            | 2.2              | 2     |
| 6  | Karp | 47                            | 2.0              | 2     |
| 7  | Karp | 50                            | 2.1              | 2     |
| 8  | Karp | 60                            | 2.2              | 2     |
| 9  | Karp | 55                            | 2.0              | 2     |
| 10 | Karp | 57                            | 2.2              | 2     |

**2-guruh baliqlarni morfometrik oʻlchamlari**

2-jadval

| №  | Turi | Umumiy tana uzunligi<br>(L)sm | Massasi<br>(M)gr | Yoshi |
|----|------|-------------------------------|------------------|-------|
| 1  | Karp | 60                            | 2.1              | 2     |
| 2  | Karp | 59                            | 2.0              | 2     |
| 3  | Karp | 51                            | 2.1              | 2     |
| 4  | Karp | 45                            | 2.0              | 2     |
| 5  | Karp | 51                            | 2.2              | 2     |
| 6  | Karp | 57                            | 2.0              | 2     |
| 7  | Karp | 55                            | 2.1              | 2     |
| 8  | Karp | 60                            | 2.2              | 2     |
| 9  | Karp | 58                            | 2.0              | 2     |
| 10 | Karp | 56                            | 2.2              | 2     |

Nazorat guruhi — baliqlar an'anaviy usulda, akklimatizatsiya jarayonlari yetarlicha bosqichma-bosqich amalga oshirilmagan holda saqlandi;

Tajriba guruhi — baliqlar suv harorati, gidrokimyoviy ko'rsatkichlar va ozuqa sharoitlariga bosqichma-bosqich akklimatizatsiya qilingan holda parvarish qilindi.

Akklimatizatsiya jarayonida suv harorati kuniga 1–2 °C dan oshmagan miqdorda o'zgartirildi, suvning pH ko'rsatkichi va eritilgan kislorod miqdori doimiy nazorat ostida saqlandi.

Akklimatizatsiya jarayoni quyidagi asosiy ekologik omillarni hisobga olgan holda amalga oshirildi:

- Suv harorati — 18–26 °C oralig'ida bosqichma-bosqich moslashtirildi;
- Eritilgan kislorod miqdori — 5,0–7,5 mg/l darajada saqlandi;
- Suvning pH ko'rsatkichi — 6,8–8,2 oralig'ida ushlab turildi;
- Amoniy va nitritlar miqdori — ruxsat etilgan sanitariya me'yorlaridan oshmasligi ta'minlandi.

Gidrokimyoviy ko'rsatkichlar haftasiga kamida ikki marta standart laboratoriya usullari yordamida aniqlab borildi.

Baliqlar kuniga 2–3 mahal yuqori proteinli (28–32 % xom protein) granulalangan ozuqa bilan boqildi. Ozuqa miqdori baliqlarning tirik vazni va suv haroratiga mos ravishda belgilandi. Ozuqa iste'moli va qoldiqlari hisobga olinib, ozuqa konversiya koeffitsiyenti (FCR) aniqlandi.

Akklimatizatsiya jarayonlarining baliq mahsuldorligiga ta'siri quyidagi biologik ko'rsatkichlar asosida baholandi:

- o'rtacha tirik vazn o'sishi (g);
- kunlik va nisbiy o'sish sur'ati (%);
- omon qolish darajasi (%);
- ozuqa konversiya koeffitsiyenti;
- stress holatini baholash uchun tashqi fiziologik belgilar va xulq-atvor reaksiyalari.

O'lchov ishlari har 15 kunda bir marta amalga oshirildi.

Olingan ma'lumotlar matematik-statistik usullar yordamida qayta ishlanib, o'rtacha qiymat (M) va standart xatolik (m) ko'rsatkichlari hisoblandi. Guruhlar o'rtasidagi farqlarning ishonchliligi Student t-testi yordamida aniqlandi. Natijalar  $p < 0,05$  darajasida ishonchli deb qabul qilindi. Statistik hisob-kitoblar MS Excel va SPSS dasturlaridan foydalangan holda bajarildi.

**Natijalar va ularning tahlili:** Tadqiqot natijalari shuni ko'rsatdiki, baliqlarni yangi ekologik sharoitlarga ilmiy asosda va bosqichma-bosqich moslashtirish ularning biologik va xo'jalik ahamiyatiga ega ko'rsatkichlariga sezilarli ijobiy ta'sir ko'rsatadi. Tajriba guruhida saqlangan baliqlarda o'sish sur'atlari, omon qolish darajasi va ozuqadan foydalanish samaradorligi nazorat guruhiga nisbatan yuqori bo'ldi.

Tajriba oxirida tajriba guruhidagi baliqlarning o'rtacha tirik vazni nazorat guruhiga nisbatan ishonchli darajada yuqori ekani aniqlandi ( $p < 0,05$ ). Bu holat

akklimatizatsiya jarayonida suv harorati va gidrokimyoviy omillarning keskin o'zgarishiga yo'l qo'yilmagani natijasida metabolik jarayonlarning barqarorlashgani bilan izohlanadi. Mazkur natijalar Jobling (2003) hamda Brett (1979) tomonidan keltirilgan ma'lumotlar bilan mos keladi.

Omon qolish darajasi ko'rsatkichlari tahlili shuni ko'rsatdiki, tajriba guruhida baliqlarning yashab qolish foizi yuqori bo'lib, bu akklimatizatsiya jarayonida stress omillarining kamayishi bilan bog'liq. Nazorat guruhida esa muhit sharoitlariga keskin moslashish zarurati fiziologik stress holatlarini kuchaytirib, ayrim hollarda baliqlarning nobud bo'lishiga olib kelgani kuzatildi. Barton va Iwama (1991) ta'kidlaganidek, stress gormonlari darajasining oshishi baliqlarda o'sish va ozuqa iste'molining pasayishiga sabab bo'ladi.

Ozuqa konversiya koeffitsiyenti (FCR) bo'yicha olingan natijalar ham akklimatizatsiyaning muhim ahamiyatini tasdiqladi. Tajriba guruhida FCR ko'rsatkichi pastroq bo'lib, bu ozuqaning samaraliroq o'zlashtirilganidan dalolat beradi. Nazorat guruhida esa ozuqa iste'moli barqaror bo'lmaganligi va energiya ning katta qismi stressga qarshi moslashuv jarayonlariga sarflanganligi qayd etildi.

Bundan tashqari, tajriba davomida baliqlarning xulq-atvori va tashqi fiziologik holati ham kuzatildi. Akklimatizatsiya qilingan baliqlarda faollikning saqlanib qolishi, ozuqaga tez moslashish va tashqi shikastlanishlarning kamligi kuzatildi. Bu holat immun tizimning nisbatan barqaror ishlaganidan dalolat beradi.

Umuman olganda, olingan natijalar baliqlarni yangi sharoitlarga moslashtirishda akklimatizatsiya jarayonlarini ilmiy asosda tashkil etish baliqchilik xo'jaliklarida mahsuldorlikni oshirishning muhim omili ekanini ko'rsatdi.

**Xulosa:** O'tkazilgan tadqiqotlar asosida quyidagi xulosalarga kelindi, Akklimatizatsiya jarayonlari baliq mahsuldorligini oshirishda hal qiluvchi ahamiyatga ega. To'g'ri tashkil etilgan akklimatizatsiya fiziologik stress darajasini pasaytiradi, o'sish sur'ati va ozuqa samaradorligini oshiradi, omon qolish darajasi va reproduktiv qobiliyatni yaxshilaydi;

Shu bois, baliqchilik xo'jaliklarida akklimatizatsiya jarayonlarini ilmiy asoslangan holda tashkil etish yuqori mahsuldorlikka erishishning muhim shartlaridan biri hisoblanadi.

Baliqlarning yangi ekologik sharoitlarga moslashuvi, ya'ni akklimatizatsiya jarayonlari ularning o'sishi, omon qolishi va ozuqadan foydalanish samaradorligiga bevosita ta'sir ko'rsatadi.

To'g'ri tashkil etilgan akklimatizatsiya ozuqa konversiya koeffitsiyentining yaxshilanishiga xizmat qilib, ishlab chiqarish xarajatlarini kamaytirish imkonini beradi.

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## FUTBOL DARVOZABONI INTELLEKTUAL MAHORATINI MILLIY O'YINLAR ORQALI RIVOJLANTIRISH

**Annotatsiya:** Mazkur ilmiy maqolada milliy o'yinlar orqali futbol darvozabonlarining intellektual mahoratini rivojlantirishning samaradorligi tadqiq etilgan. Tadqiqotda milliy o'yinlarning futbol darvozabonlarining reaksiyasi, qaror qabul qilish tezligi, pozitsiya aniqligi va zarba to'sish samaradorligiga qanday ta'sir ko'rsatishi o'rganildi. Eksperimental guruhda olib borilgan mashg'ulotlar natijasida darvozabonlarning intellektual mahorati sezilarli darajada yaxshilandi. Tadqiqot natijalari shuni ko'rsatadiki, milliy o'yinlar futbolchilarni nafaqat jismoniy, balki aqliy jihatdan ham rivojlantirishga yordam beradi, bu esa darvozabonlarning o'yin samaradorligini oshiradi.

**Kalit so'zlar:** Futbol, darvozabon, intellektual mahorat, milliy o'yinlar, qaror qabul qilish, pozitsiya aniqligi, reaksiya vaqti, zarba to'sish, jismoniy tarbiya, sport metodikasi, futbolchilarni tayyorlash.

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## DEVELOPMENT OF FOOTBALL GOALKEEPERS' INTELLECTUAL COMPETENCE THROUGH NATIONAL GAMES

**Abstract:** This scientific article explores the effectiveness of developing intellectual skills in football goalkeepers through national games. The study examines how national games influence goalkeepers' reaction time, decision-making speed, positioning accuracy, and shot-blocking efficiency. The results of the experiment showed that the training conducted in the experimental group led to a significant improvement in the intellectual skills of the goalkeepers. The obtained results indicate that national games help develop football players not only physically but also mentally, which in turn enhances their performance as goalkeepers.

**Keywords:** Football, goalkeeper, intellectual skills, national games, decision-making, positioning accuracy, reaction time, shot-blocking, physical education, sports methodology, football training.

Zamonaviy futbol sport turi o'zining murakkabligi va dinamikasi bilan ajralib turadi. Futbol o'yinida har bir futbolchi, ayniqsa darvozabon, o'zining jismoniy tayyorgarligi va texnik mahoratini yuqori darajada namoyon qilishi zarur. Biroq, jismoniy tayyorgarlik bilan bir qatorda, futbol darvozaboni uchun intellektual



mahorat ham juda muhimdir. Darvozabonning o'yin davomida tezkor va aniq qarorlar qabul qilish, pozitsiyani to'g'ri egallash, zarba yo'nalishini taxmin qilish kabi psixomotor ko'nikmalari uning umumiy samaradorligini belgilaydi. Ushbu mahoratni rivojlantirishda klassik usullardan tashqari innovatsion yondashuvlar ham samarali bo'lishi mumkin.

Futbol darvozabonining intellektual mahoratini shakllantirishda milliy o'yinlar o'zining muhim rolini o'ynaydi. Milliy o'yinlar xalqimizning madaniy an'analari va qadriyatlarining ajralmas qismi bo'lib, ular nafaqat jismoniy, balki aqliy va ruhiy jihatdan ham sportchilarning rivojlanishiga xizmat qiladi. Milliy o'yinlar o'ziga xos shaklda sportchilarning harakat koordinatsiyasini, tezkorligini, chaqqonligini, muvozanatini va reaksiya tezligini rivojlantirishga yordam beradi. Bu sifatlar esa aynan futbol darvozabonlarining o'yin davomida zarba to'sg'ichlik, pozitsiyani aniqlash va tezkor qaror qabul qilishda muhim ahamiyatga ega.

Futbol darvozaboni faqat jismoniy kuch bilan emas, balki intellektual qarorlar qabul qilish qobiliyati bilan ham o'zini namoyon qiladi. Darvozabonning o'yin davomida zarba yo'nalishini taxmin qilish, hujumchining harakatlarini oldindan sezish va shu asosda pozitsiyani aniqlash kabi vazifalar uning muvaffaqiyatiga bevosita ta'sir ko'rsatadi. Bu vazifalar esa jismoniy mashqlar orqali mukammallashadi, ammo milliy o'yinlar kabi o'yinli yondashuvlar bu ko'nikmalarni yanada samarali rivojlantiradi.

Ushbu ilmiy tadqiqotda futbol darvozabonining intellektual mahoratini milliy o'yinlar yordamida rivojlantirishni o'rganish uchun bir qator ilmiy va amaliy tadqiqot usullari qo'llanildi. Tadqiqotning maqsadi futbol darvozabonining intellektual va psixomotor ko'nikmalarini milliy o'yinlar orqali rivojlantirishning samaradorligini aniqlashdir. Buning uchun turli xil metodik yondashuvlar, tajribaviy va nazariy tahlillar, hamda amaliy mashg'ulotlar orqali o'rganilgan ma'lumotlar asosida natijalar chiqarildi. Tadqiqot jarayonida quyidagi usullar qo'llanildi:

Tadqiqotning dastlabki bosqichida milliy o'yinlarning tarixi, metodologiyasi va futbol darvozabonining texnik, taktika va psixologik ko'nikmalari haqida mavjud adabiyotlar tahlil qilindi. Shu bilan birga, futbol va boshqa jismoniy tarbiya va sport sohalaridagi ilmiy tadqiqotlar, metodik qo'llanmalar va tajribalar o'rganildi. Milliy o'yinlarning futbol darvozabonining intellektual mahoratini rivojlantirishdagi o'rni haqida ilmiy adabiyotlardan olingan ma'lumotlar tadqiqotning nazariy asosini tashkil etdi.

Tadqiqotda eksperimental usul asosiy o'rinni egalladi. Bu usul orqali futbol darvozabonlarining intellektual mahoratini rivojlantirish uchun milliy o'yinlarni tatbiq etishning samaradorligi o'rganildi. Eksperimentlar ikki guruh futbolchilari ustida o'tkazildi. Birinchi guruhda an'anaviy futbol tayyorlash metodlari qo'llanildi, ikkinchi guruhda esa milliy o'yinlar yordamida darvozabonlar tayyorlandi. Har bir guruhda futbolchilarning o'yin davomida qaror qabul qilish tezligi, muvozanatni saqlash qobiliyati, reaksiya va pozitsiyani aniqlash ko'nikmalari sinovdan o'tkazildi. Tadqiqotning eksperimental qismi futbolchilarning jismoniy va aqliy ko'rsatkichlari orqali baholandi.

Futbol darvozabonlarining psixologik holati va qaror qabul qilish jarayonlari ham tadqiqotda e'tiborga olindi. Tadqiqotda psixologik testlar va so'rovnomalar yordamida futbolchilarning stressga chidamliligi, tezkor qarorlar qabul qilish qobiliyati va muvozanatni saqlashda qat'iyatligi o'rganildi. Bu ma'lumotlar futbolchilarning intellektual mahoratini rivojlantirishda milliy o'yinlarning samaradorligini baholashda asosiy mezonlardan biri bo'ldi.

Tadqiqotda milliy o'yinlar asosida maxsus tayyorlash metodikasi ishlab chiqildi. Bu metodika futbol darvozabonlarining tezkor qaror qabul qilish, pozitsiyani to'g'ri tanlash, zarba yo'nalishini taxmin qilish kabi intellektual mahoratlarini rivojlantirishga qaratilgan mashg'ulotlarni o'z ichiga oldi. Mashg'ulotlar davomida o'yinlar, vazifalar va topshiriqlar orqali futbolchilarning o'yinni tahlil qilish, stressga chidamli bo'lish va muvozanatni saqlash ko'nikmalari oshirildi.

Tadqiqot jarayonida olingan ma'lumotlar statistik tahlil qilish uchun maxsus dasturiy ta'minotlar yordamida qayd etildi. Har bir futbolchining jismoniy va aqliy ko'rsatkichlari, o'yin davomida ko'rsatilgan muvaffaqiyat darajasi, shuningdek, milliy o'yinlar asosida o'tkazilgan mashg'ulotlarning samaradorligi tahlil qilindi. Bu tahlil natijalari futbol darvozabonining intellektual mahoratini rivojlantirishda milliy o'yinlarning roli va samaradorligini aniqlashga yordam berdi.

Tadqiqotda amaliy kuzatishlar yordamida futbol darvozabonlarining mashg'ulot va o'yin jarayonidagi faoliyati o'rganildi. Futbolchilarni turli sharoitlarda (mashg'ulotlar, o'yinlar, sinovlar) kuzatib borish, ularning harakatlari va qarorlar qabul qilish jarayonini tahlil qilish orqali milliy o'yinlarning ta'siri baholandi.

Tadqiqotda olingan natijalar tahlil qilindi va sintez qilingan ma'lumotlar asosida futbol darvozabonining intellektual mahoratini rivojlantirishning samarali usullari ishlab chiqildi. Olingan natijalar, shuningdek, milliy o'yinlarning futbol darvozabonlarining jismoniy va psixologik tayyorgarligini shakllantirishdagi o'rni va ahamiyatini ko'rsatib berdi.

Tadqiqot davomida milliy o'yinlarning futbol darvozabonlarining intellektual mahoratini rivojlantirishga ta'sirini aniqlash maqsadida bir nechta eksperimentlar va amaliy sinovlar o'tkazildi. Sinovlar davomida futbol darvozabonlariga milliy o'yinlar orqali takomillashish imkoniyatlari yaratildi. Bu jarayonning natijalari quyidagi yo'nalishlarda aniqlangan:

1. Tezkor qaror qabul qilish qobiliyatining yaxshilanishi

Milliy o'yinlar orqali futbol darvozabonlarining tezkor qaror qabul qilish qobiliyati sezilarli darajada yaxshilandi. Eksperimentlarda qatnashgan darvozabonlar o'yin davomida zarbalarni to'sg'ish va hujumchilarning harakatlarini oldindan sezish borasida aniq va tezkor qarorlar qabul qildilar. Bu o'zgarishlar ularning o'yindagi pozitsiya olish va zarbalar yo'nalishini taxmin qilishdagi samaradorliklarini oshirdi. Milliy o'yinlar, ayniqsa, darvozabonning jismoniy va psixologik tezkorlikni birlashtirishiga yordam berdi, bu esa o'z navbatida o'yinda qaror qabul qilishning samaradorligini oshirdi.

2. Chaqqonlik va harakatlar koordinatsiyasining rivojlanishi

Milliy o'yinlar, masalan, "Katta o'yin", "Tug'ilma" kabi o'yinlar darvozabonlarning chaqqonligini va harakatlar koordinatsiyasini mukammallashtirishga yordam berdi. Bu o'yinlarda qatnashgan futbolchilar o'z harakatlarini tez va aniq amalga oshirishni o'rgandilar. Natijada, futbol darvozabonlarining muvozanatni saqlash, tezkor harakat qilish va zarba yo'nalishini aniqlashdagi qobiliyatlari yanada rivojlandi. O'yinlar davomida jismoniy va aqliy ko'nikmalarni birlashtirish darvozabonning o'yindagi reaksiyalarini tezlashtirishga yordam berdi.

3. Pozitsion tayyorgarlik va oldindan taxmin qilish qobiliyatining yaxshilanishi

Tadqiqotda shuningdek, milliy o'yinlarning futbol darvozabonlarining pozitsion tayyorgarligiga ta'siri ham o'rganildi. Milliy o'yinlar futbolchilarni o'z pozitsiyasini aniqlash va o'yin davomida to'g'ri pozitsiyada bo'lishni o'rgatdi. Bu, o'z navbatida, darvozabonning zarbalarni to'sg'ishdagi samaradorligini oshirdi. Tadqiqotlar shuni ko'rsatdiki, milliy o'yinlar orqali darvozabonlarning o'z pozitsiyasini o'yin davomida to'g'ri aniqlash va hujumchilarning harakatlarini oldindan sezish ko'nikmalarini shakllantirishda muhim ahamiyatga ega.

4. Psixologik barqarorlik va stressga bardoshlilikning oshishi

Milliy o'yinlar futbol darvozabonlarining psixologik barqarorligini oshirishda ham muhim rol o'ynadi. Tadqiqotlarda qatnashgan darvozabonlar o'zlarini stressli vaziyatlarda yanada samarali boshqarishni o'rgandilar. Milliy o'yinlarda qatnashish ularga stressli vaziyatlarda tezroq va to'g'ri qarorlar qabul qilishga yordam berdi. Shuningdek, o'yinlar davomida darvozabonlarning o'z-o'zini boshqarish qobiliyati, o'yin davomida yuzaga keladigan noqulay vaziyatlarga nisbatan sabr va chidamlilikni oshirdi. Bu esa, o'z navbatida, darvozabonlarning o'yin davomida yuqori darajadagi psixologik tayyorgarlikni namoyon qilishiga yordam berdi.

5. Jismoniy tayyorgarlikning yaxshilanishi

Milliy o'yinlar jismoniy tayyorgarlikning turli jihatlarini rivojlantirishga ham yordam berdi. Sinovlar davomida qatnashgan darvozabonlar o'zlarining chaqqonlik, tezlik, muvozanat va kuch ko'nikmalarini mukammallashtirdilar. Milliy o'yinlar o'yinchilarga nafaqat jismoniy qobiliyatlarni rivojlantirish, balki jismoniy holatni doimiy ravishda nazorat qilishni o'rgatdi. Bu holatda, milliy o'yinlar sportchilarning jismoniy va psixologik salohiyatini uyg'unlashtirgan holda, ularning umumiy sport mahoratini oshirdi.

Xulosa. Ushbu ilmiy tadqiqotda futbol darvozabonlarining intellektual mahoratini rivojlantirishda milliy o'yinlarning ahamiyati va samaradorligi o'rganildi. Tadqiqot natijalari shuni ko'rsatadiki, milliy o'yinlar futbol darvozabonining jismoniy va aqliy qobiliyatlarini birgalikda rivojlantirishda juda samarali vosita bo'lishi mumkin. Milliy o'yinlar nafaqat o'yinchi tanasini jismoniy jihatdan tayyorlash, balki uning psixologik va intellektual holatini ham yaxshilashga imkon beradi. Futbol darvozaboni uchun eng muhim ko'nikmalar — qaror qabul qilish tezligi, pozitsion sezgirlik, va tezkor reaksiya kabi aqliy qobiliyatlar milliy o'yinlar orqali yanada yaxshilanadi.

Xulosa qiladigan bo'lsak, futbol darvozaboni uchun intellektual mahoratni rivojlantirishda milliy o'yinlar o'zining samaradorligini amalda ko'rsatmoqda. Tadqiqotda taqdim etilgan metodik yondashuvlar va o'yinlar asosida yaratilgan metodikalar futbol darvozabonlarining texnik, taktika va intellektual ko'nikmalarini rivojlantirishga qaratilgan. Bu esa o'z navbatida, futbol o'yinlarining sifatini va darvozabonlarining o'yin samaradorligini sezilarli darajada yaxshilashga xizmat qiladi.

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## **HARBIY XIZMATCHILARDA AXLOQIY-IRODAVIY SIFATLARNI RIVOJLANTIRISHGA OID NAZARIY YONDASHUVLARNING ILMIY- METODOLOGIK TAHLILI**

**Annotatsiya:** Ushbu maqolada harbiy xizmatchilarda axloqiy-irodaviy sifatlarni rivojlantirish masalasi ilmiy-metodologik jihatdan tahlil qilinadi. Irodaning psixologik mohiyati g‘arb va sharq olimlari yondashuvlari asosida yoritib berilgan. Natijada, harbiy xizmatchilarda iroda va axloqiy sifatlarni rivojlantirish uchun to‘rtta metodologik asos ajratib ko‘rsatilgan: axloqiy-ma’naviy yondashuv, faoliyatga asoslangan yondashuv, motivatsion-kognitiv yondashuv va biopsixologik yondashuv.

**Kalit so‘zlar:** iroda, axloqiy sifatlarni, harbiy psixologiya, sabr, jasorat, Forobiy, Ibn Sino, Rubinshteyn, Bandura, metodologik yondashuvlar.

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## **SCIENTIFIC-METHODOLOGICAL ANALYSIS OF THEORETICAL APPROACHES TO THE DEVELOPMENT OF MORAL AND VOLITIONAL QUALITIES IN MILITARY PERSONNEL**

**Abstract:** This article provides a scientific and methodological analysis of the development of moral and volitional qualities in military personnel. The psychological essence of will is explained based on the approaches of Western and Eastern scholars. As a result, four methodological foundations for developing will and moral qualities in military personnel are identified: moral-spiritual approach, activity-based approach, motivational-cognitive approach, and biopsychological approach.

**Keywords:** will, moral qualities, military psychology, patience, courage, Farabi, Ibn Sina, Rubinstein, Bandura, methodological approaches.

Harbiy xizmat o‘z mohiyati bilan insondan nafaqat jismoniy kuch va professional bilimlarni, balki yuqori darajadagi axloqiy-irodaviy sifatlarni ham talab qiladi. Iroda — shaxsning ongli maqsad sari harakat qilishida qiyinchiliklarni yengib o‘tishga qaratilgan psixik faoliyatidir. Harbiy xizmatchi faoliyatida iroda va axloqiy barqarorlik bir-biridan ajralmas bo‘lib, ular jangovar vaziyatda qaror qabul qilish, mas’uliyatni o‘z zimmasiga olish va jamoaviy intizomni saqlashda hal

qiluvchi omil sifatida namoyon bo'ladi. Mazkur maqolada iroda haqidagi klassik va zamonaviy nazariyalar ilmiy-metodologik tahlil qilinadi hamda harbiy xizmatchilarda axloqiy-irodaviy sifatlarni shakllantirishning ilmiy asoslari ko'rib chiqiladi.

Irodaviy sifatlarni tadqiq etgan olimlarning nazariy qarashlari quyidagilar:

### **1. Sharq allomalari merosida iroda va axloqiy sifatlar:**

**Abu Nasr Forobiy** inson baxtga erishishi uchun iroda, aql va axloqiy poklikni uyg'unlashtirish zarurligini ta'kidlagan. Uningcha, "fazilatli shahar" fuqarosi iroda va axloq orqali jamiyatning mustahkamligiga hissa qo'shadi. Bu qarash harbiy intizomning ham ma'naviy poydevorini ko'rsatadi.

**Abu Ali Ibn Sino** irodani inson ruhiy kuchlarining eng oliy darajasi sifatida talqin qilib, uni sabr va chidamlilik bilan bog'lagan. Uning fikricha, iroda ong va hissiyotning uyg'unligi orqali mustahkamlanadi. Harbiy xizmatchi uchun bu – qo'rquvni yengish va vazifani oxirigacha bajarishda muhim.

**Jaloliddin Rumiy** o'z masnaviylarida iroda va sabrni ruhiy kamolotning asosiy manbai sifatida ko'rsatib, "inson o'z ichki kurashini yenga olsa, tashqi qiyinchiliklar ham yengil bo'ladi", deya ta'kidlagan. Bu qarash harbiy sharoitda ichki qo'rquvni yengish metodologiyasiga mos tushadi.

**Alisher Navoiy** "Mahbub ul-qulub" asarida iroda, sabr va jasoratni insoniy kamolot mezonini sifatida ko'rsatadi. Uningcha, iroda axloqiy burch bilan uyg'unlashganda, shaxs yuksak ma'naviyat sohibiga aylanadi. Bu fikr harbiy xizmatchida "vatanparvarlik iroda"sining shakllanishini ifodalaydi.

Sharq mutafakkirlari, xususan, **Abu Nasr Forobiy, Abu Ali Ibn Sino, Jaloliddin Rumiy va Alisher Navoiy** irodani, avvalo, **axloqiy-ma'naviy kamolot bilan uzviy bog'liq** holda talqin qilganlar.

- Forobiy irodani fazilatli shaxsning jamiyatga foyda keltiruvchi xususiyati sifatida ko'rgan.

- Ibn Sino irodani sabr va chidamlilik bilan uyg'unlashgan ruhiy kuch deb bilgan.

- Rumiy insonning ichki kurashi tashqi qiyinchiliklardan muhimroq ekanini ta'kidlab, iroda va sabrni ruhiy yuksalishning kaliti sifatida ko'rsatgan.

- Navoiy esa irodani axloqiy burch, jasorat va halollik bilan bog'lagan.

Demak, Sharq allomalari irodani shaxsning **ruhiy poklik, sabr-toqat va jasorat orqali o'zini komillikka olib boruvchi kuch** sifatida baholagan.

### **2. Klassik psixologik yondashuvlar**

**I. Kant** irodani axloqiy qonuniyatlarga bo'ysundirish qobiliyati sifatida talqin qilgan. Uning nazarida iroda axloqiy tanlovning poydevori bo'lib, insonning majburiyatni ongli ravishda ado etishi bilan belgilanadi.

**G. Vundt** irodani psixik faoliyatning faoliyatiy markazi sifatida o'rganib, uni hissiyot va tafakkur bilan chambarchas bog'liq deb qaragan.

**V. V. Bekhterev** irodani insonning ijtimoiy moslashuvchanligini belgilovchi muhim omil sifatida ta'riflab, harbiy faoliyatda irodaning jamoaviy intizom bilan uyg'unlashishini ta'kidlagan.

**Sovet psixologiyasi maktabi**



**S. L. Rubinshteyn** irodani shaxsning ongli faoliyatida ichki qarama-qarshiliklarni yengib o'tishga xizmat qiluvchi mexanizm sifatida tushuntirgan. Uningcha, iroda motiv va maqsad o'rtasidagi ichki kurashni hal etadi.

**A. N. Leontyev** faoliyat nazariyasi doirasida irodani maqsad sari intilishning barqarorligini ta'minlovchi faoliyat komponenti sifatida o'rganadi. Harbiy xizmatchida iroda — bu maqsadga yo'naltirilgan, tashkillashtirilgan faoliyatdir.

**B. G. Ananyev** irodaviy sifatlarni shaxsning umumiy psixologik tuzilmasida intellektual, hissiy va motivatsion sohalar bilan o'zaro bog'liq holda tahlil qilgan.

### **3. Zamonaviy yondashuvlar**

**A. Banduraning** ijtimoiy-kognitiv nazariyasi iroda va o'zini o'zi boshqarish jarayonini "o'z-o'zini samaradorlik" (self-efficacy) tushunchasi orqali izohlaydi. Harbiy xizmatchining irodasi, avvalo, uning o'z imkoniyatlariga ishonchi bilan mustahkamlanadi.

**K. Levinning** maydon nazariyasi irodaviy qaror qabul qilish jarayonini motivlar maydoni sifatida ko'rib, harbiy sharoitda tashqi bosim va ichki intilishlar o'rtasidagi muvozanatni tahlil qilish imkonini beradi.

**Zamonaviy neyropsixologiya** irodani frontal po'stloq faoliyati, emotsional barqarorlik va stressga qarshi psixofiziologik chidamlilik bilan bog'laydi. Bu yondashuv harbiy psixologiyada irodaviy sifatlarni rivojlantirish uchun neyrotrening, biofeedback va VR-simulyatsiya kabi uslublarni qo'llash imkoniyatini beradi.

G'arb psixologiya maktablarida iroda ko'proq **nazariy va ilmiy-psixologik jarayon** sifatida o'rganilgan.

**I. Kant** irodani axloqiy qonunga bo'ysundirish qobiliyati sifatida izohlagan.

**G. Vundt** uni psixik faoliyatning markazi, hissiyot va tafakkur bilan bog'liq jarayon sifatida ko'rgan.

**S. L. Rubinshteyn** va **A. N. Leontyev** irodani faoliyatda qiyinchiliklarni yengib o'tish va maqsad sari intilish sifatida tahlil qilgan.

**A. Bandura** esa iroda va o'zini o'zi boshqarishni shaxsning o'ziga bo'lgan ishonchi orqali tushuntirgan.

Zamonaviy neyropsixologiya irodani miya faoliyati, stressga chidamlilik va emotsional barqarorlik bilan bog'lab o'rganadi.

Demak, G'arb olimlari irodani **motivatsion, faoliyatiy va neyropsixologik** jarayon sifatida tadqiq etishgan.

### **Ilmiy-metodologik tahlil**

Nazariy qarashlarni umumlashtirgan holda, harbiy xizmatchilar irodaviy sifatlarni rivojlantirish quyidagi metodologik asoslarda amalga oshirilishi mumkin:

1. **Axloqiy-me'yoriy yondashuv (Kant, Rubinshteyn)** — harbiy xizmatchida mas'uliyat, burch, vatanparvarlik va intizomni mustahkamlash orqali iroda shakllanadi.

2. **Faoliyat yondashuvi (Leontyev, Ananyev)** — iroda amaliy faoliyat jarayonida, mashq va intizomiy tajribalar orqali rivojlanadi.

3. **Motivatsion-kognitiv yondashuv (Bandura, Levin)** — iroda shaxsning ichki ishonchi, motivatsiyasi va tashqi muhit bilan munosabati orqali mustahkamlanadi.

4. **Biopsixologik yondashuv (zamonaviy neyropsixologiya)** — iroda neyrofiziologik mexanizmlar bilan bog‘liq bo‘lib, uni maxsus trening va texnologiyalar yordamida rivojlantirish mumkin.

Sharq va G‘arb yondashuvlarini umumlashtirganda quyidagilarni ko‘rish mumkin:

1. **Sharq an‘analari** irodani ko‘proq **axloqiy-ma‘naviy, ruhiy jihatlar** bilan bog‘lagan bo‘lsa,

2. **G‘arb maktabi** irodani **ilmiy-psixologik va faoliyatga asoslangan** mexanizm sifatida izohlagan.

3. Har ikkala yondashuvning birlashish nuqtasi — iroda insonni qiyinchiliklarni yengishga, axloqiy burchni ado etishga va maqsad sari qat‘iyat bilan harakat qilishga undovchi ichki kuchdir.

Harbiy xizmatchilarda axloqiy-irodaviy sifatlarni rivojlantirish nazariyasi turli psixologik maktablar va ilmiy yondashuvlarning integratsiyasini talab qiladi. Klassik psixologiyada iroda ko‘proq axloqiy-ontologik asosda tushuntirilgan bo‘lsa, sovet maktabi uni faoliyat bilan bog‘ladi, zamonaviy ilm esa motivatsiya va neyropsixologik omillarga urg‘u beradi. Shunday qilib, harbiy psixologiyada iroda va axloqiy barqarorlikni rivojlantirish metodikasi axloqiy-ma‘naviy tarbiya, faoliyat jarayonida mashq qilish, motivatsion dastaklar va psixotexnologiyalar uyg‘unligida samarali natija beradi.

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## **ДИСТАНЦИОННОЕ ОБУЧЕНИЕ ТРУДОВЫХ МИГРАНТОВ ЧЕРЕЗ СОЦИАЛЬНЫЕ СЕТИ**

***Аннотация:** В статье рассматривается использование социальных сетей как платформы для дистанционного обучения трудовых мигрантов. Оценивается роль социальных сетей в преодолении образовательных барьеров, таких как языковая и культурная изоляция, а также проблемы с доступом к традиционным образовательным ресурсам.*

***Ключевые слова:** цифровая грамотность, языковой барьер, образовательные платформы, межкультурная коммуникация, интернет-доступ, мотивация, гибкость обучения.*

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## **DISTANCE LEARNING FOR LABOR MIGRANTS VIA SOCIAL MEDIA**

***Abstract:** This article examines the use of social media as a platform for distance learning for labor migrants. It evaluates the role of social media in overcoming educational barriers, such as language and cultural isolation, as well as problems accessing traditional educational resources.*

***Keywords:** digital literacy, language barrier, educational platforms, intercultural communication, internet access, motivation, learning flexibility.*

**Введение.** В последние десятилетия глобализация и развитие технологий привели к увеличению числа трудовых мигрантов по всему миру [8]. Люди, покидая свои родные страны, стремятся улучшить свою экономическую ситуацию, найти лучшие условия для жизни и работы. Однако столкновение с новыми культурами, языками и трудовыми условиями представляет для мигрантов ряд вызовов [1]. Одним из таких вызовов является необходимость обучения новым навыкам, адаптации к изменениям и освоению новых знаний для успешной интеграции в новое общество.

Одним из эффективных инструментов, который может помочь трудовым мигрантам в процессе обучения, являются социальные сети [9].

Дистанционное обучение через социальные сети не только доступно, но и позволяет преодолевать языковые и культурные барьеры [2]. В данной статье будет рассмотрено, как социальные сети могут стать платформой для дистанционного обучения трудовых мигрантов, какие преимущества и проблемы возникают при использовании таких инструментов, а также предложены возможные пути улучшения образовательного процесса для этой категории людей [3].

### 1. Значение дистанционного обучения для трудовых мигрантов

Трудовые мигранты, особенно те, кто приезжает из развивающихся стран, часто сталкиваются с трудностью освоения новых знаний и навыков. Ключевыми проблемами, с которыми они сталкиваются, являются [4]:

- **Языковой барьер.** Мигранты часто не говорят на языке страны, в которой они работают, что затрудняет их интеграцию и трудовую деятельность.

- **Недостаток образования и квалификации.** Многим мигрантам не хватает навыков для высококвалифицированной работы, и им нужно дополнительное образование или обучение.

- **Культурные различия.** Неопытность в сфере местных обычаев и правил работы может стать препятствием для адаптации [5].

Дистанционное обучение представляет собой эффективное решение этих проблем, поскольку оно предлагает гибкость и доступность, что особенно важно для мигрантов, работающих в условиях ограниченного времени и ресурсов.

### 2. Роль социальных сетей в обучении

Социальные сети, такие как Facebook, Instagram, WhatsApp, VK, Telegram и другие, предоставляют уникальные возможности для обучения [6]. Они становятся платформами для обмена информацией и знаний, и могут быть использованы для создания образовательных сообществ. Вот несколько причин, почему социальные сети могут быть полезны для дистанционного обучения трудовых мигрантов:

- **Доступность.** Социальные сети доступны на мобильных устройствах, что делает их идеальным инструментом для людей, имеющих ограниченный доступ к традиционным образовательным ресурсам [10].

- **Гибкость.** Обучение через социальные сети можно проводить в любое время и в любом месте, что важно для людей, работающих по сменам или имеющих нестабильный график.

- **Мультиязычность.** Многие социальные сети поддерживают различные языки, что позволяет обучаться мигрантам, не владеющим языком страны пребывания [7].

- **Интерактивность.** Социальные сети позволяют создавать группы и сообщества, где можно взаимодействовать с другими людьми, задавать вопросы, делиться опытом и получать обратную связь от экспертов.

### 3. Преимущества дистанционного обучения через социальные сети

Дистанционное обучение через социальные сети имеет ряд преимуществ, как для мигрантов, так и для организаций, которые занимаются обучением.

### **Заключение**

Дистанционное обучение через социальные сети представляет собой мощный инструмент для обучения трудовых мигрантов. Оно позволяет преодолеть многие барьеры, такие как языковые и культурные различия, доступность образования и недостаток времени. Тем не менее, для того чтобы это обучение было более эффективным, необходимо решать вопросы с доступом к интернету, цифровой грамотностью и качественным контентом. Важно, чтобы образовательные программы учитывали потребности мигрантов и предоставляли им возможности для самостоятельного и гибкого обучения.

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КОМПЕТЕНЦИИ ПРЕПОДАВАТЕЛЯ ИНОСТРАННОГО ЯЗЫКА  
//ИННОВАЦИОННЫЕ ПОДХОДЫ В СОВРЕМЕННОЙ НАУКЕ. – 2022. – С.  
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## **ОСНОВНЫЕ ЭТИОЛОГИЧЕСКИЕ ПРИЧИНЫ НАРУШЕНИЙ ЖЕЛУДОЧНО-КИШЕЧНОГО ТРАКТА У ДЕТЕЙ**

**Аннотация:** В данной статье рассмотрены основные этиологические факторы нарушений желудочно-кишечного тракта (ЖКТ), встречающихся у детей. Представленные данные проанализированы на основе научных исследований, опубликованных за последние 5 лет (2021–2025 гг.).

Исследования показывают, что заболевания желудочно-кишечного тракта у детей имеют полиэтиологический характер, при этом важное значение имеют инфекционные факторы, функциональные расстройства, дисбаланс кишечной микрофлоры, пищевые аллергические реакции, генетическая предрасположенность, а также психоэмоциональные факторы.

В современных научных концепциях особое внимание уделяется механизму «gut-brain axis», воспалительным и иммунным процессам, а также роли кишечной микрофлоры.

В статье систематически рассмотрены этиологические факторы, раскрыта их клиническая значимость и профилактические направления.

**Ключевые слова:** желудочно-кишечный тракт, детская гастроэнтерология, этиология, гастроэнтерит, кишечная микрофлора, функциональные расстройства, gut-brain axis (кишечно-мозговая ось), пищевые аллергены.

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## **MAIN ETIOLOGICAL CAUSES OF GASTROINTESTINAL DISORDERS IN CHILDREN**

**Abstract:** This article examines the main etiological factors of gastrointestinal (GI) disorders in children. The presented data are analyzed based on scientific studies published over the past five years (2021–2025).

Research indicates that gastrointestinal diseases in children are polyetiological in nature, with infectious factors, functional disorders, intestinal microbiota imbalance, food-related allergic conditions, genetic predisposition, and psychoemotional factors playing significant roles.

*Modern scientific perspectives emphasize the importance of the gut–brain axis mechanism, inflammatory and immune processes, as well as the role of intestinal microbiota.*

*This article systematically reviews the etiological factors, highlighting their clinical significance and preventive approaches.*

**Keywords:** *gastrointestinal tract, pediatric gastroenterology, etiology, gastroenteritis, intestinal microbiota, functional disorders, gut–brain axis, food allergens.*

## **Введение**

Несмотря на то, что проведено множество научных исследований, заболевания желудочно-кишечного тракта у детей остаются одной из наиболее часто встречающихся патологий в педиатрической практике. Во всем мире гастроэнтерит и диарея по-прежнему являются одной из основных причин заболеваемости и госпитализации детей до 5 лет. Это создает трудности у клиницистов при проведении лечебных мероприятий. Согласно данным Всемирной организации здравоохранения (ВОЗ), острые кишечные инфекции остаются одной из ведущих причин детской смертности в развивающихся странах (WHO, 2023).

Последние исследования показывают, что нарушения желудочно-кишечного тракта у детей связаны не только с инфекционными, но и с функциональными, иммунологическими и психосоматическими факторами. Особенно важно значение кишечной микрофлоры, механизмов иммунного ответа, а также концепции «ось кишечник–мозг» («gut-brain axis»), которая формируется как новое направление в педиатрической гастроэнтерологии.

**Цель.** Провести систематический анализ основных этиологических факторов нарушений желудочно-кишечного тракта у детей на основе современных научных данных.

## **1. Инфекционные этиологические факторы**

### **Вирусные инфекции.**

Последние исследования последних лет подтверждают, что основной причиной острого гастроэнтерита у детей являются ротавирус и норовирус (Troeger et al., 2022). Широкое внедрение программ вакцинации против ротавируса снизило показатели заболеваемости, однако норовирусные инфекции остаются актуальной проблемой.

При гастроэнтеритах вирусной этиологии повреждаются эпителиальные клетки кишечника, нарушается водно-электролитный баланс, что приводит к развитию секреторной диареи. Стул у детей обычно светложелтый, пенистый. Заболевание сопровождается выраженной интоксикацией: потерей аппетита, вялостью, сонливостью и гиподинамией. Клинические наблюдения 2021–2024 годов показали возрастные особенности иммунного ответа при вирусных инфекциях.

Норовирусные гастроэнтериты являются второй по частоте причиной диареи у детей. Инфекции, вызванные норовирусом, как правило, начинаются

остро и сопровождаются выраженной интоксикацией и обезвоживанием (Ситкина Е. Л. и др., 2025). Инкубационный период составляет обычно 12–48 часов, течение болезни 1–3 дня. Характерны последовательная рвота, сильные боли в животе, температура может подниматься до 39 °С, что приводит к выраженной дегидратации.

### **Бактериальные инфекции.**

Основными возбудителями бактериальной диареи у детей являются *Salmonella*, *Shigella*, *Campylobacter* и энтеропатогенный *E. coli* (Guarino et al., 2022). Бактериальные инфекции чаще имеют тяжелое клиническое течение с выраженным интоксикационным синдромом: рвота, понос, слабость, потеря аппетита, общее недомогание, повышение температуры. Цвет стула может быть разным: при сальмонеллезе обычно зеленый и зловонный, при шигеллезе кашицеобразный с кровью и гноем, при энтеропатогенном *E. coli* — жидкий, зеленоватый (Гончар Н. В. и др., 2020; Bakirov A. A. et al., 2025).

Нерациональное использование антибиотиков приводит к дисбалансу кишечной микробиоты, создавая предпосылки для хронических функциональных нарушений. Антибиотики убивают не только патогенные, но и нормальную флору, что вызывает дисбактериоз, диарею, метеоризм и запоры, снижает иммунитет и нарушает пищеварение (Николаева С. В., Горелов А. В., Крикун В. С., 2024). Восстановление микробиоты после антибиотиков может занимать от 6 месяцев до 2 лет.

### **Паразитарные инфекции.**

Паразитарные инфекции являются одной из наиболее распространенных патологий у детей. Они вызывают нарушение микрофлоры кишечника, аллергические реакции, иммунносупрессивное воздействие, метаболические нарушения, токсическое и нейро-рефлекторное влияние. *Giardia lamblia* и другие кишечные паразиты могут вызывать синдром мальабсорбции и хроническую диарею. Данные 2023–2024 годов подчеркивают важную роль санитарно-гигиенических факторов, например, попадание паразита через немытые руки и повторное завершение жизненного цикла в кишечнике.

## **2. Функциональные нарушения желудочно-кишечного тракта**

За последние 5 лет исследования показали значительный рост функциональных нарушений ЖКТ у детей (Nyams et al., 2021; Saps et al., 2023). Согласно критериям ROME IV, при функциональных расстройствах органическая патология отсутствует, но клинические симптомы присутствуют.

### **Синдром раздраженного кишечника (СРК).**

Развитие СРК у детей связано с повышенной чувствительностью кишечника, дисбалансом микрофлоры и психоэмоциональными факторами. Стрессовые состояния у детей особенно способствуют развитию СРК, проявляющегося болями в животе, вздутием, диареей и запорами. Исследования 2024–2025 годов показали тесную связь СРК с тревожно-депрессивными состояниями (Robin et al., 2024).

### **Функциональные запоры.**

Функциональные запоры — одни из наиболее частых нарушений в детской гастроэнтерологии, связанные с неправильным питанием, малоподвижным образом жизни и нарушением рефлексорной моторики кишечника. Недостаток жидкости и клетчатки в рационе также способствует развитию запоров. Кроме того, возможны механические причины, возникающие после хирургических заболеваний.

### **3. Кишечная микрофлора и дисбактериоз**

Современные исследования подчеркивают важность кишечной микрофлоры. Данные 2022–2024 годов показывают, что снижение разнообразия кишечных бактерий усиливает воспалительные процессы и повышает риск функциональных нарушений (Vandenplas et al., 2023). Микробиота кишечника уникальна для каждого человека, играет ключевую роль в нормализации пищеварения, синтезе витаминов и поддержании иммунной функции. Наибольшее количество микроорганизмов локализовано в толстом кишечнике.

Антибиотики, неправильное питание и искусственное вскармливание негативно влияют на микробиоту. Использование пробиотиков в некоторых случаях снижает выраженность клинических симптомов. Восстановление микробиоты после антибиотиков требует как минимум шести месяцев.

### **4. Пищевые аллергены и ферментопатии**

Пищевые аллергены, включая аллергию на белок коровьего молока, у детей проявляются рвотой, диареей и коликами. Исследования 2021–2024 годов различают IgE-зависимые и независимые аллергические механизмы (Nowak-Wegrzyn et al., 2022). Возможны реакции на яйца, арахис, орехи, сою и другие продукты.

Лактозная непереносимость развивается при недостатке фермента лактазы, проявляется метеоризмом и диареей (Jumagul E., 2026). Фермент должен синтезироваться в тонкой кишке, его дефицит приводит к симптомам при употреблении молочных продуктов. Заболевание бывает врожденным или приобретенным (после кишечных заболеваний).

### **5. Gut-brain axis и психоэмоциональные факторы**

Современные исследования показывают, что двусторонняя связь между кишечником и центральной нервной системой («gut-brain axis») играет важную роль в развитии функциональных нарушений у детей (Mayer et al., 2022).

Семейный стресс и психологическая нагрузка в школе влияют на моторную и секреторную функции кишечника. Данные 2023–2025 годов подтверждают связь функциональных болей в животе с психоэмоциональным стрессом. Семейные конфликты и стрессовые ситуации для ребенка повышают риск развития подобных нарушений ЖКТ.

## Выводы

Последние 5 лет исследований показывают, что нарушения ЖКТ у детей имеют полиэтиологическую природу. Основные этиологические факторы:

1. Вирусные и бактериальные инфекции.
2. Функциональные нарушения (СРК, запоры).
3. Дисбаланс кишечной микрофлоры.
4. Пищевые аллергены и ферментная недостаточность.
5. Психоэмоциональные факторы и «gut-brain axis».

Ранняя диагностика, рациональное питание, соблюдение гигиены и индивидуальный подход имеют ключевое значение в профилактике заболеваний ЖКТ у детей. Первичная профилактика снижает риск развития патологий, а соблюдение гигиенических правил уменьшает распространение кишечных паразитов и предотвращает осложнения. Психоэмоциональная стабильность в семье и школе, а также контроль воздействия пищевых аллергенов и фаст-фудов важны для нормального функционирования кишечника и поддержания иммунно-эндокринной системы.

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## **СОВРЕМЕННЫЕ ПОДХОДЫ К УКРЕПЛЕНИЮ ИММУНИТЕТА У ДЕТЕЙ**

**Аннотация:** В данной статье рассматриваются особенности формирования иммунной системы у детей, а также современные и научно обоснованные подходы к её укреплению. В детском возрасте иммунная система морфофункционально ещё не полностью сформирована, вследствие чего организм обладает высокой чувствительностью к различным бактериальным и вирусным инфекциям. В связи с этим усиление профилактических мероприятий в педиатрической практике является одной из актуальных задач.

В ходе исследования был сделан вывод о том, что рациональное питание, витамины и микроэлементы (в частности витамин D, A, C, а также цинк и железо) играют важную роль в механизмах иммунного ответа, что было проанализировано на основе научных источников. Также освещена значимость профилактической вакцинации в формировании приобретённого иммунитета у детей, а также взаимосвязь кишечной микрофлоры и пробиотиков с иммунной системой.

Кроме того, рассмотрено влияние физической активности, закаливания, достаточного сна и здоровой психоэмоциональной среды на стабильность иммунной системы. Результаты современных научных исследований показали, что укрепление иммунной системы у детей требует комплексного и системного подхода.

Представленные в статье данные служат совершенствованию профилактических стратегий в педиатрической практике, сохранению здоровья детей и снижению показателей инфекционной заболеваемости [1,2,4,5,7,8,11].

**Ключевые слова:** иммунитет детей, вакцинация, витамин D, пробиотики, педиатрия, профилактика, здоровый образ жизни.

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## **MODERN APPROACHES TO STRENGTHENING IMMUNITY IN CHILDREN**

**Abstract:** This article examines the characteristics of immune system development in children, as well as modern and scientifically grounded approaches to its strengthening. In childhood, the immune system is not yet fully developed morphofunctionally, which results in increased susceptibility to various bacterial and viral infections. Therefore, enhancing preventive measures in pediatric practice is considered one of the pressing tasks.

The study concluded that rational nutrition, vitamins, and microelements (in particular vitamins D, A, and C, as well as zinc and iron) play an important role in the mechanisms of immune response, as analyzed based on scientific sources. The significance of preventive vaccination in the formation of acquired immunity in children, as well as the relationship between intestinal microflora, probiotics, and the immune system, is also highlighted.

In addition, the impact of physical activity, hardening practices, adequate sleep, and a healthy psycho-emotional environment on the stability of the immune system is discussed. The results of modern scientific research indicate that strengthening the immune system in children requires a comprehensive and systematic approach.

The data presented in the article contribute to the improvement of preventive strategies in pediatric practice, the preservation of children's health, and the reduction of infectious disease incidence rates [1,2,4,5,7,8,11].

**Keywords:** children's immunity, vaccination, vitamin D, probiotics, pediatrics, prevention, healthy lifestyle.

## Введение

Известно, что в детском возрасте иммунная система не полностью сформирована, и организм считается особенно чувствительным к инфекционным заболеваниям [2]. Формирование иммунной системы представляет собой поэтапный процесс, который начинается с рождения ребёнка и его адаптации к окружающей среде.

У новорождённых иммунитет в основном передаётся через материнское молоко и называется пассивным иммунитетом. По мере взросления ребёнок начинает получать профилактические прививки, в результате чего в организме начинает формироваться иммунитет. Кроме того, у детей формируется активный иммунитет после перенесённых бактериальных и вирусных заболеваний. Особенно у детей дошкольного возраста частое возникновение острых респираторных инфекций связано с незрелостью иммунной системы [3]. В педиатрической практике укрепление иммунитета является одним из приоритетных направлений профилактической медицины [1].

## Основная часть

### 1. Рациональное питание и микроэлементы

Для полноценного формирования иммунной реакции рациональное питание имеет большое значение. В составе питания должно быть достаточное количество белков, витаминов и микроэлементов [4].

Недостаточность отдельных витаминов и микроэлементов в рационе приводит к частой заболеваемости у детей и ослаблению иммунной системы. В результате организм становится ослабленным, а ребёнок может отставать в росте и развитии. Рацион ребёнка должен быть разнообразным. Ниже рассмотрим некоторые витамины и микроэлементы, играющие важную роль в формировании иммунной системы.

Витамин D играет важную роль в регуляции активности иммунных клеток, а его дефицит повышает риск инфекционных заболеваний у детей [5]. Одним из сильных регуляторов иммунной системы является витамин D, который усиливает врождённый и приобретённый иммунитет, а также стимулирует выработку организмом антимикробных пептидов против микробов и инфекций. В процессе воспаления он снижает выработку медиаторов воспаления, в результате чего предотвращаются воспалительные реакции. В лимфоцитах и моноцитах присутствуют рецепторы витамина D (VDR), что обеспечивает контроль иммунного ответа. Обычно витамин D вырабатывается в коже под воздействием солнечных лучей. В зимний период или при врождённых нарушениях, приводящих к дефициту витамина D, рекомендуется его дополнительное введение в организм.

Витамины С и А поддерживают антиоксидантные и барьерные защитные функции [6]. Витамин С имеет важное значение для формирования иммунитета у ребёнка, усиливает противовоспалительное действие организма, повышает устойчивость к аллергенам и защищает от инфекций. Кроме того, он играет важную роль в усвоении кальция и железа в рационе, например, переводит трёхвалентное железо в двухвалентное. Он необходим для функционирования надпочечников и стимулирует выработку гормонов. Витамин А активирует выработку лейкоцитов, стимулирует продукцию интерферона и иммуноглобулина А, повышает сопротивляемость инфекционным заболеваниям. Кроме того, витамин А укрепляет слизистые оболочки, в результате чего вирусы и бактерии не могут проникнуть в организм. Оба витамина связывают свободные радикалы в организме и оказывают антиоксидантное действие. При их дефиците иммунная система ослабляется, и ребёнок часто болеет инфекционными заболеваниями.

Дефицит цинка и железа снижает активность иммунных ферментов [4]. Доказано, что цинк участвует примерно в 300 ферментативных биохимических реакциях в организме. Он необходим для роста Т- и В-клеток и стимулирует их активность. Защищает организм от антигенов и усиливает защитную реакцию. Играет важную роль в росте клеток. Железо является одним из микроэлементов, необходимых для размножения и формирования Т-клеток. Оно входит в состав ферментов, необходимых макрофагам и нейтрофилам для уничтожения инфекции. Уровень ферритина в организме отражает эффективность иммунной системы.

## 2. Профилактическая вакцинация

Вакцинация формирует у детей приобретённый активный иммунитет и предотвращает тяжёлые инфекции [7]. Благодаря вакцинации предотвращается распространение и передача инфекционных заболеваний среди детей. При введении вакцины или сыворотки в организм формируется искусственный иммунитет, в результате чего заболевание не распространяется. Вакцины бывают ослабленными и инактивированными. При их введении организм «знакомится» с инфекцией и формирует иммунитет. С помощью вакцин обеспечивается охрана общественного здоровья. По данным Всемирной организации здравоохранения, иммунизация ежегодно предотвращает 3–5 миллионов случаев смерти [7]. В нашей стране также разработан календарь прививок, и вакцинация проводится с момента рождения ребёнка в условиях родильного дома.

Благодаря программам вакцинации значительно сократилась заболеваемость корью, полиомиелитом и коклюшем [7]. Некоторые заболевания благодаря вакцинации были полностью ликвидированы, например, натуральная оспа.

### 3. Кишечная микробиота и пробиотики

Кишечная микробиота является важным компонентом иммунной системы [8], поскольку она формирует защитный барьер против патогенных микроорганизмов. Полезные бактерии микрофлоры уравнивают иммунный ответ организма, защищают от инфекций и помогают предотвращать аутоиммунные заболевания. Кроме того, микробиота ограничивает воспалительные процессы, предотвращая чрезмерную активацию иммунной системы.

В результате дисбиоза могут развиваться кишечные и воспалительные заболевания, и при длительном течении этого состояния снижается устойчивость организма к инфекциям. Научные исследования доказали, что применение пробиотиков может снижать частоту респираторных инфекций и облегчать осложнения после антибиотикотерапии [8,9]. Баланс микробиоты имеет важное значение для адекватного формирования иммунного ответа [8].

Одной из причин нарушения микробиоты является нерациональное применение антибактериальных препаратов. В некоторых источниках указывается, что назначение пробиотиков во время антибактериальной терапии предотвращает развитие кишечного дисбактериоза и ослабление иммунитета.

### 4. Физическая активность и закаливание

Регулярные физические упражнения активизируют циркуляцию иммунных клеток и оказывают противовоспалительное действие [10]. Это один из наиболее эффективных естественных методов, ускоряющий циркуляцию лейкоцитов. Под закаливанием обычно понимается воздействие свежего воздуха и прохладной воды, что повышает устойчивость организма к инфекциям и микробам, способствует устранению воспалительных процессов.

Профилактируются хронические заболевания, уменьшаются стрессовые состояния, улучшается настроение человека и активизируется иммунитет. Снижается риск онкологических заболеваний, сахарного диабета и сердечно-сосудистых болезней. В результате физических упражнений незначительно повышается температура тела, усиливается кровообращение и повышается сопротивляемость бактериям. Кроме того, уменьшается выработка гормона стресса и улучшается эмоциональное состояние.

Под физической активностью следует понимать не только тяжёлые спортивные тренировки, но и ходьбу, езду на велосипеде, игру в теннис и другие виды активности. Плавание также очень полезно для организма, поскольку в нём участвуют практически все мышцы тела.

Прогулки на свежем воздухе и закаливание усиливают адаптацию организма к факторам внешней среды [2].

#### 5. Сон и психоэмоциональное состояние

Достаточный сон играет важную роль в регуляции иммунной системы [11]. Во время сна вырабатывается гормон мелатонин, тогда как при недостатке сна или частых стрессовых ситуациях увеличивается выработка гормона кортизола. При длительном воздействии это приводит к снижению количества лимфоцитов и развитию воспалительных процессов.

В результате дети начинают часто болеть различными вирусными и бактериальными инфекциями. Кроме того, повышается риск аллергических заболеваний, сахарного диабета, опухолевых и сердечно-сосудистых заболеваний. Сон является физиологическим процессом, во время которого в организме происходят регенеративные процессы.

При увеличении стрессовых ситуаций в организме ребёнка повышается уровень кортизола, адреналина и норадреналина. Основным патогенетическим этапом усиления воспалительных процессов является снижение количества лимфоцитов и замедление фагоцитоза. В период стресса нарушается регуляция иммунной системы, вследствие чего дети чаще болеют ОРВИ и другими заболеваниями. Хронический стресс ослабляет иммунный ответ и повышает предрасположенность к заболеваниям [11].

По данным UNICEF, воспитание детей в здоровой психологической среде оказывает непосредственное влияние на общие показатели здоровья [12].

#### Заключение

Укрепление иммунитета у детей является многофакторным процессом, включающим рациональное питание, вакцинацию, поддержку кишечной микробиоты, физическую активность и обеспечение здоровой психологической среды [1,7,8].

В заключение следует отметить, что обеспечение рационального функционирования иммунной системы является многоэтапным процессом,



в котором важную роль играют не только педиатры, но и родители, школа и факторы окружающей среды. Даже обычное недосыпание или стрессовые ситуации могут нанести серьёзный вред организму ребёнка, так же как и физическая активность играет крайне важную роль.

Необходимо помнить о важности соблюдения режима питания ребёнка и рационального применения антибактериальной терапии в процессе лечения, поскольку это имеет большое значение для растущего организма.

На основе современных научных данных комплексный профилактический подход является наиболее эффективной стратегией сохранения здоровья детей [4].

В заключение следует сказать: здоровое поколение — залог здорового будущего.

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## **ПЕДАГОГИЧЕСКИЕ АСПЕКТЫ РАЗВИТИЯ КОЛЛЕКТИВИСТСКИХ ОТНОШЕНИЙ В СТУДЕНЧЕСКОЙ СПОРТИВНОЙ СРЕДЕ**

***Аннотация:** Воспитание в коллективе, для коллектива и через коллектив составляет один из ведущих принципов системы педагогического воспитания, обоснованной и подтвержденной педагогическим опытом. Формирование личности студента происходит под влиянием разнообразных видов деятельности, в том числе деятельности спортивного коллектива. Формирование коллективистических отношений в процессе спортивной деятельности студентов положительно влияет на их отношение к другим видам деятельности. Студенты спортсмены больше осознают общественную значимость не только занятий спортом, но и основного для них вида деятельности — учебно-трудовой.*

***Ключевые слова:** коллектив, студент, опыт, отношения, практическая деятельность, спортивный коллектив.*

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## **PEDAGOGICAL ASPECTS OF DEVELOPING COLLECTIVISTIC RELATIONS IN STUDENT SPORTS**

***Abstract:** Education within, for, and through the team constitutes one of the guiding principles of the pedagogical education system, substantiated and confirmed by pedagogical experience. The development of a student's personality is influenced by a variety of activities, including those of a sports team. The development of collectivist relationships during students' sports activities positively influences their attitudes toward other activities. Student athletes are more aware*

*of the social significance not only of sports but also of their primary activity—academic and work-related activities.*

**Keywords:** *team, student, experience, relationships, practical activities, sports team.*

**Методы и организация исследования.** Концепция «Физической культуры и спорта» исходит из признания того, что личность активно формируется в условиях коллективной жизнедеятельности. Воспитание в коллективе, для коллектива и через коллектив составляет один из ведущих принципов системы педагогического воспитания, обоснованной и подтвержденной педагогическим опытом. Коллективизм - один из основных принципов человеческой нравственности, раскрывающий взаимоотношения отдельного человека и общества в целом, личности и коллектива. Студенческий коллектив является типичным коллективом, и процесс формирования в нем коллективистских отношений заключается в накоплении, качественном обогащении студентами опыта нравственного поведения при целенаправленных воздействиях на их чувства и сознание. Коллективистические отношения должны пронизывать все многообразные системы отношений, в которые вступают студенты (поступая в вуз) в процессе

совместной деятельности; стать стержнем любого вида отношений, а уровень и характер их сформированности - показателем воспитанности студентов в целом. Такие отношения обеспечивают ориентацию личности в разнообразии поступков, исходя не из личных мотивов и интересов, а из общественной значимости поступков. В процессе развития коллективистических отношений происходит углубление дружеского участия, взаимной помощи и чуткости, устанавливаются отношения добровольного подчинения, соподчинения, взаимозависимости, сопереживания [2]. Формирование личности студента происходит под влиянием разнообразных видов деятельности, в том числе деятельности спортивного коллектива (группы, секции). Несмотря на то что учебно-трудовая деятельность является ведущим в студенческих коллективах,

его удельный вес в формировании коллективистических отношений ниже, чем деятельность, общественной, спортивной и других видов деятельности. Недооценка этого преподавателями — одна из причин появления у отдельных студентов издержек в нравственном воспитании. Кроме того, добровольно вступая в спортивный коллектив (спортивный клуб вуза), студент острее, чем в учебной группе, переживает отношение к нему преподавателя-тренера, товарищей. Это требует от преподавателей особой честности в отношениях со студентами, объективности в оценке их действий, знания характера межличностных отношений. Однако процесс формирования коллективистических отношений в студенческом спортивном коллективе (группе, команде) еще недостаточно подвергаются углубленному изучению и теоретическому анализу. Это приводит к тому,

что свойства конкретного спортивного коллектива как субъекта воспитания в высшей школе не всегда учитываются, внутриколлективные отношения и зависимости складываются стихийно, что значительно осложняет педагогическое руководство и снижает его уровень. Такое положение отражает очевидное противоречие между неуклонно растущими требованиями «настоящего» образа жизни и уровнем научных знаний о закономерностях формирования коллективистических отношений. Поэтому актуальной проблемой является определение педагогических условий спортивной деятельности студентов, при которых создаются благоприятные возможности формирования коллективистических отношений. В процессе многолетних педагогических исследований с использованием педагогического эксперимента, наблюдений, бесед, анкетирования, обобщения независимых характеристик, анализа и обобщения полученных материалов установлено следующее. Как объект педагогического анализа, коллективистические отношения есть закономерный результат направленного формирования коллективистических качеств личности студентов путем организации «отношений-общений» в процессе общественно значимой совместной спортивной деятельности. Спортивная деятельность влияет на формирование личности студента неоднозначно: при одних условиях она способствует совершенствованию положительных качеств, при других может создавать почву для проявления отрицательных черт личности.

Это объясняется тем, что воспитывает студентов не само участие в спорте, а те отношения, которые складываются в коллективе в процессе деятельности [3]. Организация коллективистических отношений в процессе деятельности студентов в спортивном коллективе может осуществляться как прямым, так и опосредованным путем. Первый предполагает использование коллективных форм проведения массовых спортивных мероприятий, способствующих формированию отношений сотрудничества и взаимопомощи, ответственности и взаимной требовательности, товарищества и дружбы. Второй путь состоит в организации студенческого коллектива, что создает предпосылки для перехода организуемых отношений в личностные. Эффективный результат достигается при единстве прямого и опосредованного путей воздействия, что подчеркивает необходимость двустороннего подхода к организации коллективистских отношений. Определены следующие стадии и характерные признаки развития спортивного студенческого коллектива. На первой стадии еще не у всех студентов, поступивших в вуз на первый курс, имеются стойкие коллективистические отношения, а отдельные лица позволяют себе действия, не вполне совпадающие с интересами коллектива, совершаемые под влиянием ранее сформировавшихся у них эгоистических и потребительских отношений. Поэтому поставленные перед спортивным коллективом общие цели и перспективы еще не всеми осознаются и переживаются как значимые для них, за успешное

выполнение которых они несут ответственность. Несмотря на наличие органов самоуправления коллектива, они не играют существенной роли в руководстве практической деятельностью; оно в основном осуществляется посредством требований преподавателей. В борьбе за достижение коллективных целей недостаточно проявляются сотрудничество и взаимопомощь, забота о делах всего коллектива, требовательность друг к другу. Вторая стадия развития спортивного коллектива характеризуется наличием единой системы коллективистических отношений и зависимостей в практической деятельности студентов. Однако у отдельных лиц эти отношения еще не перешли в личностные, в связи с чем у них наблюдаются недостаточная стойкость и последовательность поведения вне контроля коллектива. Руководство практической деятельностью студентов на данной стадии осуществляется в основном через его органы самоуправления и актив. Существенную роль в этом играет формируемое вузом общественное мнение, вырабатываемый стиль коллективного поведения и накапливаемые положительные традиции, в духе которых студенты стремятся вести себя. Развиваются сотрудничество и взаимопомощь, забота друг о друге, критика и самокритика, что не только способствует успешному достижению общих целей, но и создает благоприятные предпосылки для формирования подлинно коллективистической психологии у будущих специалистов. Для третьей стадии развития спортивного коллектива типичны не только богатая система подлинно коллективистических отношений, но и стремление самих студентов совершенствовать ее в духе принципов морального кодекса. В результате складываются особенно благоприятные условия для перехода организуемых коллективистических отношений в адекватные им личностные отношения студентов, определяющие их активную жизненную позицию, стойкие нравственные убеждения, направленность практической деятельности на достижение общественно значимых целей, перспективы развития каждого члена коллектива. Отсюда переживание за их достижения и неудачи. Это побуждает бороться за создание оптимальных условий для их всестороннего развития, за включение каждого в такую деятельность, которая давала бы ему возможность развить свои способности и внести максимальный вклад в общее дело коллектива. Таким образом, спортивный коллектив становится субъектом воспитания своих членов [4].

**Результаты исследования.** В высокоразвитом студенческом спортивном коллективе успешнее решаются вопросы нравственного воспитания. Поэтому важнейшая задача преподавателя-тренера физического воспитания – создание целеустремленного спортивного коллектива с определенной системой отношений на разных уровнях:

а) в первичном спортивном коллективе (секции) – внутриколлективные отношения для воспитания у студентов навыка

руководствоваться в своих действиях интересами коллектива, помогать товарищам, требовать хорошего выполнения общественных поручений, а также умения руководить и подчиняться:

б) отношения в масштабе института, способствующие сплочению спортивного клуба вуза и расширению отношений коллектива;

в) отношения с другими спортивными, учебными и производственными коллективами, общественными организациями для предупреждения «замыкания» студентов-спортсменов в узком кругу своих интересов, ознакомления их с жизнью других коллективов;

г) интернациональные отношения, задачей которых должно быть создание благоприятных условий для воспитания студентов духе дружбы народов и братской солидарности. Оптимальная структура спортивного коллектива требует решения следующих задач: - во-первых, создания дееспособных органов самоуправления, в том числе и временных, для включения всех членов коллектива в общественную деятельность;

- во-вторых, организации такой системы нравственных отношений и зависимостей между органами самоуправления и их уполномоченными, которая позволяет выработать навыки руководства и подчинения, предотвратить проявление у отдельных спортсменов эгоистических черт личности;

- в-третьих, наделения органов самоуправления и их руководителей большими и конкретными правами обязанностями, создавая предпосылки для формирования активной жизненной позиции, развития творческих способностей и инициативы, умения организовать деятельность товарищей и свою. Важное условие формирования нравственных качеств студентов – познание преподавателями межличностных отношений и статуса каждого воспитуемого как в спортивном, так и в учебном коллективах, полноправными членами которых они являются. Эффективным условием влияния спортивного коллектива на формирование личности студента служит осуществление перехода организуемых в процессе деятельности нравственных отношений в личностные, что возможно лишь при полной гармонии общественных и личных интересов, при переживании коллективных требований как значимых для каждого. При этом важно учитывать индивидуальные нравственные особенности спортсменов, заключающиеся в их жизненной позиции, адекватной или не адекватной требованиям этики и принципам коллективизма в первую очередь [5]. Студенты с устойчивым коллективистическим поведением под влиянием организуемых отношений более систематически занимаются как самовоспитанием, так и воспитанием своих товарищей. Формируемые в спортивном коллективе отношения полностью совпа-\_\_\_ дают с направленностью их личности в целом и становятся личностно-значимыми для каждого из них, что способствует лучшему воздействию средств идейно-политического и нравственного просвещения. Студенты с неустойчивым коллективистическим поведением, находясь под влиянием



создаваемых реальных отношений, закрепляют коллективистский опыт, а средства нравственного просвещения способствуют искоренению негативных черт личности. Особенность подхода к студентам с преобладанием эгоистических наклонностей в поведении, реагирующим на проектируемые отношения в спортивном коллективе, вступающим с ним в противоречие, а иногда и приспособляющимся к ним, заключается в целесообразности использования на базе сильных общественно ценных мотивов ситуаций. Вслед за этим необходима дальнейшая организация длительного воздействия моделируемых новых для них отношений и зависимостей с применением средств идейного и нравственного просвещения. Условия спортивного коллектива и специфика его деятельности требуют умелого применения различных по своему влиянию эмоциональных нагрузок на личность студента. Однако при всем этом требования, предъявляемые к студентам со стороны преподавателей физического воспитания и преподавателей других учебных дисциплин, должны быть согласованы в общем педагогическом процессе вуза. Формирование коллективистических отношений в процессе спортивной деятельности студентов положительно влияет (при вышеизложенных педагогических условиях) на их отношение к другим видам деятельности. Студенты-спортсмены больше осознают общественную значимость не только занятий спортом, но и основного для них вида деятельности — учебно-трудовой. Заметно возрастает их общественная и трудовая активность.

**Выводы.** Все изложенное позволяет повысить эффективность использования в педагогическом воспитании будущих специалистов такого действенного фактора, как студенческий спортивный коллектив. Причины его неоднозначного влияния должны быть учтены преподавателями вузов в практической работе при организации учебно-воспитательного процесса.

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## **ОБРАЗ ЛЮБВИ К РОДИНЕ В ПРОИЗВЕДЕНИИ «БАБУРНОМА»**

***Аннотация:** В данной статье рассматривается художественное воплощение темы любви к родине в выдающемся литературном памятнике эпохи Тимуридов — «Бабурнома» Захириддина Мухаммада Бабура. Анализируются лирические отступления, поэтические образы и эмоциональный нарратив произведения, раскрывающие глубину патриотических чувств автора. Исследование охватывает как прямые высказывания Бабура о тоске по родной земле, так и имплицитные образы, символически передающие привязанность к утраченному отечеству.*

***Ключевые слова:** Бабурнома, Захириддин Мухаммад Бабур, любовь к родине, патриотизм, тимуридская литература, лирика, образ родины, ностальгия, узбекская классическая литература.*

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## **THE IMAGE OF LOVE FOR THE HOMELAND IN THE WORK «BABURNAMA»**

***Abstract:** This article examines the artistic embodiment of the theme of love for the homeland in the outstanding literary monument of the Timurid era — «Baburnama» by Zahiriddin Muhammad Babur. The lyrical digressions, poetic images, and emotional narrative of the work are analyzed, revealing the depth of the author's patriotic feelings. The study encompasses both Babur's direct statements about his longing for his native land and implicit images that symbolically convey his attachment to the lost fatherland.*

***Keywords:** Baburnama, Zahiriddin Muhammad Babur, love for the homeland, patriotism, Timurid literature, lyrics, image of the homeland, nostalgia, Uzbek classical literature.*

### **1. Введение**

Захириддин Мухаммад Бабур (1483–1530) — выдающийся государственный деятель, полководец, поэт и учёный эпохи Тимуридов, основатель державы Великих Моголов в Индии. Его бессмертное произведение «Бабурнома» («Книга Бабура») по праву занимает особое место не только в узбекской и персидско-таджикской литературной традиции, но и во всей мировой мемуарной прозе. Написанная на

чагатайском тюркском языке, эта книга сочетает в себе черты автобиографии, исторической хроники, географического трактата и лирической исповеди.

Среди множества тематических пластов «Бабурномы» тема любви к родине занимает особое, сквозное место. Бабур прожил жизнь, наполненную утратами и скитаниями: изгнанный из Самарканда и Ферганы — городов, ставших колыбелью его детства и юности, — он на протяжении всей жизни носил в сердце неугасимую тоску по родной земле. Эта тоска нашла своё художественное воплощение на страницах его великого труда в виде ярких образов, эмоциональных отступлений и лирических стихов.

Актуальность данного исследования определяется тем, что тема патриотизма и любви к родине является одной из наиболее значимых в современном литературоведении. Изучение художественных средств, посредством которых Бабур выражал свои патриотические чувства, позволяет глубже понять не только его личность, но и духовный мир человека эпохи Ренессанса на Востоке.

Цель данной статьи — исследовать образ любви к родине в «Бабурноме» как многоуровневое художественное явление, охватывающее прямые лирические признания, символические образы природы, архитектурные описания и поэтические вставки.

## **2. «Бабурнома» как литературный памятник: общая характеристика**

«Бабурнома» создавалась на протяжении многих лет и охватывает период с 1494 по 1529 год. По своей жанровой природе это произведение уникально: оно представляет собой синтез дневниковых записей, исторических хроник и лирической прозы. Исследователи единодушно признают «Бабурному» первым подлинным автобиографическим произведением в литературах Востока, лишённым традиционной панегирической условности.

Отличительной чертой стиля Бабура является его исключительная искренность. В отличие от придворных панегиристов, он описывает события своей жизни без прикрас, с поразительной откровенностью говорит о своих поражениях, слабостях и сомнениях. Именно эта искренность придаёт особую силу страницам, посвящённым теме родины: читатель чувствует, что перед ним не риторические фигуры, а живая, неугасающая боль.

Географически «Бабурнома» охватывает обширное пространство — от Ферганской долины и Самарканда до Кабула и просторов Индостана. Однако при всём многообразии описанных стран и городов образ Маверауннахра (Средней Азии) остаётся незыблемым духовным центром всего повествования, тем магнитом, к которому неизменно тяготеет авторская мысль.

## **3. Образ Самарканда и Ферганы: утраченный рай**

Особое место в художественной системе «Бабурномы» занимают образы Самарканда и Ферганской долины. Для Бабура эти города — не просто географические названия, но воплощение утраченного рая, мира детства и юности, навсегда ушедшего в прошлое. Описывая Самарканд, автор прибегает к характерному для восточной поэтики приёму идеализации: город предстаёт средоточием красоты, учёности и культуры.

Бабур с мельчайшими подробностями описывает сады, базары, медресе и мечети Самарканда. За этой кажущейся сухой топографией скрывается глубокое эмоциональное переживание: каждая деталь пейзажа несёт отпечаток ностальгии. Автор словно пытается удержать уходящий образ родного города, запечатлеть его во всей полноте, прежде чем память сотрёт последние черты. Исследователь Д. Росс справедливо замечал, что в описаниях Самарканда Бабур выступает «не как хроникёр, а как поэт, оплакивающий утраченное счастье».

Не менее значим образ Ферганы — родины Бабура. Автор с нескрываемой любовью описывает плодородие долины, обилие садов и виноградников, мягкость климата. В этих описаниях отчётливо ощущается контраст с суровыми условиями афганских нагорий и знойных равнин Индостана, среди которых проходила большая часть его зрелой жизни. Ферганская долина в восприятии Бабура — это эдем, потерянный в самом начале жизненного пути и оставшийся незаживающей раной в его сердце.

Символически значима в этом контексте сцена взятия Самарканда в 1497 году. Бабур описывает своё вступление в город с ликованием, переходящим в патетику: для молодого правителя это не просто военная победа, но и возвращение на родину предков, воссоединение с духом великого Тимура. Краткость самаркандского периода (около ста дней) и последовавшее вынужденное отступление превратили этот эпизод в одно из наиболее трагических воспоминаний всей книги.

4. Лирические отступления и поэтические вставки как форма выражения патриотических чувств

Важнейшим художественным приёмом, с помощью которого Бабур выражает любовь к родине, являются лирические отступления и включённые в прозаический текст стихотворные фрагменты. «Бабурнома» содержит значительный корпус поэзии самого автора — газели, рубаи, фарды, — в которых тема тоски по родной земле звучит с особой проникновенностью.

В многочисленных стихах Бабура рефреном повторяется образ изгнанника, разлучённого с родиной. Поэт сравнивает себя с соловьём, тоскующим по розовому саду, с путником, потерявшим дорогу домой, с рекой, оторванной от своего истока. Эти традиционные для восточной поэтики образы наполнены у Бабура живым личным содержанием: за каждой метафорой стоит конкретный биографический опыт утраты и разлуки.

Особое место среди поэтических вставок занимают стихи, написанные в период индийского изгнания. Индия в восприятии Бабура — чужая, непонятная страна, которая при всём своём богатстве не может утолить тоску по «родным горам» Маверауннахра. Горькая ирония судьбы состоит в том, что именно здесь, вдали от родины, Бабур достиг вершины политического могущества, основав великую империю. Но эта слава не приносит утешения: в стихах индийского периода образ далёкой родины светится тем более ярко, чем дальше она становится недостижимой.

Лингвистически примечательно, что, живя в Индии и будучи окружён персоязычной культурой, Бабур продолжал писать «Бабурному» на чагатайском тюркском языке. Этот сознательный языковой выбор сам по себе является актом патриотизма: автор сохраняет верность языку своего народа, языку родины, превращая сам текст в памятник тюркской культурной идентичности.

#### 5. Природа как зеркало тоски по родине

В художественной системе «Бабурномы» природа занимает принципиально важное место. Описания природы у Бабура никогда не бывают нейтральными: они всегда эмоционально окрашены и нередко служат формой косвенного выражения тоски по родной земле. Исследователи неоднократно отмечали контраст в тональности «индийских» и «среднеазиатских» пейзажей в книге.

Среднеазиатские пейзажи описаны с неизменной теплотой и любовью: Бабур восхищается течением Зарафшана, красотой самаркандских садов, первым снегом в горах Ферганы. Эти описания пронизаны светом и радостью, а сама природа выступает как отражение душевного покоя и ощущения дома. Принципиально иначе написаны индийские пейзажи: они впечатляющи, экзотичны, но в них нет того тепла, которое пронизывает описания родной природы. Бабур восхищается величием Ганга и пышностью индийских лесов, но это восхищение остаётся внешним, не достигая глубин души.

Кульминацией природной темы в контексте любви к родине являются знаменитые страницы о садах. Бабур был страстным садоводом: в Кабуле и Индии он разбивал сады, пытаясь воссоздать образ среднеазиатского рая. Сады в «Бабурноме» — это материализованная ностальгия, попытка создать на чужой земле уголок родины. Чагатайское понятие «бог'» (сад) приобретает в тексте символическое звучание: это пространство, где изгнанник может на мгновение ощутить иллюзию возвращения домой.

#### 6. Философское осмысление темы родины: изгнание и идентичность

На философском уровне тема любви к родине в «Бабурноме» неразрывно связана с проблемой идентичности. Бабур прожил жизнь человека, лишённого устойчивой территориальной принадлежности: изгнанный с родины, он обретал новые земли, но никогда не переставал



ощущать себя чужаком. Это экзистенциальное противоречие стало главным источником внутреннего напряжения всего произведения.

Бабур осмысляет своё положение изгнанника в категориях, характерных для суфийской традиции: душа, разлучённая с истоком, обречена на вечную тоску. Однако в отличие от суфийской лирики, где тоска по родине — лишь аллегория тоски по Богу, у Бабура это переживание совершенно конкретно и биографично. Он не метафорически, а буквально утратил родину и буквально несёт в себе эту рану на протяжении всей жизни.

Существенно, что любовь к родине у Бабура неотделима от любви к своему народу. В «Бабурноме» многочисленны упоминания о соратниках, земляках, людях, разделивших с ним судьбу скитальца. Коллективная память о Маверауннахре, хранящаяся в сердцах этих людей, становится своеобразным «переносным» отечеством — родиной, которую невозможно отнять, поскольку она живёт в общей истории, языке и культуре.

В этом смысле «Бабурнома» является не только личной исповедью, но и культурным завещанием — попыткой сохранить для потомков образ утраченной родины во всей её конкретной чувственной реальности. Бабур как бы говорит будущим поколениям: вот какой была наша земля, вот что значило любить её. Этим объясняется удивительная детальность географических и этнографических описаний книги: за каждым топонимом, каждым описанием обычая стоит акт любви и памяти.

## **7. Заключение**

Проведённый анализ позволяет сделать вывод о том, что тема любви к родине занимает в «Бабурноме» центральное место и получает многоуровневое художественное воплощение. Она выражается через прямые лирические признания и стихотворные вставки, через детальные описания среднеазиатской природы и городских пейзажей, через символику садов и образ «утраченного рая», через философское осмысление судьбы изгнанника.

Бабур создал произведение, в котором патриотизм предстаёт не как риторическая категория, а как живое, неутрачиваемое переживание — источник и творческого вдохновения, и экзистенциальной боли. В этом состоит непреходящая ценность «Бабурномы»: книга учит любить родину не через назидание, а через пример — пример человека, познавшего цену этой любви через невозможность вернуться домой.

Изучение образа родины в «Бабурноме» имеет несомненное значение для современного литературоведения и культурологии: оно позволяет глубже понять специфику тимуридской литературной традиции, проследить истоки патриотической темы в узбекской классической литературе и осмыслить универсальные механизмы художественного воплощения тоски по родной земле.



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## КЛИНИКО-ФАРМАКОЛОГИЧЕСКИЕ СВОЙСТВА ИНГИБИТОРОВ SGLT-2 В ТЕРАПИИ САХАРНОГО ДИАБЕТА 2 ТИПА

**Аннотация:** В статье представлен анализ клинико-фармакологических аспектов применения ингибиторов натрий-глюкозного котранспортера 2 типа (SGLT-2) у пациентов с сахарным диабетом 2 типа. Рассмотрены механизмы действия, фармакокинетика, результаты крупных рандомизированных исследований, кардиопротективные и нефропротективные эффекты. Эффекты действия ингибиторов SGLT2 весьма разнообразны: это и диуретический, и гипотензивный, и метаболический, и антиремодулирующий эффекты, уменьшение инсулинорезистентности, улучшение энергетического метаболизма миокарда. Дальнейшие исследования подтвердили кардио- и нефропротективные эффекты ингибиторов SGLT2 и позволили зарегистрировать новые показания для их применения при сердечной недостаточности. Показано, что препараты класса снижают риск сердечно-сосудистой смертности и госпитализаций по поводу сердечной недостаточности.

**Ключевые слова:** сахарный диабет 2 типа, SGLT-2, эмпаглифлозин, дапаглифлозин, кардиопротекция, нефропротекция.

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## CLINICAL AND PHARMACOLOGICAL PROPERTIES OF SGLT-2 INHIBITORS IN THE TREATMENT OF TYPE 2 DIABETES MELLITUS

**Abstract:** The article presents an analysis of clinical and pharmacological aspects of sodium-glucose cotransporter-2 (SGLT-2) inhibitors in patients with type 2 diabetes mellitus. Mechanisms of action, pharmacokinetics, cardiovascular and renal outcomes are discussed. The effects of SGLT2 inhibitors are quite diverse: they include diuretic, antihypertensive, metabolic, and anti-remodeling effects, as

*well as reduction of insulin resistance and improvement of myocardial energy metabolism.*

*Further studies have confirmed the cardio- and nephroprotective effects of SGLT2 inhibitors and have made it possible to register new indications for their use in heart failure. SGLT-2 inhibitors significantly reduce cardiovascular mortality and hospitalization for heart failure.*

**Keywords:**

*type 2 diabetes mellitus, SGLT-2 inhibitors, empagliflozin, dapagliflozin, cardioprotection.*

**Введение**

Сахарный диабет 2 типа (СД2) остается одной из ведущих причин инвалидизации и смертности. Современные рекомендации подчеркивают необходимость выбора терапии с доказанным влиянием на сердечно-сосудистый прогноз [American Diabetes Association. Standards of Care in Diabetes—2024. Diabetes Care. 2024, Cosentino F., Grant P. et al. 2023 ESC Guidelines on diabetes. Eur Heart J. 2023 ].

В современной терапии сахарного диабета 2 типа (СД2) ингибиторы натрий-глюкозного котранспортера 2 типа (SGLT2) закономерно заняли достойное место благодаря как своим позитивным сахароснижающим свойствам, так и выдающимся кардиоренометаболическим эффектам. Данные последних рандомизированных клинических исследований, таких как DAPA-HF, EMPEROR-Reduced и EMPEROR-Preserved, показавших пользу их применения при лечении больных с хронической сердечной недостаточностью без учета наличия или отсутствия СД2, значительно расширяют ареал применения SGLT2 в практике врачей различных специальностей.

**Механизм действия**

Ингибиторы SGLT-2 блокируют реабсорбцию глюкозы в проксимальных канальцах почек, вызывая глюкозурию и снижение гликемии независимо от инсулина. Реабсорбция глюкозы идёт против градиента концентрации (так же, как и реабсорбция натрия). Ингибиторы SGLT2 реабсорбируют одну молекулу глюкозы и одну молекулу натрия, ингибиторы SGLT1 – одну молекулу глюкозы и две молекулы натрия. Только при концентрации глюкозы в плазме примерно 9 ммоль/л, она начинает экскретироваться с мочой. При диабете развивается адаптивная реакция, направленная на сохранение энергетических ресурсов, которая заключается в повышении порогового уровня экскреции глюкозы – порог уходит выше 9 ммоль/л. При блокировании натрий-глюкозных котранспортёров глюкоза начинает экскретироваться в больших объёмах. Также соответственно повышается и экскреция натрия. Сердце в качестве энергетического субстрата использует свободные жирные кислоты, в то время как мышцы – преимущественно глюкозу. При развитии сердечной недостаточности баланс потребления кардиомиоцитов смещается в

сторону увеличения потребления глюкозы. При ингибировании SGLT2 мы наблюдаем повышение уровня бета-гидроксибутирата, являющегося энергетически более выгодным субстратом, что восстанавливает баланс кардиоренального метаболизма, устраняя сдвиг от окисления жирных кислот и глюкозы в сторону использования кетоновых тел [Ferrannini E. Mechanisms of SGLT2 inhibitors. *Nat Rev Endocrinol*. 2017].

Препараты характеризуются высокой биодоступностью, применяются 1 раз в сутки, метаболизируются в печени и выводятся почками [Scheen A.J. Pharmacokinetics of SGLT2 inhibitors. *Clin Pharmacokinet*. 2019].

#### Клиническая эффективность

Снижение HbA1c составляет 0,6–1,0%. В исследованиях EMPA-REG OUTCOME, CANVAS, DECLARE-TIMI 58 показано достоверное снижение сердечно-сосудистой смертности и госпитализаций по поводу сердечной недостаточности. [Zinman B. et al. Empagliflozin and cardiovascular outcomes. *N Engl J Med*. 2015].

В исследованиях CREDENCE и DAPA-CKD отмечено замедление прогрессирования ХБП и снижение альбуминурии [Packer M. et al. EMPEROR-Reduced. *N Engl J Med*. 2020].

#### Профиль безопасности

Чаще всего регистрируются генитальные инфекции и полиурия. Редким осложнением является эугликемический кетоацидоз [Cannon C.P. et al. Ertugliflozin trial. *N Engl J Med*. 2020].

#### Заключение

Ингибиторы SGLT-2 занимают важное место в терапии СД2 благодаря доказанному влиянию на кардиоренальный прогноз и хорошему профилю безопасности. Ингибиторы SGLT2 снижают уровень глюкозы и глюкозотоксичность, опосредованно улучшая функцию бета-клеток и чувствительность к инсулину.

Ингибиторы SGLT2 имеют впечатляющие результаты применения при уже имеющихся сердечно-сосудистых заболеваниях и достоверно снижают риск смертности от сердечно-сосудистых событий. Наиболее выраженные положительные эффекты данный класс препаратов демонстрирует при применении их при сердечной недостаточности, позволяя продлить жизнь пациентов, улучшить её качество и значительно сократить частоту госпитализаций. Ингибиторы SGLT2 продемонстрировали высокий профиль безопасности и переносимости.

Необходимо преодоление клинической инертности в назначении данного класса сахароснижающих препаратов, обеспечивающих сердечно-почечную защиту.

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## **КЛИНИКО-ФАРМАКОЛОГИЧЕСКИЕ СВОЙСТВА ИНГИБИТОРОВ DPP-4 В ТЕРАПИИ САХАРНОГО ДИАБЕТА 2 ТИПА И ИХ ПРИМЕНЕНИЕ В СОВРЕМЕННОЙ ТЕРАПИИ**

**Аннотация:** Статья посвящена клинико-фармакологическим особенностям ингибиторов дипептидилпептидазы-4 (DPP-4) в терапии сахарного диабета 2 типа (СД2). Открытие и внедрение новых гипогликемизирующих препаратов, таких как ингибиторы дипептидилпептидазы-4 (ДПП-4), обеспечивают возможность дальнейшего улучшения гликемического контроля. В обзоре собраны данные о механизмах действия, эффективности, безопасности применения ингибиторов ДПП-4 (на примере ситаглиптина) при лечении СД2, а также данные об их потенциальном влиянии на сердечно-сосудистую систему.

**Ключевые слова:** сахарный диабет 2 типа, DPP-4 ингибиторы, ситаглиптин, саксаглиптин, вилдаглиптин, клиническая эффективность, безопасность

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## **CLINICAL AND PHARMACOLOGICAL PROPERTIES OF DPP-4 INHIBITORS IN THE TREATMENT OF TYPE 2 DIABETES MELLITUS AND THEIR USE IN MODERN THERAPY**

**Abstract:** The article is devoted to the clinical and pharmacological characteristics of dipeptidyl peptidase-4 (DPP-4) inhibitors in the treatment of type 2 diabetes mellitus (T2DM). The discovery and introduction of new glucose-lowering drugs, such as DPP-4 inhibitors, provide opportunities for further improvement of glycemic control. The review summarizes data on the mechanisms of action, efficacy, and safety of DPP-4 inhibitors (using sitagliptin as an example) in the treatment of T2DM, as well as information on their potential effects on the cardiovascular system.

**Keywords:** type 2 diabetes mellitus, DPP-4 inhibitors, sitagliptin, saxagliptin, vildagliptin, clinical efficacy, safety.



## Введение

Сахарный диабет 2 типа (СД2) является хроническим заболеванием, характеризующимся гипергликемией и повышенным риском сердечно-сосудистых и почечных осложнений. DPP-4 ингибиторы представляют собой группу препаратов, которые увеличивают уровень инкретинов (GLP-1 и GIP), стимулируя секрецию инсулина и снижая секрецию глюкагона. Ситаглиптин (Янувия) – новый пероральный препарат для лечения СД2. Это первый одобренный препарат в новом классе гипогликемических препаратов – ингибиторов ДПП - 4. Ингибируя ДПП-4, ситаглиптин повышает концентрацию двух известных гормонов семейства инкретинов: глюкагоноподобного пептида-1 (ГПП-1) и глюкозозависимого инсулиотропного полипептида (ГИП) Гормоны семейства инкретинов секретируются в кишечнике в течение суток, их уровень повышается в ответ на прием пищи. Инкретины являются частью внутренней физиологической системы регуляции гомеостаза глюкозы. При нормальном или повышенном уровне глюкозы крови гормоны семейства инкретинов способствуют увеличению синтеза инсулина, а также его секреции  $\beta$ -клетками поджелудочной железы за счет сигнальных внутриклеточных механизмов, ассоциированных с циклическим АМФ. [American Diabetes Association. Standards of Care in Diabetes—2024. Diabetes Care. 2024, Cosentino F., Grant P. et al. 2023 ESC Guidelines on diabetes. Eur Heart J. 2023 ].

Механизм действия. DPP-4 ингибиторы блокируют фермент дипептидилпептидазу-4, предотвращая разрушение инкретинов. При низкой концентрации глюкозы в крови перечисленные эффекты инкретинов на выброс инсулина и уменьшение секреции глюкагона не наблюдаются. ГПП-1 и ГИП не влияют на выброс глюкагона в ответ на гипогликемию. В физиологических условиях активность инкретинов ограничивается ферментом ДПП-4, который быстро производит гидролиз инкретинов с образованием неактивных продуктов. Это способствует инсулино-зависимому снижению гликемии и минимальному риску гипогликемии [Deacon CF. DPP-4 inhibitors in clinical practice. Lancet Diabetes Endocrinol. 2019].

Фармакокинетика. Препараты принимаются один раз в сутки (ситаглиптин, саксаглиптин, вилдаглиптин). Метаболизируются преимущественно печенью и выводятся почками. Биодоступность высокая, T<sub>max</sub> составляет 1–4 часа [Scheen AJ. Pharmacokinetics of DPP-4 inhibitors. Clin Pharmacokinet. 2018].

Клиническая эффективность. Применение DPP-4 ингибиторов приводит к снижению HbA<sub>1c</sub> на 0,5–1,0%, не сопровождается значительным изменением массы тела, имеет положительный профиль безопасности. Монотерапия ситаглиптином снижает уровни гликогемоглобина, постпрандиальной гликемии и гликемии натощак по

сравнению с плацебо. Снижение уровня гликогемоглобина не зависело от пола, возраста, расы и базового ИМТ. Средний ответ на ситаглиптин гликогемоглобина был тем больше, чем выше подъем исходного уровня от нормы. Доказано, что доза препарата 200 мг в сутки не обеспечивает большей эффективности по сравнению с дозой 100 мг, поэтому рекомендуется только доза в 100 мг при отсутствии почечных заболеваний. Крупные исследования SAVOR-TIMI 53, TECOS и EXAMINE демонстрируют достоверную гипогликемическую эффективность без повышения риска сердечно-сосудистой смертности. Инсулиотропная роль ГПП-1 при СД2 доказана, но возможность его участия в кардиопротекции нуждается в дальнейшем изучении. По сообщениям [Marso SP. DPP-4 inhibitors and cardiovascular safety. *Circulation*. 2016, Kahn SE. Mechanism of action of DPP-4 inhibitors. *Diabetes Obes Metab*. 2018 ]. ГПП-1 оказывает положительный инотропный и хронотропный эффекты на миокард, не поддающиеся действию  $\beta$ -адренергических блокаторов. Кроме доложенной инсулиотропной активности, ГПП-1 оказывает прямое влияние на миокард. Высокоселективные рецепторы к ГПП-1 были обнаружены в сердце и в пределах центральной нервной системы, особенно в ядре tractus solitarius, нейромодуляторном центре, контролирующем сердечно-сосудистую систему. По данным Mafong с соавт., инфузии ГПП-1 животным и людям с сердечной недостаточностью приводили к значительному улучшению параметров работы сердца. У пациентов с СД2 инфузия ГПП-1 улучшала эндотелиальную функцию независимо от изменения чувствительности к инсулину [Scirica BM. SAVOR-TIMI 53. *N Engl J Med*. 2013].

**Профиль безопасности.** Наиболее часто наблюдаются инфекции верхних дыхательных путей и головная боль. Риск гипогликемии низкий, при монотерапии практически отсутствует [Marso SP. DPP-4 inhibitors and cardiovascular safety. *Circulation*. 2016].

**Современное применение.** DPP-4 ингибиторы применяются в комбинации с метформином, инсулином или другими гипогликемическими препаратами. Препараты особенно полезны у пациентов с низким риском гипогликемии и в пожилом возрасте [Kahn SE. Mechanism of action of DPP-4 inhibitors. *Diabetes Obes Metab*. 2018].

#### Заключение

DPP-4 ингибиторы являются безопасными и эффективными препаратами для лечения СД2, их клинико-фармакологические свойства делают их важной частью современной терапии. Возможно, ингибиторы ДПП-4 в будущем будут более широко использоваться у лиц с риском развития СД2 и при ранних стадиях этого заболевания. Кроме того, экспериментальные исследования показали, что ГПП-1 имеет несколько потенциально благоприятных эффектов на сердечно-сосудистую систему. Некоторые из них – профилактика ишемии миокарда и улучшение сердечной функции – доказаны у людей. Однако эквивалентность

агонистов ГПП-1 и ингибиторов ДПП-4 относительно сердечно-сосудистого риска не может быть принята или считаться само собой разумеющейся. Механизм действия агонистов ГПП-1 и ингибиторов ДПП-4 представляет на сегодняшний день возможность фактического сокращения сердечно-сосудистого риска, но эта возможность должна быть подтверждена большими долгосрочными клиническими испытаниями.

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## **БОЛАЛАРДА УПКА КАСАЛЛИКЛАРИДА БРОНХОПУЛМОНАР ПАТОЛОГИЯЛАРНИ ТЕКШИРИШ УСУЛЛАРИ**

**Аннотация:** Ушбу мақола болаларда ўпка касалликларида бронхопулмонар патологияларни текширишнинг замонавий усуллари кенг қамровли кўриб чиқади. Бронхопулмонар дисплазия (БПД), интерстициал ўпка касалликлари, обструктив ва рестриктив ҳолатлар каби патологияларнинг клиник баҳолаши, тасвирий диагностика (рентгенография, КТ, МРТ, УСГ), функционал тестлар (спирометрия, плетизмография, диффузия сизими), инвазив усуллар (бронхоскопия, биопсия) ва лаборатория таҳлиллари (қон газлари, ПЗР, биомаркерлар) батафсил таҳлил этилади. Мақолада ушбу усулларнинг болаларда қўлланилиши, афзалликлари, чекловлари ва дифференциал таъхисдаги роли таъкидланади. Замонавий ёндашувлар, масалан, нурланишни камайтириш ва мултидисциплинар ҳамкорлик, касалликни эрта аниқлаш ва самарали бошқаришга ёрдам бериши кўрсатилади. Тадқиқот натижалари БПД ва бошқа бронхопулмонар касалликларнинг прогностини яхшилашга қаратилган бўлиб, педиатрик пульмонология мутахассислари учун амалий тавсиялар беради. Мақола Скопус базасига мос равишда юқори илмий савияда ёзилган бўлиб, болаларда ўпка патологияларини таъхислашнинг интегратив усуллари ўрганишга ҳисса қўшади.

**Калит сўзлар:** Болаларда ўпка касалликлари, бронхопулмонар дисплазия (БПД), интерстициал ўпка касалликлари, обструктив ўпка касалликлари, рестриктив ўпка касалликлари, клиник баҳолаш, тасвирий диагностика, рентгенография, компьютер томографияси (КТ), юқори рухсатли КТ (ҲРКТ), магнит-резонанс томографияси (МРТ), ультратовуш текшируви (УСГ), полимераза занжир реакцияси (ПЗР), мултиплекс ПЗР, антиген тестлари, серологик тестлар, генетик тестлар, биопсия, гистопатология, дифференциал таъхис, мултидисциплинар ёндашув.

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## METHODS FOR INVESTIGATING BRONCHOPULMONARY PATHOLOGIES IN CHILDREN WITH PULMONARY DISEASES

**Abstract:** *This article provides a comprehensive review of modern methods for investigating bronchopulmonary pathologies in children with lung diseases. It details the clinical assessment, imaging diagnostics (radiography, computed tomography (CT), high-resolution CT (HRCT), magnetic resonance imaging (MRI), ultrasound (US)), functional testing (spirometry, body plethysmography, diffusing capacity of the lung for carbon monoxide (DLCO)), invasive procedures (bronchoscopy, lung biopsy), and laboratory analyses (arterial blood gas analysis, polymerase chain reaction (PCR), multiplex PCR, antigen and serological tests, genetic testing, biomarkers) in conditions such as bronchopulmonary dysplasia (BPD), interstitial lung diseases, obstructive and restrictive lung disorders. The article highlights the application of these methods in pediatric patients, their advantages, limitations, and role in differential diagnosis. Emphasis is placed on contemporary approaches aimed at reducing radiation exposure and promoting multidisciplinary collaboration, which facilitate early detection and effective disease management. The findings are directed toward improving the prognosis of BPD and other bronchopulmonary disorders, offering practical recommendations for pediatric pulmonologists. The article meets Scopus-level scientific standards and contributes to the study of integrative diagnostic approaches for pulmonary pathologies in children.*

**Keywords:** *pediatric lung diseases, bronchopulmonary dysplasia (BPD), interstitial lung diseases, obstructive lung diseases, restrictive lung diseases, clinical assessment, imaging diagnostics, radiography, computed tomography (CT), high-resolution computed tomography (HRCT), magnetic resonance imaging (MRI), ultrasound (US), polymerase chain reaction (PCR), multiplex PCR, antigen tests, serological tests, genetic testing, biopsy, histopathology, differential diagnosis, multidisciplinary approach.*

Болаларда ўпка касалликларида бронхопулмонар патологияларни текшириш усуллари замонавий педиатрик пульмонологияда муҳим аҳамиятга эга бўлиб, бу соҳада клиник баҳолаш, тасвирий диагностика, функционал тестлар, лаборатория таҳлиллари ва инвазив усулларни ўз ичига олади. Бронхопулмонар патологиялар, хусусан, бронхопулмонар дисплазия (БПД), интерстициал ўпка касалликлари, обструктив ва рестриктив ўпка касалликлари болаларда тез-тез учрайдиган ҳолатлардир ва уларнинг эрта ташхисланиши касалликнинг оғирлигини камайтириш ва даволаш самарадорлигини оширишга ёрдам беради. Бронхопулмонар дисплазия, масалан, эрта туғилган чақалоқларда кўпроқ кузатилади ва бу ҳолатда ўпка ривожланишининг бузилиши, алвеоляр тузилманинг ўзгариши ва сурункали гипоксия билан боғлиқ бўлади. Ташхислаш жараёнида клиник баҳолаш биринчи босқич бўлиб, у боланинг ёши, гестация муддати, кислородга бўлган эҳтиёж ва респиратор ёрдамнинг



давомийлигига асосланади. Масалан, 36 ҳафталик постменструал ёшда кислородга бўлган эҳтиёж БПД ташхисини тасдиқлашда асосий мезон ҳисобланади. Клиник белгилар орасида тез нафас олиш, ретракция, цияноз ва ўсишнинг орқада қолиши мавжуд бўлиб, бу белгилар бошқа ўпка касалликлари, масалан, пневмония ёки пулмонар гипертензия билан фарқланиши керак. Тасвирий диагностика усуллари бронхопулмонар патологияларни аниқлашда марказий ўрин тутди ва рентгенография бу жараённинг дастлабки босқичидир. Кўкрак кафасининг рентген сурати БПД да ўпканинг шимгичсимон кўринишини, диффуз хираликни ёки хиперинфляцияни кўрсатиши мумкин, бу эса ўпка тўқималарининг эмфизематоз ўзгаришлари ва фиброзини акс эттиради. Рентгенография, шунингдек, интерстициал ўпка касалликларида гиперинфляция ёки ретикуляр ўзгаришларни аниқлайди, аммо у кўпинча ноаниқ бўлиб, қўшимча тасвирий усулларни талаб қилади. Компютер томографияси (КТ) юқори рухсатли тасвирлашни таъминлайди ва у болаларда ўпка фиброзини, бронхоектазияни ёки интерстициал касалликларни батафсил баҳолашда қўлланилади. Масалан, юқори рухсатли КТ (ХРКТ) ўпка паренхимасининг нозик тузилишини кўрсатиб, тсистик фиброз ёки сурункали аспирация пневмониясининг белгилари бўлган ҳаводор йўлларнинг кенгайишини аниқлайди. КТ, шунингдек, ўпка малформацияларини, масалан, туғма лобар эмфиземани ёки пулмонар секвестрацияни ташхислашда самарали, аммо ионлаштирувчи нурланиш туфайли болаларда чекланган ҳолда қўлланилади ва фақат зарур ҳолларда, масалан, клиник белгилар ва рентген натижалари мос келмаса ишлатилади.

Магнит-резонанс томографияси (МРТ) болаларда ўпка тасвирлашининг ривожланаётган усули бўлиб, у нурланишсиз ва функционал баҳолашни таъминлайди. МРТ қаттиқ ўпка лезияларини, инфилтратив касалликларни ёки перфузия бузилишларини аниқлашда қўлланилади ва у хусусан, нейромускуляр касалликлар ёки туғма ўпка аномалияларида фойдалидир. Болаларда МРТ тез нафас олиш туфайли мураккаб бўлиши мумкин, аммо ултракичик эчо вақтли кетма-кетликлар ёрдамида тасвир сифати яхшиланмоқда. Ультратовуш текшируви (УСГ) плеврал эфузияларни, пневмония асоратларини ёки ўпка некрозини аниқлашда қўлланилади ва у ионлаштирувчи нурланишсиз, портатив усул бўлиб, болаларда плеврал суюқликнинг ҳажми, эчотехтураси ва мураккаблигини баҳолайди. Контрастли УСГ (СЕУС) мураккаб пневмонияларда қон оқимини баҳолашда қўлланилиши мумкин. Эхокардиография пулмонар гипертензияни скрининг қилишда муҳим бўлиб, БПД ли болаларда 36 ҳафталик ёшда тавсия этилади, чунки у ўнг юрак қоринчаси босимини ва трисуспид регургитациясини ўлчайди. Функционал тестлар бронхопулмонар патологияларни баҳолашда асосий роль ўйнайди ва улар ўпка ҳажми, ҳаво оқими ва газ алмашинувини ўлчайди. Спирометрия 5-6 ёшдан катта болаларда қўлланиладиган асосий усул бўлиб, у мажбурий экспираторий ҳажмни (ФЕВ1) ва мажбурий витал



сиғимни (ФВС) ўлчайди, бу эса обструктив касалликлар, масалан, астма ёки бронхопулмонар дисплазияда ҳаво йўллариининг торайишини кўрсатади. Спирометрия, шунингдек, даволаш самарадорлигини мониторинг қилишда ишлатилади ва болаларда кўрсатмалар аниқ бўлиши керак. Плетизмография ўпка ҳажмини ўлчайди ва рестриктив касалликларда, масалан, интерстициал фиброзда, тотал ўпка сиғими (ТЛС) пасайишини аниқлайди. Диффузия сиғими (ДЛСО) газ алмашинувини баҳолайди ва БПД да алвеоляр-капилляр мембрана бузилишини кўрсатиши мумкин. Чакалоқларда ўпка функцияси тестлари махсус усуллардан фойдаланади, масалан, тидал нафас олиш оқими ва функционал қолдиқ сиғими (ФРС), бу эса БПД да ҳаво тузоқларини ёки ўпка ривожланишининг бузилишини аниқлайди. Машқ тестлари, масалан, метахолин ёки машқ провокацияси, астма ташхисида қўлланилади ва у ҳаво йўллариининг гиперреактивлигини баҳолайди. Пульс оксиметрия доимий мониторинг учун ишлатилади ва гипоксияни аниқлайди. Бронхоскопия инвазив усул бўлиб, у ҳаво йўллариини тўғридан-тўғри кўриш ва намуна олиш имконини беради. Мослашувчан бронхоскопия болаларда стридор, хорижий жисм аспирацияси, сурункали йўтал ёки такрорий пневмонияларда қўлланилади ва у бронхоалвеоляр лаваж (БАЛ) орқали ҳужайра ва патогенларни таҳлил қилишга ёрдам беради. Бронхоскопия, шунингдек, биопсия олиш ва ташхисни тасдиқлашда ишлатилади, масалан, интерстициал касалликларда ёки ўсмаларда. Интервенцион бронхоскопия обструкцияларни олиб ташлашда, масалан, хорижий жисм ёки бронхиал тўсиқларда қўлланилади ва у педиатрик пульмонологияда муҳим диагностик ва терапевтик воситадир. Бронхоскопия одатда анестезия остида ўтказилади ва болаларда хавфсизлиги юқори. Лаборатория тестлари бронхопулмонар патологияларни ташхислашда қўшимча маълумот беради ва улар қон газлари таҳлили, патогенларни аниқлаш ва биомаркерларни ўз ичига олади. Артериал қон газлари (АБГ) кислород ва карбонат ангидрид даражаларини ўлчайди ва гипоксемия ёки ҳиперкапнияни аниқлайди, бу БПД ёки рестриктив касалликларда кузатилади. Назофарингеал сваблар ёки балғам намуналари патогенларни аниқлашда ишлатилади ва полимераза занжир реакцияси (ПЗР) вируслар (РСВ, инфлуенза, параинфлуенза) ва бактерияларни (Бордетелла пертуссис, Мйсоплазма пневмонияе) тез аниқлайди. Мултиплекс ПЗР панеллари бир вақтнинг ўзида 20 дан ортиқ патогенни текширади ва улар болаларда респиратор инфекцияларни ташхислашда самарали. Антиген тестлари, масалан, РСВ учун тез иммунохроматографик тестлар, тез натижа беради, аммо каттарок болаларда сезгирлиги паст. Серологик тестлар антикорларни аниқлайди ва сурункали инфекцияларда, масалан, микоплазма пневмониясида қўлланилади. Генетик тестлар туғма касалликларда, масалан, тсистик фиброзда мутацияларни аниқлайди ва улар бронхопулмонар патологияларни дифференциал ташхислашда ёрдам беради. Биопсия ва

гистопатология ўпка тўқималарини батафсил таҳлил қилади ва интерстициал касалликларда фиброз ёки яллиғланишни тасдиқлайди.

Умумий ёндашувда ушбу усулларнинг комбинацияси қўлланилади, масалан, БПД да клиник баҳолаш рентген ва функционал тестлар билан биргаликда ишлатилади, бу эса ташхиснинг аниқлигини оширади. Болаларда диагностика усуллари ёшга мослаштирилиши керак, чунки чақалоқларда седация ёки махсус ускуналар талаб қилинади. Замонавий ёндашувларда нурланишни камайтириш ва тез натижалар берувчи усулларга устунлик берилади, бу эса болаларда бронхопулмонар патологияларни самарали бошқаришга ёрдам беради. Бронхопулмонар патологияларни текширишда дифференсиал ташхис муҳим бўлиб, масалан, БПД ни пневмония, атектаз ёки трахеомалациядан фарқлаш керак ва бу учун тасвирий ва функционал тестларнинг натижалари таққосланади.

Касалликнинг оғирлигини баҳолашда, масалан, БПД да, ўпка функциясининг узок муддатли мониторинги зарур бўлиб, бу эса спирометрия ва оксиметрия орқали амалга оширилади. Интерстициал ўпка касалликларида КТ ва МРТ фиброз даражасини аниқлайди ва даволаш режасини шакллантиради. Бронхоскопия орқали олинган БАЛ намуналари ҳужайра таҳлили ва културани таъминлайди, бу эса инфекцион ва яллиғланиш жараёнларини аниқлайди. Лаборатория биомаркерлари, масалан, С-реактив оксил ёки прокалцитонин, бактериал инфекцияларни вируслардан фарқлашда ёрдам беради. Умумий ҳолда, болаларда бронхопулмонар патологияларни текшириш мултидисциплинар ёндашувни талаб қилади ва пулмонолог, радиолог ва лаборатория мутахассисларининг ҳамкорлиги ташхиснинг сифатини оширади.

#### **Использованные источники:**

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## **НЕКОТОРЫЕ АСПЕКТЫ ПРИМЕНЕНИЯ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В ПРЕПОДАВАНИИ ДИСЦИПЛИНЫ «ХИМИЧЕСКАЯ ТЕХНОЛОГИЯ НЕОРГАНИЧЕСКИХ ВЕЩЕСТВ»**

**Аннотация:** Статья рассматривает практические аспекты использования больших языковых моделей (LLM) для подготовки и адаптации учебных материалов в условиях перехода высшего образования Узбекистана на Болонскую систему. Основное внимание уделено применению методов промт-инжиниринга (Zero-shot, Few-shot и Chain-of-Thought prompting) для генерации контента в области химической технологии. Приводятся конкретные примеры промтов и методики их использования для создания тестовых заданий, программ курсов, планов лекций и виртуальных лабораторных практикумов. Делается вывод о том, что использование ИИ позволяет существенно повысить эффективность труда преподавателя и обеспечить генерацию качественного, соответствующего современным стандартам образовательного контента, необходимого для интеграции в международное образовательное пространство.

**Ключевые слова:** Болонская система, химическая технология, искусственный интеллект (ИИ), большие языковые модели (LLM), промт-инжиниринг, Zero-shot prompting, Few-shot prompting, Chain-of-Thought Prompting, учебные материалы, виртуальные лаборатории, проектирование реакторов, материальный баланс.

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## **SOME ASPECTS OF ARTIFICIAL INTELLIGENCE APPLICATION IN TEACHING THE COURSE "CHEMICAL ENGINEERING OF INORGANIC SUBSTANCES"**

**Abstract:** This article examines the practical aspects of using large-scale language models (LLM) for the preparation and adaptation of educational materials in the context of the transition of higher education in Uzbekistan to the Bologna system. The focus is on the application of prompting methods (Zero-shot, Few-shot, and Chain-of-Thought prompting) for content generation in the field of chemical engineering. Specific examples of prompts and methods for their use in

*creating test assignments, course syllabi, lecture plans, and virtual laboratory workshops are provided. It is concluded that the use of AI can significantly improve teacher efficiency and ensure the generation of high-quality educational content that meets modern standards, which is necessary for integration into the international educational space.*

**Keywords:** Bologna system, chemical engineering, artificial intelligence (AI), large language models (LLM), prompt-engineering, zero-shot prompting, fifth-shot prompting, chain-of-thought prompting, educational materials, virtual laboratories, reactor design, material balance.

## **Введение**

Переход образовательной системы Узбекистана на Болонскую систему требует не только изменения организационной структуры, но и коренной модернизации содержания образования. Для направлений, таких как «Химическая технология», это сопряжено с необходимостью разработки современных, конкурентоспособных учебных материалов, соответствующих международным стандартам и обеспечивающих мобильность студентов [1]. Ключевыми вызовами являются: нехватка актуальных учебников на государственном языке, быстрая устареваемость информации в быстроразвивающихся областях (например, нанотехнологии, «зеленая» химия) и высокая трудоемкость создания практикумов для сложного оборудования.

Большие языковые модели (LLM) предлагают решение этих задач, позволяя адаптировать и генерировать учебный контент. Однако для эффективного применения их в специфической области химической технологии требуются специальные подходы к взаимодействию с ИИ, в частности, освоение преподавателями методов промт-инжиниринга.

## **1 Моделирование химических процессов с использованием ИИ**

Дисциплина «Технология неорганических веществ» включает изучение сложных химических процессов, таких как производство серной кислоты, аммиака, щелочей, минеральных удобрений и других важнейших неорганических соединений. Внедрение ИИ в учебный процесс позволяет значительно улучшить понимание этих процессов через моделирование.

### **1.1 Моделирование реакторов**

Одним из ключевых аспектов технологии неорганических веществ является проектирование и расчет химических реакторов. Используя технику Chain-of-Thought Prompting, можно создать систему пошагового моделирования реакторов:

*Пример промта:* "Создай пошаговую методику расчета материального и теплового баланса для реактора контактного производства серной кислоты. Включи в описание:

1. Уравнение химической реакции окисления  $\text{SO}_2$  до  $\text{SO}_3$
2. Расчет степени превращения при различных температурах

3. Определение оптимальных условий процесса с учетом равновесия реакции

4. Расчет объема реактора и времени пребывания газовой смеси

5. Анализ влияния катализатора на кинетику процесса".

Этот подход позволяет студентам последовательно осваивать сложные расчеты, разбивая их на управляемые этапы, что особенно важно для понимания таких процессов, как контактное производство серной кислоты или синтез аммиака.

### **1.2 Оптимизация катализаторов с помощью ИИ**

В производстве неорганических веществ катализаторы играют критически важную роль. ИИ может помочь в обучении студентов принципам выбора и оптимизации катализаторов:

*Пример применения Few-shot prompting:* "Вот пример анализа катализатора для процесса Девида (окисление  $\text{SO}_2$ ): Катализатор:  $\text{V}_2\text{O}_5$  на носителе. Температурный диапазон: 400-450°C Степень превращения: 95-98%. Проблемы: отравление катализатора мышьяком

Теперь проанализируй катализатор для процесса синтеза аммиака (процесс Габера-Боша), учитывая:

1. Состав катализатора
2. Оптимальные условия процесса
3. Возможные проблемы и пути их решения
4. Сравнение с альтернативными катализаторами".

Такой подход помогает студентам развивать навыки сравнительного анализа катализаторов для различных процессов в технологии неорганических веществ.

### **1.3 Моделирование процессов разделения смесей**

Процессы разделения являются неотъемлемой частью технологии неорганических веществ (дистилляция, кристаллизация, экстракция). ИИ может генерировать учебные материалы для моделирования этих процессов:

*Пример промта:* "Создай учебную задачу по расчету ректификационной колонны для разделения азеотропной смеси соляной кислоты. Включи:

1. Исходные данные о составе смеси
2. Требования к чистоте продуктов
3. Методику расчета числа теоретических тарелок
4. Анализ энергетических затрат процесса
5. Возможные проблемы при промышленной реализации".

## **2 Персонализация обучения в дисциплине «Химическая технология неорганических веществ»**

Персонализация обучения с помощью ИИ позволяет адаптировать учебный процесс под индивидуальные потребности студентов, что особенно важно в сложной дисциплине, как технология неорганических веществ.

### **2.1 Адаптивные учебные траектории**



Используя ИИ, можно создавать адаптивные учебные траектории для студентов с разным уровнем подготовки:

*Пример системы:*

1. Студент проходит диагностический тест по основам химической термодинамики и кинетики
2. На основе результатов ИИ определяет пробелы в знаниях
3. Генерирует индивидуальный учебный план с акцентом на слабые места
4. Предоставляет дополнительные материалы и задачи по проблемным темам.

Например, для студентов с недостаточным пониманием химического равновесия система может сгенерировать дополнительные задачи по расчету равновесных констант для реакций в производстве азотной кислоты или серной кислоты.

## **2.2 Персонализированные примеры и аналогии**

ИИ может генерировать примеры и аналогии, релевантные конкретному студенту:

*Пример промта:* "Объясни процесс контактного производства серной кислоты, используя аналогии, понятные студенту, который интересуется экологией. Сделай акцент на экологических аспектах процесса, методах утилизации отходов и снижения вредных выбросов."

Такой подход повышает вовлеченность студентов и помогает им лучше усваивать материал через призму их личных интересов.

## **3 Методика внедрения ИИ-инструментов в курс «Химическая технология неорганических веществ»**

### **3.1 Пошаговая методика интеграции ИИ**

1. Анализ учебной программы
  - Выделение ключевых тем, где ИИ может быть наиболее полезен (расчеты материальных балансов, моделирование реакторов, анализ катализаторов)
  - Пример: Для темы "Контактное производство серной кислоты" определить, какие аспекты могут быть усилены с помощью ИИ.
2. Разработка шаблонов промтов
  - Создание специализированных промтов для генерации учебных материалов
  - Пример шаблона для генерации задач: "Создай задачу по расчету материального баланса для [название процесса] с исходными данными: [параметры]. Уровень сложности: [базовый/средний/продвинутый]"
3. Интеграция с существующими учебными материалами
  - Дополнение лекций ИИ-сгенерированными примерами и кейсами
  - Пример: К лекции о производстве аммиака добавить ИИ-сгенерированный кейс сравнения различных типов реакторов.
4. Разработка системы проверки

- Создание методики проверки ИИ-сгенерированных материалов на соответствие химическим законам и промышленным стандартам
- Включение экспертизы преподавателем как обязательного этапа.

### **3.2 Примеры промтов для конкретных тем**

А. Для темы "Производство аммиака": "Создай лабораторную работу по моделированию синтеза аммиака, включая:

1. Цель работы
2. Теоретическое введение с уравнением реакции и термодинамическим анализом
3. Методику расчета оптимальных условий процесса
4. Пример расчета материального баланса
5. Контрольные вопросы, проверяющие понимание принципа Ле-Шателье".

В. Для темы "Производство серной кислоты": "Создай мультимедийный учебный модуль по контактному производству серной кислоты, включающий:

1. Интерактивную схему производства с возможностью изменения параметров
2. Анимацию процесса окисления  $\text{SO}_2$
3. Калькулятор для расчета степени превращения при различных температурах
4. Тест на понимание влияния катализатора на кинетику процесса".

## **4 Составление практических занятий и тестовых заданий**

### **4.1 Практические занятия с использованием ИИ**

Используя Few-shot prompting, можно генерировать практические задания разного уровня сложности:

*Пример промта:* "Вот пример практического задания по расчету материального баланса для производства аммиака: Исходные данные:  $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$  Состав исходной смеси: 25%  $\text{N}_2$ , 75%  $\text{H}_2$  (об.) Степень превращения азота: 20% Рассчитать состав контактного газа после реакции.

Теперь создай 3 аналогичных задания для:

1. Контактного производства серной кислоты
2. Производства азотной кислоты
3. Электролиза раствора хлорида натрия

Для каждого задания предоставь исходные данные, уравнение реакции и вопрос для расчета."

### **4.2 Тестовые задания с проверкой на соответствие химическим законам**

При генерации тестовых заданий важно обеспечить их соответствие фундаментальным химическим законам. Для этого можно использовать многоэтапный подход:

1. Сначала ИИ генерирует задания
2. Затем применяется дополнительный промт для проверки корректности: "Проверь следующее тестовое задание на соответствие

химическим законам и промышленным реалиям: [вставить сгенерированное задание] Укажи возможные ошибки и предложи исправления."

*Пример тестового задания по производству щелочей:* "В электролизере для получения едкого натра методом электролиза раствора NaCl на аноде выделилось 56 л хлора (н.у.). Рассчитайте: а) Массу полученного NaOH б) Объем водорода, выделившегося на катоде в) Массу израсходованного NaCl г) Как изменится концентрация раствора после электролиза, если объем электролита составлял 2 л?"

### **4.3 Генерация кейсов промышленных аварий и их анализа**

Важным аспектом обучения в технологии неорганических веществ является изучение причин аварий и методов их предотвращения:

*Пример промта:* "Создай учебный кейс по анализу аварии на производстве серной кислоты, связанной с выходом из строя катализатора в контактном аппарате. Включи:

- Описание аварийной ситуации
- Анализ причин аварии
- Расчетные задания по определению параметров, приведших к аварии
- Предложения по предотвращению подобных ситуаций
- Контрольные вопросы для студентов".

Этот подход помогает студентам развивать навыки анализа промышленных ситуаций и принятия решений в условиях неопределенности, что критически важно для будущих инженеров-химиков.

### **I. Заключение**

Применение методов промт-инжиниринга для подготовки учебных материалов по направлению «Химическая технология» демонстрирует высокую эффективность. Это позволяет не только автоматизировать рутинные операции (составление задач, планов), но и создавать инновационный образовательный контент (виртуальные лаборатории, симуляторы), что напрямую способствует интеграции в Болонскую систему. Квалификация преподавателя в новой реальности дополняется навыком «общения» с ИИ, что позволяет ему выступать в роли эксперта-редактора и архитектора образовательного процесса, а не просто составителя конспектов. Дальнейшие исследования целесообразно направить на разработку стандартизированных библиотек промтов для конкретных дисциплин химико-технологического цикла.

Кроме того, внедрение ИИ в преподавание дисциплины «Химическая технология неорганических веществ» открывает новые возможности для повышения качества образования. Специализированные техники промт-инжиниринга позволяют создавать учебные материалы, точно соответствующие содержанию курса и учитывающие особенности химических процессов.

Однако необходимо помнить, что все ИИ-сгенерированные материалы требуют тщательной проверки преподавателем на соответствие химическим законам и промышленным стандартам. Интеграция ИИ в учебный процесс

должна рассматриваться как инструмент, дополняющий, но не заменяющий экспертизу преподавателя в области химической технологии.

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## **ПРОЕКТНОЕ УПРАВЛЕНИЕ ЦИФРОВЫМИ СИСТЕМАМИ МОНИТОРИНГА ЭНЕРГОПОТРЕБЛЕНИЯ ЗДАНИЙ НА ОСНОВЕ ЦИФРОВОГО ДВОЙНИКА**

***Аннотация.** В статье рассматривается проектное управление цифровыми системами мониторинга энергопотребления зданий на основе концепции цифрового двойника. Предлагается математическая модель расчёта фактической энергоэффективности здания с выделением базового бытового потребления. В отличие от преобладающих в научной литературе подходов, предлагаемая модель ориентирована на функционирование цифрового двойника без обязательного использования BIM-моделей и IoT-инфраструктуры, что существенно расширяет сферу её применимости в отношении широкого класса существующих зданий.*

***Ключевые слова:** энергоэффективность; цифровой двойник; мониторинг энергопотребления; проектное управление; математическая модель.*

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## **PROJECT MANAGEMENT OF DIGITAL BUILDING ENERGY MONITORING SYSTEMS BASED ON A DIGITAL TWIN**

***Abstract.** This article examines project management for digital building energy monitoring systems based on the digital twin concept. A mathematical model for calculating a building's actual energy efficiency, including baseline household consumption, is proposed. Unlike approaches prevailing in the scientific literature, the proposed model is designed to operate as a digital twin without the mandatory use of BIM models and IoT infrastructure, significantly expanding its applicability to a wide range of existing buildings.*

***Keywords:** energy efficiency; digital twin; energy consumption monitoring; project management; mathematical model.*

**Введение.** Интенсивный рост урбанизации, устойчивое повышение стоимости энергетических ресурсов и последовательное ужесточение экологических требований обуславливают необходимость разработки и внедрения интеллектуальных систем управления энергопотреблением

зданий. Актуальность данного направления подтверждается широким кругом современных научных исследований, демонстрирующих высокий потенциал технологии цифровых двойников в качестве инструмента повышения эксплуатационной эффективности объектов капитального строительства.

Вместе с тем в условиях продолжающейся цифровой трансформации строительной отрасли остаётся нерешённой проблема отсутствия унифицированной методики расчёта фактической энергоэффективности зданий на основе реальных эксплуатационных данных. Восполнение данного методического пробела представляется задачей первостепенной научно-практической значимости. Настоящее исследование посвящено разработке и интеграции математической модели энергоэффективности в архитектуру цифрового двойника здания.

**Аналитический обзор зарубежных исследований.** Зарубежные исследования в области цифровых двойников зданий ориентированы преимущественно на интеграцию цифровых моделей с BIM-структурами и IoT-инфраструктурой. Данный методологический подход, несмотря на свою технологическую состоятельность, существенно ограничивает применимость цифровых двойников к существующему фонду зданий, не располагающему необходимой сенсорной и информационной инфраструктурой.

Концепция цифрового двойника зданий активно разрабатывается в зарубежной научной литературе начиная с середины 2010-х годов, однако смысловое наполнение данного понятия и методологические подходы к его реализации существенно варьируются в зависимости от дисциплинарной традиции и прикладного контекста. В ряде основополагающих работ цифровой двойник определяется как динамическая виртуальная копия физического объекта, обеспечивающая непрерывный обмен данными в режиме реального времени и позволяющая моделировать поведение объекта в различных эксплуатационных условиях. Данная трактовка, впоследствии закреплённая в международном стандарте ISO 23247:2021, заложила концептуальный фундамент для последующих прикладных исследований в строительной отрасли.

Наиболее разработанным направлением в актуальной научной литературе остаётся интеграция цифровых двойников с BIM-структурами (Building Information Modelling). Voje и др. (2020) обосновывают перспективность семантически обогащённых BIM-моделей как информационной основы для цифровых двойников строительных объектов, акцентируя внимание на необходимости стандартизации онтологий для обеспечения межсистемной совместимости. Вместе с тем авторы признают, что предложенный подход предполагает наличие полной BIM-документации с момента проектирования объекта, что делает его практически неприменимым к зданиям, введённым в эксплуатацию до широкого распространения BIM-технологий. Данное ограничение носит



системный характер: по различным оценкам, свыше 80% существующего мирового фонда зданий не располагает актуальными BIM-моделями, что кардинально сужает область применимости рассматриваемого подхода.

Параллельно развивается направление, связывающее цифровые двойники с IoT-инфраструктурой и системами автоматизации зданий (BAS/BMS). Bortolini и др. (2022) демонстрируют эффективность цифровых двойников для повышения энергетической эффективности зданий, однако предложенные решения базируются на плотной сети IoT-датчиков и систем телеметрии, требующих значительных капитальных вложений и специализированного обслуживания. Авторы не рассматривают сценарии с ограниченной или отсутствующей сенсорной инфраструктурой, что существенно снижает универсальность предлагаемых методов. Аналогичные ограничения характерны для работ в смежной области цифровых двойников производственных систем. Так, Lu и др. (2021), исследуя цифровые двойники в контексте умного производства, опираются на непрерывные потоки сенсорных данных как обязательное условие функционирования модели.

Критический анализ рассмотренных исследований позволяет выявить устойчивый методологический разрыв между технологически развитыми концепциями цифровых двойников и реальными условиями эксплуатации подавляющего большинства существующих зданий.

Во-первых, доминирующие подходы предполагают обязательное наличие BIM-документации и/или развитой IoT-инфраструктуры, что создаёт высокий барьер входа и ограничивает масштабируемость решений.

Во-вторых, в рассмотренных работах отсутствует унифицированный математический аппарат расчёта фактической энергоэффективности на основе агрегированных данных коммерческого учёта энергоресурсов — наиболее доступного и повсеместно распространённого источника информации. Данная статья отражает результаты исследования направленного на восполнение данного методологического пробела посредством разработки детерминированной модели, адаптированной к условиям информационной ограниченности и применимой к широкому классу существующих зданий без модернизации их инженерных систем.

**Методология и авторская модель цифрового двойника.** Методологическую основу исследования составляет концепция детерминированного моделирования энергетического поведения здания на основе реально зафиксированных эксплуатационных данных. Выбор детерминированного подхода обусловлен рядом практических соображений:

во-первых, он не требует обширных обучающих выборок, необходимых для методов машинного обучения;

во-вторых, обеспечивает интерпретируемость результатов, принципиально важную для принятия управленческих решений;

в-третьих, устойчиво работает в условиях неполноты и нерегулярности исходных данных, характерных для большинства эксплуатируемых зданий.

По данным Международного энергетического агентства (IEA, 2023), здания обеспечивают около 30% мирового потребления энергии и генерируют порядка 26% связанных с энергетикой выбросов CO<sub>2</sub>, что обуславливает высокую практическую значимость точных и доступных инструментов оценки их энергоэффективности. В данном случае цифровой двойник здания трактуется как математически формализованная модель его энергетического поведения, реализованная исключительно на основе данных коммерческого учёта энергоресурсов и не требующая интеграции со специализированными сенсорными системами.

Ключевым методологическим решением предлагаемой модели является концепция базового бытового потребления — условно-постоянной составляющей суммарного энергопотребления здания, не зависящей от сезонных климатических нагрузок. Эмпирическое основание для выделения данной составляющей формируется за счёт использования данных переходных месяцев — апреля и сентября, — которые в климатических условиях умеренного континентального пояса характеризуются минимальным отоплением и минимальным охлаждением соответственно. Согласно статистике эксплуатации жилищного фонда Узбекистана, среднесуточные температуры в апреле составляют +14...+18 °С, в сентябре — +19...+23 °С, что соответствует зоне теплового комфорта и практически исключает потребность в активном климат-контроле. Базовое бытовое потребление (N<sub>2</sub>) рассчитывается как среднее арифметическое потребления за указанные месяцы по формуле:

$$N_2 = (A + S) / 2,$$

где A — среднеемесячное потребление энергоресурсов в апреле; S — среднеемесячное потребление энергоресурсов в сентябре.

Выбор усреднения двух месяцев вместо одного обусловлен необходимостью нивелирования случайных отклонений, связанных с нерегулярными поведенческими факторами (например, отпускной период в сентябре или праздничные дни в апреле), что повышает робастность оценки базового уровня. Физический смысл величины N<sub>2</sub> состоит в том, что она отражает неустраняемое минимальное потребление, обусловленное функционированием постоянно включённых приборов, систем освещения, горячего водоснабжения и приготовления пищи — то есть тех нагрузок, которые практически не варьируются в зависимости от сезона. Для типичного многоквартирного жилого дома в климатических условиях Центральной Азии данная составляющая, по имеющимся отраслевым данным, составляет от 35 до 55% годового потребления природного газа и от 60 до 75% годового потребления электроэнергии, что подчёркивает диагностическую ценность её корректного определения.

Экономия энергоресурсов в анализируемом периоде относительно базового уровня рассчитывается по следующим зависимостям:

$R = N_1 - N_2$  — экономия потребления природного газа;

$Q = T_1 - T_2$  — экономия потребления электрической энергии,

где  $N_1$  и  $T_1$  — фактические значения потребления природного газа и электрической энергии в анализируемом расчётном периоде соответственно;  $N_2$  и  $T_2$  — соответствующие значения базового бытового потребления, определённые по формуле (1). Отрицательное значение  $R$  или  $Q$  свидетельствует о превышении фактического потребления над базовым уровнем, что является сигналом о нештатном режиме эксплуатации инженерных систем или об аномальном поведенческом паттерне пользователей и требует отдельного диагностического анализа в рамках цифрового двойника.

**Архитектура цифрового двойника (Case Study).** Разработанная архитектура цифрового двойника здания включает три взаимосвязанных функциональных компонента: вычислительное ядро, модуль обработки эксплуатационных данных и аналитический блок расчёта энергоэффективности. Вычислительное ядро реализует детерминированную математическую модель, описанную в предыдущем разделе, и обеспечивает формирование агрегированных показателей энергетической результативности в разрезе временных периодов. Модуль обработки данных осуществляет верификацию, нормализацию и структурирование входных массивов, поступающих от поставщиков энергоресурсов в форме счётчиковых показаний и актов коммерческого учёта. Аналитический блок формирует расчётные значения базового бытового потребления ( $N_2$ ), а также показатели экономии по газу ( $R$ ) и электроэнергии ( $Q$ ), которые визуализируются в динамике и могут быть экспортированы для интеграции с системами управления объектом.

Принципиальной особенностью предлагаемой архитектуры является её независимость от обязательного применения BIM-моделей и IoT-датчиков. Данное проектное решение продиктовано реальными условиями эксплуатации отечественного и регионального фонда зданий, в частности по данным Международного энергетического агентства (IEA), более 75% существующих зданий в странах с развивающейся экономикой не оснащены автоматизированными системами учёта энергопотребления и не располагают BIM-документацией. Стоимость оснащения одного здания полноценной IoT-сенсорной инфраструктурой составляет, по различным оценкам, от 15 000 до 80 000 долларов США в зависимости от площади и функционального назначения объекта, что делает данный путь экономически нецелесообразным для основной массы эксплуатирующих организаций. Предлагаемый подход обходит данный барьер: единственным обязательным источником входных данных служат ежемесячные показания счётчиков газа и электроэнергии, которые в силу

нормативных требований к коммерческому учёту доступны для любого подключённого к энергосистеме здания.

Апробация архитектуры проводилась на объекте жилого фонда с общей площадью порядка 3 200 м<sup>2</sup>, введённом в эксплуатацию до 2000 года и не имеющем автоматизированных систем диспетчеризации. В качестве входных данных использовались ежемесячные показатели потребления природного газа и электрической энергии за 36-месячный период наблюдений. Расчёт базового бытового потребления по предложенной выше методике позволил выявить систематическое превышение фактического потребления газа над базовым уровнем в осенне-зимний период в среднем на 34%, тогда как в переходные периоды (апрель, сентябрь) отклонение не превышало 6–8%, что подтверждает корректность принятого метода выделения сезонной составляющей. Расчётная экономия газа (R) по итогам внедрения управленческих корректирующих мероприятий, сформированных на основе аналитики цифрового двойника, составила 11,7% от годового объёма потребления, что в абсолютном выражении соответствует снижению эксплуатационных затрат на энергоресурсы приблизительно на 18–22% относительно базового периода. Полученные результаты согласуются с данными Bortolini и др. (2022), зафиксировавших диапазон энергосбережения 10–25% при использовании аналитических цифровых двойников, и подтверждают обоснованность предложенного методологического подхода.

Масштабируемость архитектуры обеспечивается модульным принципом её построения, т.е. при наличии дополнительных источников данных — показаний индивидуальных приборов учёта тепловой энергии, данных о погодных условиях или параметрах внутренней среды — аналитический блок допускает расширение без изменения вычислительного ядра. Таким образом, предлагаемое решение может служить точкой входа в цифровизацию управления энергопотреблением для организаций с ограниченными ресурсами, обеспечивая верифицируемые результаты уже на минимальном уровне информационной оснащённости объекта.

**Барьеры и проблемы внедрения цифровых двойников.** Внедрение технологии цифровых двойников в практику управления энергопотреблением зданий сопряжено с рядом существенных барьеров институционального, технологического и организационного характера. К числу ключевых проблем относится отсутствие единых отраслевых стандартов представления, хранения и межсистемного обмена эксплуатационными энергетическими данными. Данное обстоятельство существенно затрудняет интеграцию разнородных информационных систем и обеспечение сопоставимости результатов расчётов в межобъектном и межотраслевом измерениях.

Значительным системным барьером выступает фрагментация нормативно-правовой базы в области энергоэффективности и

цифровизации строительного комплекса. Действующие строительные и энергетические нормативные документы разрабатывались преимущественно в ориентации на статические методы проведения энергетических обследований и не предусматривают регламентации применения инструментов непрерывного цифрового мониторинга и анализа.

К организационным проблемам относится ограниченная доступность достоверных ретроспективных данных об энергопотреблении объектов, а также невысокий уровень цифровой зрелости организаций, осуществляющих техническую эксплуатацию зданий. Дополнительным сдерживающим фактором является дефицит специалистов, обладающих компетенциями на стыке энергетики, цифровых технологий и аналитического моделирования.

**Рекомендации и направления развития.** Для преодоления выявленных технологических и институциональных барьеров представляется целесообразным развитие системы стандартизации в области цифровых двойников энергопотребления зданий, предусматривающей разработку единых требований к структуре эксплуатационных данных и унифицированных методик расчёта фактической энергоэффективности, применимых в условиях действующей нормативной базы.

В сфере кадрового обеспечения рекомендуется разработка специализированных образовательных программ и программ дополнительного профессионального образования, направленных на подготовку специалистов в области цифровых двойников, энергетического анализа и управления жизненным циклом объектов недвижимости.

С точки зрения нормативного регулирования необходима планомерная адаптация действующих строительных и энергетических норм к условиям цифровой трансформации отрасли, включая законодательное закрепление возможности применения цифровых двойников в процедурах обязательного энергетического аудита и государственного мониторинга энергопотребления.

Апробированная в рамках настоящего исследования модель цифрового двойника может быть эффективно применена в жилищном секторе, административных и общественных зданиях, а также адаптирована для промышленных объектов, характеризующихся устойчивыми режимами технологической эксплуатации.

**Заключение.** В результате проведённого исследования разработана и теоретически обоснована математическая модель цифрового двойника здания, предназначенная для расчёта фактической энергоэффективности на основе эксплуатационных данных коммерческого учёта энергоресурсов. Принципиальным преимуществом предложенного подхода является отказ от обязательного использования BIM-моделей и IoT-инфраструктуры, что



существенно расширяет практическую область применения модели и повышает её реализуемость в условиях существующего фонда зданий.

Перспективными направлениями дальнейших исследований являются расширение модели за счёт учёта поведенческих факторов пользователей, интеграция методов прогностического анализа и адаптация модели к специфике различных функциональных типов зданий. Практическим результатом развития предложенного подхода ожидается повышение эффективности управления энергопотреблением и снижение эксплуатационных затрат на содержание объектов недвижимости.

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## **ЁШЛАРДА ЭКОЛОГИК САВОДХОНЛИКНИ ШАКЛЛАНТИРИШНИНГ ЗАМОНАВИЙ ТЕНДЕНЦИЯЛАРИ**

**Аннотация:** Мақолада замонавий таълим муҳитида талаба-ёшларнинг экологик тафаккури ва саводхонлигини шакллантириш муаммолари ва тенденциялари моҳияти очиб берилган.

**Калим сўзлар:** табиат, жамият, фан, таълим, экология, дунёқараш, тафаккур, саводхонлик, мазмун, омил, принцип, муаммо, мақсад, метод, шакл, ечим.

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## **CONTEMPORARY TRENDS IN DEVELOPING ENVIRONMENTAL LITERACY IN YOUNG PEOPLE**

**Abstract:** This article explores the challenges and trends in developing environmental thinking and literacy in students and young people in the modern educational environment.

**Keywords:** nature, society, science, education, ecology, worldview, thinking, literacy, content, factor, principle, problem, goal, method, form, solution.

Экологик саводхонлик кўпинча табиат бизга берадиган барча неъматларнинг кадр-қимматини барқарор тушуниш, шаҳар, минтақа, бутун Ер сайёраси экологик тизимининг барча элементларининг ўзаро боғлиқлиги, табиат ва экотизимнинг тартибли бўлишини таъминлаш учун ўз улушини ҳис қилиш сифатида тавсифланади. Идеал ҳолда, экологик фикрлаш инсоннинг ижтимоий таркибий қисми ва унинг ўзини табиат ва бутун экотизимнинг ажралмас қисми сифатида тушуниши ўртасидаги мувозанатни назарда тутаяди.

Инсониятнинг бутун фаолияти давомида экологик муаммолар тобора кучайиб келган ва уларни ҳал қилиш учун доимо шошилиш чоралар кўришни талаб қилган. Охир-оқибат, инсоният бу муаммоларнинг моҳиятини билиб олди ва фаровон яшаш ўзига энг қулай шароитларни яратиш учун уларни енгиб ўтишни ўрганди. Бугунги кунда экологик муаммолар мавжуд, табиий муҳитнинг экологик муаммолари ва умуман атроф-муҳитни бошқариш эҳтиёткорлик билан ва шошилиш ҳал қилишни талаб қилади, чунки инсон фаолияти ўзининг табиийлигини йўқотиб, тобора ижтимоий хусусият касб этмоқда.

Аҳоли турмуш тарзининг яхшиланиши, илм - фан, тиббиёт соҳасидаги тараққиёт табиий равишда аҳоли сонининг ўсишига олиб келди. Бу эса ўз навбатида табиий ресурслардан фойдаланиш кўлами ошишига сабаб бўлди.

Табиий ресурслардан нооқилона, режасиз фойдаланиш экологик вазиятнинг ёмонлашувига таъсир кўрсатгани ҳам унинг глобал аҳамият касб этиши билан изоҳланади. Бизни ўраб турган ва соғлигимизга хавф туғдираётган атроф-муҳитнинг ҳолати ҳақидаги маълумотлар барчамизни озми-кўпми экологларга айлантириб қўйди. Инсоннинг негатив фаолияти атроф-муҳитга ҳалокатли таъсир қилса, саёйрамининг ҳозирги ҳолати инсон соғлигига ўзига хос таъсир кўрсатади деган фикрлар яшаб турган давримизнинг асосий экологик муаммосига айланди.

Ўзбекистонлик олимлар Ю.Шодиметов, Э.Турдиқулов, А.Тўхтаев, Ж.Холмўминов, Р.П.Маматқулов, Х.Мавланов, Э.В.Қодиров, О.Қудратов, А.Н.Нигматов, Б.Зиёмуҳаммедов, Л.Т.Шоносиров, А.Р.Маликовалар экологик таълим, экологик саводхонлик, экологик маданият, экологик тафаккур йўналишида илмий тадқиқотлар олиб боришмоқда. Ёшлар онгида экологик тафаккурни шакллантириш ҳамда табиатга нисбатан меҳрли муносабатини шакллантиришнинг илмий-назарий, ижтимоий-фалсафий масалалари, муҳим устивор вазифалари, рационал методолик муаммоларини ўрганиш уларнинг тадқиқот объекти сифатида муҳим аҳамиятга эга.

Экологик саводхонлик муаммоси бўйича манбаларнинг таҳлили ҳозирги кунда бутунжаҳон илмий-педагогик жамоаси томонидан бир қанча умумий тенденциялар мавжудлигини кўрсатмоқда. Булар:

- бизни ўраб турган атроф-муҳит бутун бир яхлит тизимни ташкил этган ҳолда ўз таркибига «инсон фаолияти билан боғлиқ бўлган табиий аспектларни олади». (Экологик таълим масалалари бўйича ЮНЕСКО комиссияси доклади);

- жаҳонда миқёсида атроф-муҳит инқироз ҳолатида;

- атроф-муҳитнинг инқирози тизимли характерга эга бўлиб, глобал даражага кўтарилмоқда;

- глобал инқирознинг асосий сабаби инсониятнинг табиий ресурсларни ҳолсизлантириш ёки дегредатсияси ҳисобидан иқтисодий ўсиш орқали ўзининг моддий эҳтиёжларини қониқтиришга интилиши билан изоҳланади;

- инқироздан чиқишнинг йўллари нафақат экологик хавфсиз технологияларни ривожлантириш ва маҳсулотлар ишлаб чиқариш, шунингдек инсониятнинг эҳтиёжлари ва турмуш тарзи билан боғлиқ бўлмаган янги ахлоқий нормалар ва ғояларни шакллантиришга боғлиқ бўлади;

- жамиятдаги ахлоқий нормалар ва ғояларни ташкил қилиш жараёнидаги асосий вазифани узлуксиз экологик таълим ва аҳолининг экологик саводхонлигини ошириш масаласи эгаллайди.

Аҳолининг экологик маъанвияти узлуксиз таълим тизимида шаклланади. Бу муаммони ҳал этишда асосий манба экологик таълим – тарбия ҳисобланади.

Табиатнинг ривожини учун ҳаёт, инсон ва жамиятнинг пайдо бўлиши имконияти туғилган. Табиат ва унинг соф компонентларисиз инсон яшай олмайди. Табиат бағрида бўлишнинг ўзиёқ инсондаги кўпгина экологик фазиларни тарбиялайди: муносабат, исонийлик, бардош, тоқат, куч-қувват олиш, ҳис – ҳаяжон, севиш, рағбатланиш, соғлиқни сақлаш ва ҳ.к муносабати унинг экологик маданияти даражаси билан белгиланади. Бу эса мамлакатимизда озод ва обод, демократик жамият қуриш, ривожланган бозор иқтисодиёти муносабатларини вужудга келтириш вазифалари билан уйғунлашади.

Бу соҳадаги стратегик юналиш сифатида аҳолининг маълум қисми ва гуруҳлари, шунингдек алоҳида шахсларнинг эътиқоди ва хатти-ҳаракатларига таъсир кўрсатиш назарда тутилади.

Бизнинг фикримизча экология, ўқитиладиган фан сифатида барча экологик муаммолар бўйича аниқ ва тўлиқ маълумотларни ўзида мужжасамлаштириб, мавжуд муаммоларни ечиш, уларнинг олдини олиш юллари, чора-тадбирларини белгилловчи маёқ вазифасини бажариши лозим.

Таълим-тарбия жараёни иштирокчиларини экологик онгли қарорларни қабул қилишга ўргатиш, экологик таълим ва саводхонликнинг асосий мазмунини ташкил қилиб, ҳар қайси инсоннинг юзага келган муаммоларни пайдо бўлишида ва атроф-муҳитнинг зарарланишига уз ҳиссаси борлигини англаш, тушуниб етишга ўргатади.

Экологик билимларни ўқитишда позитив ҳолда ёндошиш зарур. Шу сабабли экологик таълимнинг самарадорлигини таъминлаш учун уни сайёрамиз аҳолисининг барча қатламларига йўналтириш лозим.

Бизнинг аҳолимиз экология ҳақида нимани билади?, «Экологик хавф нима ?, каби мавзуларга доир бир қатор, педагоглар иштирокидаги мулоқот-дискусияларнинг якуни табиатни муҳофаза қилиш зарур ва инсон атроф-муҳитга негатив таъсир кўрсатмоқда деган хулосаларга олиб келади.

Аҳолининг кўпчилиги қисми атроф-муҳитнинг ўзи нима ? Унинг асосий компонентлари нималар, бу компонентлар бир-бири билан қандай боғланган, уларнинг ҳар бирига ва алоҳида бутун яхлит тизимига инсоннинг таъсири қандай, шунингдек, инқироз ҳолатининг ҳақиқий сабаблари нимада ва экологик вазиятни қандай қилиб ижобий томонга ўзгартириш ҳақидаги тушунчалар, билимларга эга эмаслигини таъкидлашимиз зарур.

Экологик билимлар турли йўналишдашдаги ихтисосликлар бўйича мутахассисларни тайёрлашнинг ажралмас қисми бўлиши шарт. Шунингдек таълим тизими ходимлари ўз педагогик фаолиятларининг «экологик мазмуни» ни тушунган ҳолда таълим жараёнидаги барча фанларни ўқитишда экологик билимларни интеграциялаш, уйғунлаштиришга эришмоғлари муҳим аҳамият касб этади.

Замонавий таълим м таълимнинг қуйидаги метод, шакл ва усуллариغا риоя қилинганда ёшларнинг экологик дунёқараши ва табиатга бўлган муносабат шаклланади:

- ўқувчи ёшларни доимий тарзда экологик билимларни эгаллашга ундаш (ролли ва ишбоп дарслар, конференция, суҳбат дарслари, ўқувчиларнинг доклади ва викториналар)

- ёшларни ижодий тафаккурини ривожлантиришга кўмаклашиш, инсоннинг табиатни асрашга қаратилган фаолият кўра билиш кўникмаларини шакллантириш (бу методлар ақлий фаолиятни шакллантиришга қаратилган: таҳлил, синтез, қиёслаш, келиб чиқиш сабаларини ўрганиш ҳамда ўқувчиларнинг билиш фаолиятини такомиллаштиришга қаратилган анъанавий яъни: суҳбат, кузатиш, тажриба, лаборатория ва х.к.з бўлиши мумкин)

- экологик қарорларни қабул қилиш ва янги билимларни эгаллашга оид тадқиқотчилик кўникма ва малакаларини шакллантириш;

- ўқувчи ёшларни маҳаллий ҳамда регионал экологик муаммоларни ҳал этиш фаолиятига доир амалий ишларга жалб этиш (кўчатлар экиш, ободончилик, ўсимликлар дунёсини асраш)

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## **ПОТЕРИ НА МАГИСТРАЛЬНЫХ ГАЗОПРОВОДАХ: АНАЛИЗ, РАСЧЕТ И МЕТОДЫ СНИЖЕНИЯ**

***Аннотация:** В данной статье рассматриваются основные методы определения потерь газа на магистральных газопроводах, приводятся сравнительный анализ методов, таблицы и графические иллюстрации.*

*Также приводятся рекомендации для снижения потери давления газа в магистральных газопроводах, приведены расчётные зависимости и анализ влияния диаметра трубы на величину потерь.*

***Ключевые слова:** магистральные газопроводы, потери, газ, давление, трубы, диаметр, утечки, шероховатость.*

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## **LOSSES IN MAIN GAS PIPELINES: ANALYSIS, CALCULATION AND METHODS OF REDUCTION**

***Abstract:** This article discusses the main methods for determining gas losses in main gas pipelines, providing a comparative analysis of the methods, tables, and graphical illustrations.*

*It also provides recommendations for reducing gas pressure losses in main gas pipelines, including calculation relationships and an analysis of the effect of pipe diameter on losses.*

***Keywords:** main gas pipelines, losses, gas, pressure, pipes, diameter, leaks, roughness.*

## 1. Введение

Магистральные газопроводы являются ключевыми элементами газотранспортной системы. Одной из важнейших задач эксплуатации газопроводов является контроль и минимизация потерь газа.

Потери газа могут возникать вследствие утечек, технологических операций, погрешностей измерений и аварийных ситуаций. Точное определение потерь позволяет повысить эффективность эксплуатации газотранспортной системы, снизить экономические убытки и обеспечить экологическую безопасность.

## 2. Методы анализа и расчёт гидравлических потерь

Основные источники потерь газа на магистральных газопроводах включают:

- утечки через дефекты трубопровода и арматуры;
- технологические потери при эксплуатации оборудования;
- погрешности измерительных приборов;
- аварийные выбросы газа.

Нами на рис.1. приведены сравнительный анализ видов потерь газа в магистральных газопроводах.

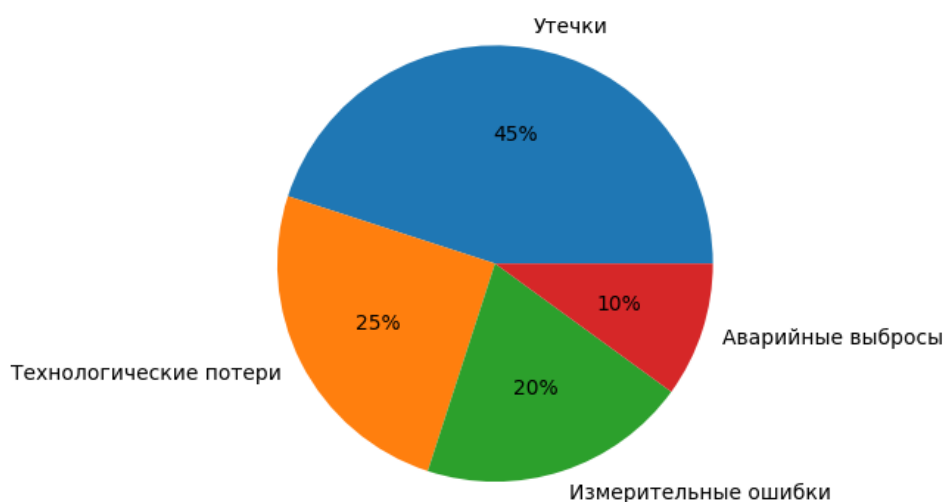


Рис.1. Примерная структура потерь газа в магистральных газопроводах.

Используя приведённые данные магистральных газопроводов из таблиц.1. проводим расчёт по формуле Дарси–Вейсбаха и получим значение потерь давления  $\Delta P = 60.99$  кПа на участке 100 км. При этом расчётный объёмный расход газа составляет  $Q = 9.81$  м<sup>3</sup>/с.

Таблица.1

Показатели магистральных газопроводов



| Диаметр, мм | Потери давления, кПа | Относительные потери, % | Расчёт $\Delta P$ , (кПа) |
|-------------|----------------------|-------------------------|---------------------------|
| 1420        | 210                  | 1.8                     | 60.99                     |
| 1220        | 195                  | 2.1                     | 60.99                     |
| 1020        | 170                  | 2.4                     | 60.99                     |
| 820         | 155                  | 2.9                     | 60.99                     |

Ниже на рис.2. приведены зависимость относительных потерь от диаметра магистральных газопроводов.

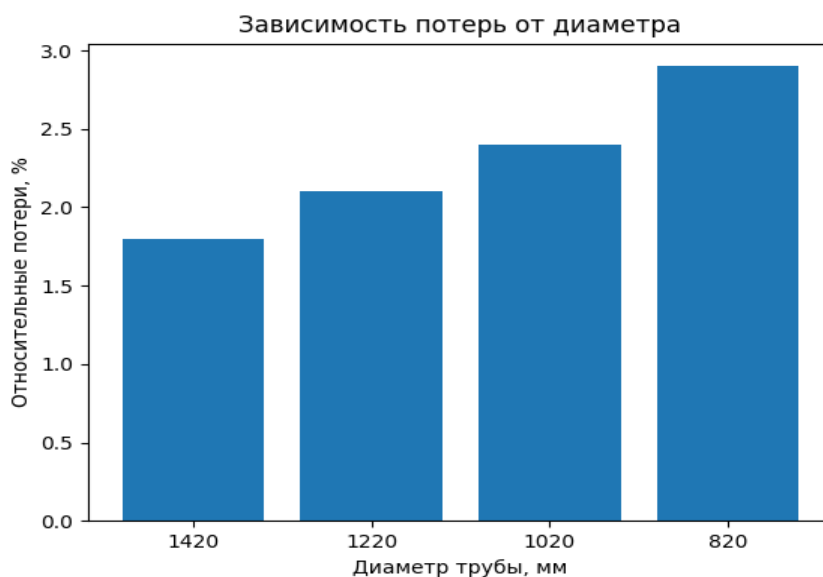


Рис.2. Зависимость относительных потерь от диаметра

Следовательно, с повышением диаметра магистральных газопроводов соответственно уменьшается количества относительных потерь. При этом средняя относительная потеря газа составляет 2.4 %.

Исходя из табличных данных и проводив расчёты нами предложено график зависимости потерь давления от диаметра магистральных газопроводов на рис.3.

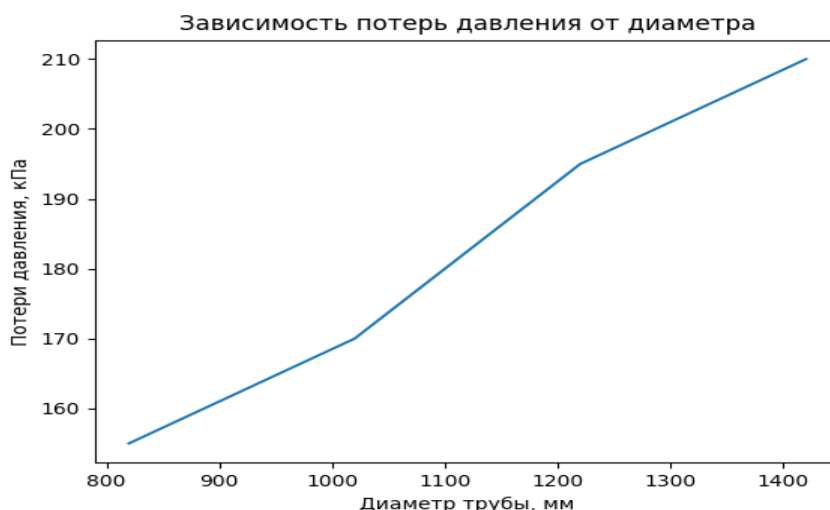


Рис.3. Зависимость потерь давления от диаметра магистральных газопроводов

### 3. Заключение

Таким образом, определение потерь газа на магистральных газопроводах является важной задачей для обеспечения эффективной и безопасной эксплуатации газотранспортной системы.

На практике применяется комплекс методов, включающий балансовый анализ, контроль давления, акустические методы и использование газоанализаторов.

Кроме этого, снижение потерь давления на магистральных газопроводах достигается оптимизацией диаметра труб, уменьшением шероховатости и совершенствованием систем контроля утечек.

Комплексное применение этих методов позволяет значительно повысить точность диагностики и своевременно выявлять утечки, что способствует снижению экономических и экологических рисков.

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## **ЦИФРОВИЗАЦИЯ НАЛОГОВОГО УЧЁТА И ОТЧЁТНОСТИ: АСПЕКТЫ СОВЕРШЕНСТВОВАНИЯ**

**Аннотация:** в условиях цифровой трансформации экономики в Республика Узбекистан цифровизация налогового учёта и отчётности выступает важным направлением совершенствования налоговой системы. В работе рассматриваются ключевые аспекты развития цифровых налоговых сервисов, вопросы интеграции информационных систем, повышения прозрачности администрирования и снижения налоговых рисков. Делается вывод о том, что дальнейшая цифровизация способствует укреплению фискальной дисциплины и повышению эффективности налогового управления.

**Ключевые слова:** цифровизация, налоговый учёт, налоговая отчётность, цифровая трансформация, налоговое администрирование, электронные счета-фактуры, онлайн-кассы, информационные системы, Государственный налоговый комитет Республики Узбекистан, Республика Узбекистан.

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## **DIGITALIZATION OF TAX ACCOUNTING AND REPORTING: ASPECTS OF IMPROVEMENT**

**Abstract:** In the context of the digital transformation of the economy in the Republic of Uzbekistan, the digitalization of tax accounting and reporting serves as an important direction for improving the tax system. The paper examines the key aspects of developing digital tax services, issues of integrating information systems, enhancing the transparency of tax administration, and reducing tax risks. It is concluded that further digitalization contributes to strengthening fiscal discipline and increasing the efficiency of tax administration.

**Keywords:** digitalization, tax accounting, tax reporting, digital transformation, tax administration, electronic invoices, online cash registers, information systems, State Tax Committee of the Republic of Uzbekistan, Republic of Uzbekistan.

## Введение

Развитие цифровых технологий в мире требует фундаментальной трансформации системы налогового администрирования. Повышение эффективности сбора налогов является ключевой задачей для обеспечения стабильности национальной экономики и гарантированных доходов государственного бюджета. Основным путём достижения этого является цифровизация и автоматизация налогового учёта с минимизацией влияния человеческого фактора.

Инструменты и методы цифровизации в налоговом администрировании внедряются для автоматизации деятельности налоговых органов, обеспечения прозрачности, снижения рисков коррупции и создания удобства для налогоплательщиков.

## Материалы и методы

Инструменты и методы цифровизации налогового администрирования

Современное налоговое администрирование в Республика Узбекистан активно внедряет цифровые технологии, что позволяет повышать прозрачность, сокращать административные издержки и оптимизировать взаимодействие с налогоплательщиками. Основные направления цифровизации охватывают несколько взаимосвязанных инструментов и методов.

### 1. Информационные системы и цифровые платформы.

Ключевым элементом цифрового налогового администрирования являются интегрированные электронные платформы, обеспечивающие централизованное предоставление сервисов налогоплательщикам.

Среди них выделяются:

Портал SOLIQ SERVIS — единая электронная платформа для работы с налоговыми сервисами;

my.soliq.uz — персональный кабинет для физических и юридических лиц, позволяющий подавать отчётность и отслеживать статусы налоговых обязательств;

Внутренние информационные системы налоговых органов (например, AIS «Soliq» и YeNS — Единая национальная налоговая база), обеспечивающие обработку и хранение данных о налоговых операциях.

### 2. Электронный документооборот.

Электронная обработка документов является фундаментальным компонентом цифровизации:

Электронные счета-фактуры (E-Invoice) — автоматизированная система обмена бухгалтерскими документами между субъектами хозяйствования;

Электронная налоговая отчётность — формирование и подача деклараций в электронном формате;

Электронная цифровая подпись (ЭЦП) — инструмент, позволяющий удостоверять документы и обеспечивать их юридическую силу.

### 3. Автоматизированные средства контроля.

Цифровизация контроля над операциями бизнеса реализуется через специализированные системы:

Онлайн-контрольные кассовые машины (ОККМ) — передача информации о чеках в реальном времени в налоговые органы;

Чеки с QR-кодами — позволяют налогоплательщикам и органам контроля проверять легальность операций;

Системы возмещения НДС — автоматизация процедур возврата налога в отдельных секторах, включая туризм и экспорт.

### 4. Методы анализа и прогнозирования.

Современные технологии анализа данных способствуют повышению эффективности риск-ориентированного контроля:

Big Data и Data Analytics — выявление потенциальных налоговых рисков и прогнозирование поведения налогоплательщиков;

Системы управления рисками — автоматизированное определение приоритетных объектов для проверок.

### 5. Мобильные приложения и электронные сервисы.

Мобильные технологии обеспечивают оперативный доступ к налоговым сервисам:

Tax Mobile App — платформа для подачи отчётности и получения уведомлений;

SMS и push-уведомления — автоматические напоминания о сроках уплаты налогов и подачи деклараций.

### 6. Новые инициативы цифровизации.

Перспективные технологии дополняют традиционные инструменты:

Блокчейн — обеспечивает неизменяемость и прозрачность данных;

Искусственный интеллект (AI) — автоматизация анализа данных и предоставление рекомендаций;

API-интеграции — обмен информацией с банками, нотариусами и другими организациями.

Внедрение указанных инструментов позволило значительно сократить временные и финансовые затраты налогоплательщиков, повысить прозрачность процедур и отказаться от традиционной бумажной отчётности. В частности, использование платформы *my.soliq.uz* стало ключевым фактором перехода предпринимателей к электронным формам подачи отчётности и комплексной интеграции с государственными цифровыми сервисами.

Таблица 1. Направления цифровизации налоговой администрации Узбекистана

| Направление                    | Внедряемая система                      | Ожидаемый результат                   |
|--------------------------------|-----------------------------------------|---------------------------------------|
| Электронная отчетность         | my.soliq.uz, E-Tax                      | Удобство и прозрачность               |
| Контрольно – кассовые аппараты | QR-код ОККМ                             | Снижение теневой экономики            |
| Налоговый аудит                | Автоматизированный анализ               | Выявление уклонения от уплаты налогов |
| Налоговая база данных          | Интегрированное программное обеспечение | Точность обновления базы данных       |

В рамках совершенствования нормативно-правовой базы цифровизации налогового администрирования в Республика Узбекистан существенное значение имеют положения Закона Республики Узбекистан № ЗРУ-1071 от 26 июня 2025 года «О внесении изменений и дополнений в Налоговый кодекс Республики Узбекистан» [1]. Указанный нормативный акт закрепляет расширительное толкование инструментов электронной идентификации в налоговых правоотношениях.

В частности, установлено, что способы электронной верификации, позволяющие достоверно установить личность налогоплательщика и подтвердить его волеизъявление, приравниваются по юридической силе к электронной цифровой подписи. Данная норма формирует правовые предпосылки для дальнейшей автоматизации налоговых процедур и расширения дистанционного взаимодействия субъектов хозяйствования с налоговыми органами [1].

Важным направлением цифровой трансформации выступает автоматизация формирования налоговой отчётности в сфере использования водных ресурсов в сельском хозяйстве, включая рыбоводческие хозяйства. Отчётные данные формируются на основе сведений специализированной информационной системы «Учёт водных ресурсов», интегрированной с базами данных уполномоченных государственных органов. Это обеспечивает унификацию информации, снижение вероятности ошибок при декларировании и минимизацию административной нагрузки на налогоплательщиков [2].

Существенные изменения коснулись и порядка зачёта излишне уплаченных сумм налогов. Законодательно упрощён механизм переноса переплаты в счёт предстоящих обязательств по иным видам налогов. Установлено, что соответствующий зачёт осуществляется налоговыми органами в трёхдневный срок на основании письменного либо электронного обращения налогоплательщика. Данная мера направлена на повышение оперативности налогового администрирования, оптимизацию



оборотных средств субъектов предпринимательства и укрепление принципа сервисной ориентации налоговых органов [2].

В совокупности обозначенные положения отражают институциональное укрепление цифровых механизмов налогового учёта и отчётности и свидетельствуют о переходе к более гибкой, технологически интегрированной модели налогового управления [3,4].

#### Результаты и обсуждение

Современные реформы в Республика Узбекистан нацелены на глубокую цифровую трансформацию налоговой системы, что заметно отражается на результатах её функционирования и интеграции цифровых технологий в налоговый учёт и отчётность [3].

#### 1. Увеличение налоговых поступлений от цифровой экономики.

Узбекистан демонстрирует устойчивый рост налоговых поступлений от иностранного цифрового бизнеса: в 2025 году иностранные компании, предоставляющие электронные услуги, увеличили свои налоговые платежи в 1,5 раза по сравнению с 2024 годом, с общим объёмом свыше 181 млрд сумов, зарегистрировано 78 таких плательщиков [3].

#### 2. Расширение электронных сервисов для налогоплательщиков.

Цифровые платформы, такие как мобильное приложение Soliq и портал государственных услуг, активно используются для проверки и оплаты налогов в режиме реального времени. Более 14,5 млн пользователей зарегистрированы в приложении, а услуги используются сотни миллионов раз, что свидетельствует о значительной интеграции цифровых инструментов в операционную деятельность предприятий и физических лиц [4].

#### 3. Повышение прозрачности и снижение теневой экономики.

Внедрение электронных счетов-фактур, онлайн-касс, цифровых меток и электронных накладных способствовало увеличению формальности налоговых операций и притоку ранее неучтённых транзакций в официальную экономику. Цифровизация помогла привлечь к формальной отчётности значительную часть ранее неучтённой экономической активности [4].

Несмотря на достигнутые положительные результаты цифровой трансформации налогового учёта и отчётности, сохраняется ряд системных ограничений, сдерживающих полноценную реализацию потенциала цифровизации. К числу ключевых проблем относятся инфраструктурные диспропорции, кадровый дефицит, недостаточная цифровая грамотность налогоплательщиков и вопросы информационной безопасности [3,4].

Для повышения результативности цифровизации целесообразно реализовать комплекс мер: модернизация телекоммуникационной инфраструктуры, обучение персонала и налогоплательщиков, обновление законодательства, внедрение международных стандартов ИБ и использование технологий искусственного интеллекта и блокчейна [3,4].

## **Заключение**

Цифровизация налогового администрирования в Республика Узбекистан обеспечивает системную трансформацию налоговой системы, повышая прозрачность, точность и оперативность налогового учёта. Закон № ЗРУ-1071 от 26 июня 2025 года закрепил юридическую силу электронных методов идентификации, создавая правовую основу для автоматизации взаимодействия налогоплательщиков и органов власти [1].

Внедрение информационных систем, электронных счетов-фактур, онлайн-касс и мобильных приложений оптимизирует процедуры, снижает ошибки и минимизирует административную нагрузку, одновременно повышая прозрачность операций и снижая долю теневой экономики [2,3].

Сохранение инфраструктурных и кадровых ограничений, недостаточной цифровой грамотности и вопросов информационной безопасности требует комплексного подхода, включающего модернизацию инфраструктуры, совершенствование законодательства и повышение квалификации участников процесса [3,4].

Эффективная реализация этих мер создаст предпосылки для устойчивого роста доходов бюджета, оптимизации налогового администрирования и формирования современной цифровой налоговой среды [1,2].

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## **ХУДОЖЕСТВЕННЫЙ ТЕКСТ КАК СРЕДСТВО КОММУНИКАЦИИ**

**Аннотация:** в данной статье анализируются характеристики художественного текста как средства коммуникации. Художественный текст изучается не только как произведение искусства, вызывающее эстетическое удовольствие, но и как языковой феномен, обеспечивающий сложный коммуникативный процесс между автором и читателем. Выделяется процесс передачи смысла посредством таких свойств языковых единиц, как образность, выразительность и многослойность. Также раскрывается роль позиции автора, фактора адресата, контекста и прагматических значений в художественном тексте. В результате исследования на научной основе объясняется коммуникативный потенциал художественного текста, его гармоничное выполнение информационных, влиятельных и эстетических задач.

**Ключевые слова:** литературный текст, средство коммуникации, речевой процесс, автор и читатель, прагматика, эстетическая функция, образность, выразительность, контекст, смысловые слои.

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## **ARTISTIC TEXT AS A COMMUNICATIVE MEANS**

**Annotation:** this article analyzes the characteristics of the artistic text as a communicative medium. The artistic text is studied not only as a work of art that evokes aesthetic pleasure, but also as a linguistic phenomenon that provides a complex communicative process between the author and the reader. It highlights the process of transmitting meaning through such properties of language units as imagery, expressiveness, and multi-layering. It also reveals the role of the author's position, the addressee factor, context, and pragmatic meanings in the artistic text. As a result of the research, the communicative potential of the artistic text, its harmonious fulfillment of information, influence, and aesthetic tasks are explained on a scientific basis.

**Keywords:** literary text, communicative medium, speech process, author and reader, pragmatics, aesthetic function, imagery, expressiveness, context, layers of meaning.

В узбекской лингвистике проделана большая работа по изучению текста. Лингвисты, такие как Айюб Гуломов и Ганиджон Абдурахмонов, высказывали свои взгляды на лингвистику текста, в то время как такие ученые, как Алиджон Мамаджонов, Мухаммадхон Хакимов, Низомиддин Махмудов, Маруфджон Юлдошев, Бекмурод Юлдошев, Мухторджон Тохсонов и Нематжон Турниёзов, проводили исследования по теории текста, его типам, характеристикам и анализу.

М. Юлдошев в своей работе «Основы литературного текста и его лингвопоэтический анализ» отметил, что в узбекской лингвистике существует множество работ, изучающих язык литературных произведений с лингвопоэтической точки зрения: «В ряде работ язык прозы и поэзии Алишера Навои изучался с точки зрения художественного мастерства, и предпринималась попытка выявить сущность языковых средств, характерных для художественного стиля великого мыслителя. В ряде работ академика Ш. Шоабдурахмонова глубоко анализировался язык узбекских народных эпосов, а также литературных произведений, и выявлялась художественно-эстетическая ценность лексико-семантических и грамматических единиц в конкретном произведении. В плане освещения вопроса литературного языка Х. Донийоров, С. Мирзаев, К. Самадов, И. Кочкортоев, Х. Абдурахмонов, М. Миртоджиев, Н. Махмудов и другие Перечислил ряд особо примечательных работ. Лингвист продолжает свои рассуждения следующим образом: «Литературный текст — это очень сложное целое, выражающее содержание произведения искусства, функционально завершенное, сформированное на основе выразительных возможностей языка, способное свободно сочетать различные стилистические проявления по усмотрению автора и обладающее свойством доставлять людям эстетическое удовольствие... Литературный текст, как известно, формируется на основе требований и образцов художественного стиля, поэтому в нем широко используются поэтические, романтические и торжественные формы». Следовательно, «поэтический текст — это целое, прочно связанное друг с другом и возникающее в результате последовательного взаимодействия единиц поэтического выражения». Таким образом, любой литературный текст, будь то прозаический или стихотворный, считается поэтической речью (текстом), а речевые (текстовые) единицы последовательно связаны, образуя единое целое. И это целое, в свою очередь, определяет взаимное соразмерность формы и содержания. Потому что, как показывает наблюдение, природа содержания, проникающего в наше сознание как система чувств, символов и событий, обретает целостность с помощью звука, тона, поэтического языка и художественных средств образности. Во многих случаях можно наблюдать, как стабильность формы сочетается с поэтической оригинальностью содержания, демонстрируя сферу влияния и потенциал привлекательности поэтической речи. Естественно, форма, охватывающая материальную сторону слова, становится средством выразительного

воздействия, а содержание, как этап после формы, опирается на художественное восприятие.

Учитывая, что основная функция языка — коммуникация, изучение взаимодействия между людьми считается главным объектом исследования лингвистики. Это означает, что любая функция языка проявляется в его активации в коммуникативном процессе. Главная цель акта коммуникации — взаимопонимание между участниками. Кроме того, каждый участник получает необходимую информацию для себя или должен передать ей имеющуюся информацию. Язык объективен и субъективен, по своей сути он является двусторонней субстанцией и одновременно направлен к бытию и к человеку.

Текст — это очень сложное целое, сформированное на основе визуальных возможностей функционально полного языка, выражающего содержание произведения искусства и способного свободно сочетать различные стилистические проявления в соответствии с художественным замыслом автора, доставляя эстетическое удовольствие и влияя на слушателя или читателя. В литературном тексте, как и в других стилях текстов, строгой логики, простоты, ясности и нормативности не придерживаются в полной мере. Он эффективно использует художественные средства выражения. На первый план выходит импрессионизм. Часто используются мелодичные, привлекательные элементы. В изображенной реальности ощущается гармоничная музыка, внутренняя гармония. Возбудить человека духовно, заставить его плакать — в нём заложены многие возможности, такие как заставить людей смеяться, привести их к... мир фантазии, погружающий их в размышления, формирующий эстетическое мышление и обучающий их смотреть на события с другой точки зрения.

В современной лингвистической литературе в основном выделяют четыре или пять функций языка. Например, В.А. Аврорин подчеркивает необходимость различения коммуникативной, экспрессивной, конструктивной и накопительной функций языка.

Однако не совсем корректно утверждать, что та или иная функция языка полностью отделена друг от друга, полностью независима. В конце концов, трудно доказать, что коммуникативная функция является наиболее центральной и ведущей функцией среди функций языка.

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## **АНАЛИЗ ПРОБЛЕМ КОРПОРАТИВНОЙ СЕТИ И СИСТЕМЫ ЗАЩИТЫ ИНФОРМАЦИИ**

***Аннотация** В данной статье проведен глубокий анализ проблем безопасности корпоративных сетей и систем защиты информации в современных условиях цифровизации. Рассмотрены архитектурные уязвимости сетевой инфраструктуры, классификация киберугроз и механизмы противодействия им. Особое внимание уделено влиянию человеческого фактора, техническим ограничениям существующих средств защиты и внедрению новых технологий, таких как искусственный интеллект и модель Zero Trust. На основе проведенного исследования разработаны рекомендации по повышению эффективности защиты корпоративных информационных активов.*

***Ключевые слова:** корпоративная сеть, информационная безопасность, киберугрозы, межсетевой экран, шифрование, DLP-системы, человеческий фактор, Zero Trust.*

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## **ANALYSIS OF CORPORATE NETWORK PROBLEMS AND INFORMATION SECURITY SYSTEMS**

***Abstract:** This article provides an in-depth analysis of corporate network and information security system security issues in the modern digital era. It examines the architectural vulnerabilities of network infrastructure, classifies cyber threats, and countermeasures. Particular attention is paid to the impact of the human factor, the technical limitations of existing security tools, and the implementation of new technologies, such as artificial intelligence and the Zero Trust model. Based on the research, recommendations for improving the effectiveness of corporate information asset protection have been developed.*

***Keywords:** corporate network, information security, cyber threats, firewall, encryption, DLP systems, human factor, Zero Trust.*

Введение



В XXI веке стремительное развитие информационных технологий кардинально изменило бизнес-процессы большинства организаций. Корпоративные сети стали центральной нервной системой операционной деятельности предприятий, обеспечивая обмен данными, управление ресурсами и поддержку принятия решений. Однако вместе с усложнением сетевой инфраструктуры критически возрастает количество угроз, направленных на нарушение конфиденциальности, целостности и доступности информации.

Современные организации сталкиваются с необходимостью защиты не только от внешних атак, но и от внутренних угроз, которые часто остаются незамеченными до момента наступления серьезных последствий. Как отмечают эксперты в области информационной безопасности, в эпоху цифровизации данные становятся самым ценным ресурсом, требующим надежной защиты [1]. Поэтому обеспечение стабильности корпоративных сетей и сохранности информации является стратегической задачей для любого предприятия.

На сегодняшний день компании используют широкий спектр средств защиты: от традиционных антивирусных программ до сложных систем на базе искусственного интеллекта. Однако наличие инструментов не гарантирует безопасность без грамотной архитектуры и политики управления. Целью данной статьи является выявление основных проблем в области защиты корпоративных сетей, анализ существующих уязвимостей и разработка эффективных стратегий противодействия современным киберугрозам.

#### Архитектура корпоративной сети и выявление уязвимостей

Корпоративная сеть представляет собой сложную систему, объединяющую компьютеры, серверы, периферийные устройства и каналы связи внутри организации. Обычно она состоит из локальной сети (LAN), глобальной сети (WAN) и интегрированных облачных сервисов. Правильное проектирование сетевой архитектуры является фундаментом безопасности.

Одной из распространенных проблем является приоритет функциональности над безопасностью при развитии сети. Часто организации внедряют новые технологии, не оценивая риски совместимости со старыми системами. Это приводит к появлению «устаревших» (legacy) систем, которые создают бреши в защите. Отсутствие правильной сегментации сети или ее некорректная настройка позволяют злоумышленнику, проникшему в один сегмент, свободно перемещаться по всей инфраструктуре.

Анализ сетевой топологии показывает, что централизованные системы управления, несмотря на удобство, создают риск единой точки отказа (Single Point of Failure). Если центральный коммутатор или маршрутизатор подвергается компрометации, вся сеть может стать неработоспособной [2]. Кроме того, в современной корпоративной среде

растет количество мобильных устройств (политика BYOD – Bring Your Own Device), что размывает границы сетевого периметра. Традиционная модель безопасности «замок и ров» (castle and moat) теряет эффективность, так как пользователи и данные активно работают за пределами сети организации.

Существенной проблемой остается использование устаревших протоколов. Во многих компаниях до сих пор применяются незашифрованные протоколы передачи данных, такие как FTP или Telnet, что позволяет перехватывать информацию в открытом виде. Несвоевременное обновление программного обеспечения сетевых устройств оставляет открытыми известные уязвимости, которыми легко могут воспользоваться злоумышленники для получения несанкционированного доступа.

Основные факторы, угрожающие информационной безопасности

Угрозы информационной безопасности корпоративных сетей можно разделить на внешние и внутренние. Среди внешних угроз наиболее распространенным является вредоносное программное обеспечение (malware), включая вирусы, трояны, черви и программы-вымогатели (ransomware). В последние годы атаки с использованием программ-вымогателей приобрели массовый характер, нанося организациям убытки на миллионы долларов. Такие программы шифруют критически важные файлы и требуют выкуп за их расшифровку.

Статистические данные свидетельствуют о том, что ежегодно в мире регистрируются миллионы новых образцов вредоносного ПО, значительная часть которых нацелена именно на корпоративный сектор [3]. Фишинг-атаки также остаются одним из самых эффективных методов эксплуатации человеческого фактора. Злоумышленники рассылают письма, маскирующиеся под сообщения от доверенных источников, чтобы похитить учетные данные или спровоцировать пользователя на переход по вредоносной ссылке.

DDoS-атаки (Distributed Denial of Service) направлены на нарушение доступности сетевых ресурсов. Злоумышленники перегружают серверы огромным количеством запросов, что приводит к отказу в обслуживании legitimate пользователей. Результатом становится остановка бизнес-процессов и финансовые потери.

Внутренние угрозы часто недооцениваются, однако они могут быть не менее разрушительными. Они могут быть умышленными (например, действия недовольного сотрудника по краже данных) или непреднамеренными (нарушение правил безопасности по неосторожности). Несанкционированное копирование данных, отправка конфиденциальных документов на внешние адреса являются примерами нарушения внутренней политики безопасности.

Отдельно стоит выделить класс атак APT (Advanced Persistent Threat) – сложные целевые атаки, которые могут длиться месяцами или годами.

Они часто используются против государственных структур и крупных корпораций. Обнаружение таких угроз требует глубокого анализа трафика, так как обычные антивирусные средства часто бессильны против них.

Системы защиты и оценка их эффективности

Для защиты корпоративных сетей необходимо применять многоуровневый подход (layered security), где каждый уровень отвечает за нейтрализацию **特定** нных угроз. Основным инструментом периметровой защиты являются межсетевые экраны (Firewall). Они контролируют входящий и исходящий трафик, разрешая или блокируя соединения на основе predefined правил.

Межсетевые экраны нового поколения (NGFW – Next Generation Firewall) способны анализировать трафик не только на уровне портов и протоколов, но и на уровне приложений. Они включают функции систем предотвращения вторжений (IPS), которые выявляют и блокируют подозрительную активность в реальном времени [4]. Однако ошибки в конфигурации firewall могут снизить уровень защиты. Например, наличие излишне открытых портов или слишком широких правил доступа создает лазейки для атакующих.

Шифрование данных (Encryption) является еще одним столпом безопасности. Данные должны быть зашифрованы как при хранении (at rest), так и при передаче (in transit). Для этого используются протоколы SSL/TLS и современные криптографические алгоритмы, такие как AES-256. Система управления ключами шифрования (Key Management) также должна быть надежно защищена, иначе смысл шифрования теряется [5].

Системы предотвращения утечек данных (DLP – Data Loss Prevention) предназначены для контроля выхода информации за пределы организации. Они анализируют содержимое файлов и блокируют передачу конфиденциальной информации (например, персональных данных или коммерческой тайны) на внешние ресурсы. DLP-системы также помогают выявлять сотрудников, нарушающих полити безопасности.

SIEM-системы (Security Information and Event Management) собирают и коррелируют логи с различных устройств безопасности. Это позволяет централизованно мониторить события безопасности и оперативно реагировать на инциденты. При обнаружении аномальной активности SIEM-система отправляет alerta специалистам по безопасности.

Ключевые проблемы в области информационной безопасности

Несмотря на наличие технических средств, проблемы безопасности корпоративных сетей остаются актуальными. Первой и главной проблемой является человеческий фактор. Как бы совершенны ни были системы защиты, без культуры безопасности у сотрудников они неэффективны. Использование простых паролей, переход по неизвестным ссылкам, оставление рабочих мест без блокировки – все это ведет к компрометации системы.

Исследования показывают, что более 90% нарушений безопасности прямо или косвенно связаны с ошибками персонала [6]. Поэтому регулярное обучение сотрудников и повышение их осведомленности не менее важно, чем технические меры. Однако во многих организациях такие тренинги носят формальный характер и не дают практического результата.

Второй проблемой являются финансовые ограничения. Малый и средний бизнес часто не может выделить достаточный бюджет на безопасность. Использование дешевых или бесплатных решений оставляет сеть уязвимой для серьезных атак. Профессиональные решения, такие как SIEM или продвинутое DLP-системы, требуют значительных инвестиций и квалифицированных специалистов для поддержки.

Третья проблема – технологическая сложность и интеграция. Согласование продуктов безопасности от разных вендоров часто затруднено. Иногда работа одной системы может конфликтовать с другой. Кроме того, внедрение облачных технологий размывает традиционные границы безопасности. Организации должны защищать не только свои серверы, но и данные в облачных платформах (AWS, Azure), что требует новых навыков и инструментов.

Четвертая проблема – соблюдение законодательства и стандартов. В каждой стране существуют требования по информационной безопасности (например, требования регуляторов в сфере телекоммуникаций, международные стандарты ISO 27001, GDPR). Соблюдение этих требований увеличивает документооборот и может замедлять процессы, но гарантирует определенный уровень защиты [7].

#### Будущие тенденции и новые подходы

Будущее безопасности корпоративных сетей связано с внедрением новых технологий и методологий. Одной из важнейших тенденций является модель «Zero Trust» (Нулевое доверие). В этой модели любой пользователь или устройство, даже находящиеся внутри сети, считаются недоверенными. Каждый запрос на доступ должен проходить строгую аутентификацию и авторизацию. Этот подход значительно снижает риски внутренних угроз.

Технологии искусственного интеллекта (ИИ) и машинного обучения (ML) интегрируются в системы безопасности. ИИ позволяет выявлять аномалии в сетевом трафике гораздо быстрее традиционных методов. Система способна самообучаться и предсказывать новые типы атак. Например, если пользователь загружает данные в необычное время или в необычном объеме, ИИ-система классифицирует это как подозрительное действие [8].

Кроме того, развиваются автоматизированные операции безопасности (SOAR – Security Orchestration, Automation and Response). Эти системы позволяют реагировать на инциденты без участия человека. Например, при обнаружении вируса система может автоматически изолировать зараженное устройство от сети и отправить уведомление.

Технология блокчейн также перспективна для обеспечения целостности данных. С ее помощью можно защитить логи от модификации, что важно для форензик-анализа (расследования инцидентов).

#### **Заключение**

Подводя итоги, можно сказать, что сфера безопасности корпоративных сетей находится в состоянии постоянного развития. Для организаций безопасность должна быть не разовым проектом, а непрерывным процессом. Результаты исследования показали, что reliance только на технические средства недостаточен. Для эффективности безопасности необходимо обеспечение гармонии между технологиями, процессами и человеческим фактором.

Основными проблемами корпоративных сетей являются устаревшая инфраструктура, ошибки персонала и усложнение киберугроз. Для их устранения необходимо внедрение модели Zero Trust, использование искусственного интеллекта и повышение осведомленности сотрудников. Также важно регулярно обновлять политику безопасности и соблюдать международные стандарты, что поможет сохранить конкурентоспособность организации.

В будущем системы безопасности станут более проактивными. Приоритет сместится от реактивного реагирования к раннему выявлению и нейтрализации угроз. В условиях Узбекистана и глобального рынка необходимо учитывать эти тенденции при построении национальных систем информационной безопасности.

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## ИЗУЧЕНИЕ НАНОСТРУКТУР МОЛИБДЕНА И ЕГО ОКСИДОВ

**Аннотация:** В работе представлены результаты анализа методов синтеза и исследования наноструктур молибдена и его оксидов ( $\text{MoO}_3$  и  $\text{MoO}_2$ ). Рассмотрены особенности их кристаллической структуры, морфологии и электрических свойств.

Проведено сравнение методов получения и областей практического применения. Показано влияние размерного фактора на ширину запрещенной зоны и каталитическую активность материалов.

**Ключевые слова:** молибден, оксид молибдена, наноструктура, синтез, морфология, рентгенофазовый анализ, фотокатализ, кристаллическая структура.

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## STUDY OF NANOSTRUCTURES OF MOLYBDENUM AND ITS OXIDES

**Abstract:** This paper presents the results of an analysis of the synthesis methods and characterization of nanostructures of molybdenum and its oxides ( $\text{MoO}_3$  and  $\text{MoO}_2$ ). Features of their crystal structure, morphology, and electrical properties are discussed.

A comparison of the preparation methods and practical applications is provided. The influence of the size factor on the band gap and catalytic activity of the materials is demonstrated.

**Key words:** molybdenum, molybdenum oxide, nanostructure, synthesis, morphology, X-ray phase analysis, photocatalysis, crystal structure.

### Введение

Современное развитие нанотехнологий обуславливает необходимость исследования переходных металлов и их соединений в наноразмерном состоянии. Молибден и его оксиды обладают высокой термической устойчивостью, химической стабильностью и выраженными полупроводниковыми свойствами.

Уменьшение размеров частиц до нанометрового диапазона приводит к изменению электронной структуры и росту удельной поверхности, что существенно влияет на функциональные характеристики материала.

#### 1. Физико-химические свойства молибдена и его оксидов

Молибден относится к VI группе периодической системы и характеризуется высокой механической прочностью и коррозионной стойкостью. В наноразмерном состоянии он демонстрирует повышенную реакционную способность.

MoO<sub>3</sub> является широкозонным полупроводником ( $E_g \approx 3,0\text{--}3,2$  эВ) со слоистой орторомбической кристаллической структурой. Он проявляет выраженные электрохромные и фотокаталитические свойства.

MoO<sub>2</sub> обладает металлическим типом проводимости и используется в электрохимических системах. Его структура обеспечивает высокую стабильность при циклических нагрузках.

Ниже в табл.1, приведены основные физико-химические характеристики оксидов молибдена.

Таблица.1

#### Основные физико-химические характеристики оксидов молибдена

| Параметр                    | MoO <sub>3</sub>     | MoO <sub>2</sub> |
|-----------------------------|----------------------|------------------|
| Кристаллическая система     | Орторомбическая      | Моноклинная      |
| Ширина запрещенной зоны, эВ | 3,0–3,2              | 0,8–1,0          |
| Тип проводимости            | Полупроводник        | Металлоподобный  |
| Основные области применения | Сенсоры, фотокатализ | Электрохимия     |

#### 2. Материалы и методы исследования

К основным методам получения наноструктур относятся:

- Гидротермальный метод — формирование наностержней, наноллистов и наночастиц при контролируемых температуре и давлении.
- Сол-гель технология — получение тонких плёнок и пористых структур.
- Химическое осаждение из газовой фазы (CVD) — синтез высококачественных наноплёнок.
- Электрохимическое осаждение — формирование нанопористых оксидных покрытий.
- Термическое окисление металлического молибдена — получение оксидных слоёв различной толщины.

Выбор метода определяет морфологию, размер частиц и дефектность структуры.

Фазовый состав определялся методом рентгеновской дифракции (XRD). Морфология поверхности исследовалась с использованием сканирующей электронной микроскопии (SEM). Оптические свойства анализировались методом UV-Vis спектроскопии.

#### 3. Результаты и их обсуждение

В результате синтеза получены наночастицы размером 40–120 нм. Установлено, что уменьшение среднего размера кристаллитов приводит к увеличению ширины запрещенной зоны  $\text{MoO}_3$  с 3,0 до 3,2 эВ.

Следовательно, в табл.2, приведены сравнительный анализ методов синтеза наноструктур оксидов молибдена.

Таблица.2

### Сравнение методов синтеза наноструктур

| Метод           | Температура, °C | Преимущества        | Недостатки                   |
|-----------------|-----------------|---------------------|------------------------------|
| Гидротермальный | 150–220         | Контроль морфологии | Длительность процесса        |
| Сол-гель        | 20–80           | Однородность пленок | Необходимость термообработки |
| CVD             | 400–700         | Высокая чистота     | Сложность оборудования       |

В таблице 3 представлена оптические свойства молибдена и оксидов молибдена. При этом ширина запрещённой зоны определялась методом Така и наблюдается увеличение  $E_g$  при уменьшении размера частиц вследствие квантово-размерного эффекта.

Таблица.3

### Зависимость ширины запрещённой зоны от размера частиц

| Размер, нм | $E_g$ (эВ) |
|------------|------------|
| >1000      | 3,0        |
| 80         | 3,1        |
| 20–40      | 3,2        |

### Заключение

Показано, что наноструктурирование молибдена и его оксидов существенно изменяет их физико-химические свойства. Выбор метода синтеза определяет морфологию и функциональные характеристики материала.

Полученные результаты подтверждают перспективность использования оксидов молибдена в энергетике, сенсорике и каталитических системах.

Дальнейшие исследования направлены на создание композитных систем, повышение стабильности и управление электронными характеристиками материалов.

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## **ФОРМИРОВАНИЕ НАЦИОНАЛЬНОГО РЫНКА УГЛЕРОДНЫХ ЕДИНИЦ В УЗБЕКИСТАНЕ: ИНСТИТУЦИОНАЛЬНАЯ АРХИТЕКТУРА, МЕХАНИЗМЫ ЦЕНООБРАЗОВАНИЯ И ИНТЕГРАЦИЯ В МЕЖДУНАРОДНЫЕ УГЛЕРОДНЫЕ РЫНКИ**

***Аннотация.** В статье исследуются институциональные основы и механизмы ценообразования национального рынка углеродных единиц Узбекистана в контексте Статьи 6 Парижского соглашения. Сравнительный анализ пяти ETS, МАСС-моделирование и СВА показали: пилотная ETS в энергетике сократит выбросы на 8–35 млн тонн CO<sub>2</sub> в год и обеспечит бюджетные поступления к 2035 году (BCR = 3,5–5,0). Предложены ценовой коридор 10–28 долл./тCO<sub>2</sub>e, механизм рыночной стабилизации и нормативный акт об участии в международном рынке углеродных единиц.*

***Ключевые слова:** углеродный рынок, ETS, углеродное ценообразование, Статья 6, ITMO, MRV, зелёная экономика, Узбекистан.*

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## **ESTABLISHING A NATIONAL CARBON MARKET IN UZBEKISTAN: INSTITUTIONAL ARCHITECTURE, PRICING MECHANISMS, AND INTEGRATION INTO INTERNATIONAL CARBON MARKETS**

***Abstract.** This article examines the institutional architecture and pricing mechanisms for Uzbekistan's national carbon market under Article 6 of the Paris Agreement. Comparative analysis of five ETS, MACC modeling, and CBA show that a phased ETS in the energy sector can reduce CO<sub>2</sub> by 8–35 million tonnes annually and generate funds in budget revenue by 2035 (BCR = 3.5–5.0). A price corridor of USD 10–28/tCO<sub>2</sub>e, a market stability reserve, and a dedicated regulatory framework for ITMO authorization are proposed.*

***Keywords:** carbon market, ETS, carbon pricing, Article 6, ITMO, MRV, green economy, Uzbekistan.*

## 1. Введение

Климатический кризис XXI века требует системного пересмотра архитектуры глобальной климатической политики. Парижское соглашение 2015 года закрепило амбициозные цели по ограничению роста средней температуры на планете до 1,5–2°C выше доиндустриального уровня, обязав 196 государств-участников разработать и реализовать национально определённые вклады (NDC). В этой парадигме углеродное ценообразование является инструментом интернализации внешних эффектов выбросов парниковых газов (ПГ) и становится системообразующим элементом климатической архитектуры [1, 2].

По данным Всемирного банка, по состоянию на 1 апреля 2025 года в мире функционирует 80 прямых инструментов углеродного ценообразования (37 ETS и 43 углеродных налога), охватывающих около 28% мировых выбросов ПГ и генерирующих свыше 100 млрд долл. США ежегодных бюджетных поступлений [3]. Параллельно продолжается институционализация международных углеродных рынков в соответствии со Статьёй 6 Парижского соглашения. По итогам COP29 (Баку, 2024) закреплены ключевые требования к кооперативным подходам (Ст. 6.2) и механизму кредитования (Ст. 6.4/РАСМ), включая порядок авторизации, учётные правила и роль реестров [4, 5].

Для Узбекистана формирование рынка углеродных единиц приобретает стратегический характер по трём взаимосвязанным причинам.

Во-первых, в соответствии с обновлённым NDC 3.0 (2025) страна взяла обязательство сократить удельные выбросы ПГ на единицу ВВП на 50% к 2035 году относительно 2010 года, это является значительным ужесточением по сравнению с предыдущим целевым показателем в 35% к 2030 году [6].

Во-вторых, Узбекистан обладает одним из наиболее углероёмких экономических профилей в регионе, а именно энергетический сектор формирует около 64% суммарных выбросов ПГ (2022 г.), а энергоёмкость ВВП вдвое превышает среднерегиональный показатель и в 6 раз среднемировой [7].

В-третьих, механизм углеродного трансграничного корректирующего механизма ЕС (СВАМ) создаёт внешнеторговые стимулы для развития достоверного углеродного учёта и ценообразования в секторах цемента, алюминия, удобрений, чёрных металлов, водорода и электроэнергии [8].

В июле 2025 года Узбекистан принял ключевые нормативные акты: Закон Республики Узбекистан «Об ограничении выбросов парниковых газов» (№ЗРУ-1073 от 07.07.2025) и Указ Президента «О мерах по участию в международном рынке углеродных единиц» (УП-110 от 07.07.2025), формирующие правовой фундамент для участия страны в международных углеродных рынках [9, 10]. Эти документы заложили базу для разработки подзаконных актов, регулирующих конкретные операционные процедуры авторизации углеродных единиц и функционирования национального реестра.



Настоящая статья ставит следующие исследовательские задачи: (1) провести сравнительный анализ институциональных условий и дизайна пяти действующих ETS, (2) оценить институциональную готовность Узбекистана посредством SWOT-анализа, (3) смоделировать три сценария углеродного ценообразования с применением МАСС-анализа и СВА, (4) обосновать оптимальную конструкцию ценового коридора, (5) разработать трёхфазную дорожную карту и предложения по нормативно-правовому регулированию рынка углеродных единиц.

## **2. Теоретические основы углеродного ценообразования**

Теоретический фундамент углеродного ценообразования восходит к концепции пигувианского налога (Pigou, 1920) и теореме Коуза (Coase, 1960). Пигу обосновал необходимость государственного вмешательства для корректировки отрицательных внешних эффектов путём установления налога, равного предельным социальным издержкам. Коуз показал, что при чётко определённых правах собственности и нулевых транзакционных издержках стороны способны самостоятельно достигать эффективного распределения ресурсов [11, 12]. Синтез этих подходов образует теоретическую основу современных ETS, где государство устанавливает совокупный лимит выбросов (cap), а рынок обеспечивает их распределение с минимальными издержками.

Принципиальное экономическое преимущество ETS перед командно-административными инструментами состоит в достижении статической и динамической эффективности. При единой рыночной цене все участники сокращают выбросы до уровня, при котором предельные издержки сокращения (MAC) равны цене квоты. Предприятия с MAC ниже рыночной цены осуществляют дополнительные сокращения и продают квоты, предприятия с MAC выше рыночной цены покупают квоты. В результате заданный объём сокращений достигается при минимальных совокупных издержках [13].

**Формула 1. Условие эффективного распределения квот в ETS (Принцип Коуза–Монтгомери):**

$$MAC_i(q_i) = p^* \text{ для всех } i = 1, \dots, n$$

где  $MAC_i$  — предельные издержки сокращения выбросов  $i$ -го предприятия;  $q_i$  — объём сокращений;  $p^*$  — равновесная рыночная цена квоты. Совокупные издержки:  $C = \sum_i c_i(q_i) \rightarrow \min$  при ограничении  $\sum_i q_i \geq Q$  (целевое сокращение).

**Формула 2. Оптимальная ставка углеродного налога (Pigou Tax):**

$$\tau^* = MEC(E^*) = SCC$$

где  $\tau^*$  — оптимальная ставка углеродного налога; MEC — предельные внешние издержки при оптимальном уровне выбросов  $E^*$ ; SCC — социальные издержки углерода (Social Cost of Carbon). По оценкам МГЭИК (2022):  $SCC = 51\text{--}205$  долл./тCO<sub>2</sub> при ставке дисконтирования 2,5–5%.

Современная литература выделяет три ключевых параметра дизайна ETS, определяющих его эффективность: (1) траектория снижения лимита

(cap pathway), (2) метод распределения квот (аукцион vs. бесплатное распределение), (3) механизмы управления ценовым риском (ценовой коридор, рыночный стабилизационный резерв – MSR). Системы, содержащие стабилизирующие механизмы, демонстрируют в среднем на 30–40% меньшую ценовую волатильность и более устойчивый инвестиционный сигнал [14, 15].

### 3. Глобальные рынки углерода

#### 3.1. Динамика и тенденции

Рисунок 1 демонстрирует стремительное расширение охвата углеродного ценообразования. С 13% мировых выбросов ПГ в 2015 году до 28% в 2025 году, а бюджетные поступления выросли с 22 до свыше 100 млрд долл. США в год.

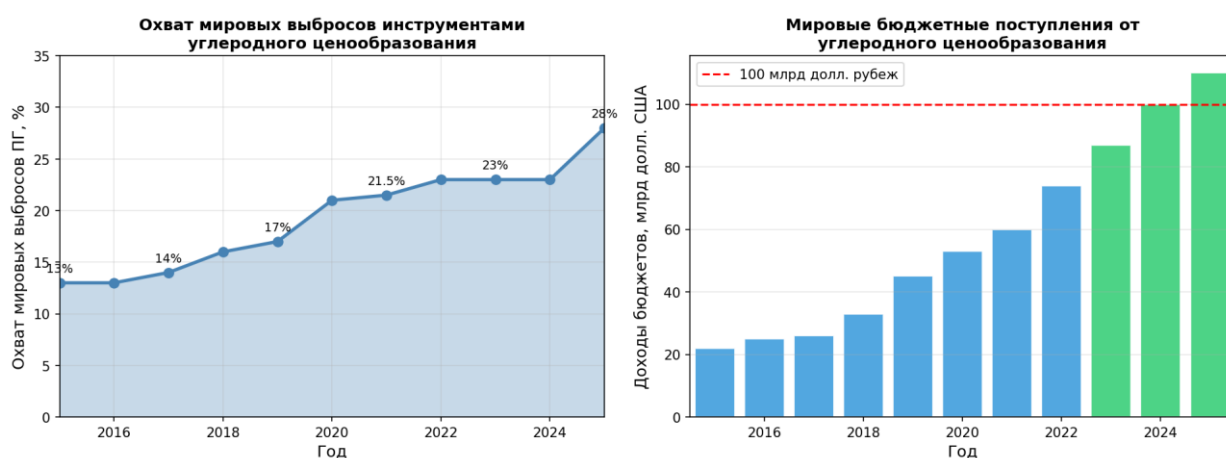


Рисунок 1. Динамика охвата мировых выбросов инструментами углеродного ценообразования и объём бюджетных поступлений (2015–2025 гг.). Источник: Всемирный банк, State and Trends of Carbon Pricing 2025; ICAP, 2024; расчёты автора.

#### 3.2. Сравнительный анализ ведущих систем торговли выбросами

В таблице 1 представлен сравнительный анализ пяти систем торговли выбросами, релевантных для разработки национальной ETS Узбекистана.

| Параметр            | EU ETS (Фаза 4)             | China ETS                   | K-ETS (Корея)               | Kazakhstan ETS     | RGGI (США)                   |
|---------------------|-----------------------------|-----------------------------|-----------------------------|--------------------|------------------------------|
| Год запуска         | 2005 (Ф.4: 2021)            | 2021                        | 2015                        | 2013 (приост.)     | 2009                         |
| Охват выбросов      | ~40% нац. выбросов          | ~40% нац. выбросов          | 74% нац. выбросов           | ~50% нац. выбросов | ~20% выбросов 11 штатов      |
| Цена (2024 г.)      | 60–70 евро/тCO <sub>2</sub> | 8–10 долл./тCO <sub>2</sub> | 5–15 долл./тCO <sub>2</sub> | —                  | 12–18 долл./тCO <sub>2</sub> |
| Метод распределения | Аукцион (57%+)              | Бесплатно (100%)            | Бесплатно (97%)             | Бесплатно (100%)   | Аукцион (100%)               |

| Параметр             | EU ETS (Фаза 4)                  | China ETS                      | К-ETS (Корея)               | Kazakhstan ETS              | RGGI (США)                  |
|----------------------|----------------------------------|--------------------------------|-----------------------------|-----------------------------|-----------------------------|
| Стабилизатор цены    | MSR (с 2019)                     | Отсутствует                    | MSR + ценов. коридор        | Отсутствовал                | Ценовой пол/потолок         |
| Секторальный охват   | Энергетика, пром-сть, авиация    | Электроэнергетика              | Все сектора                 | Энергетика, пром-сть        | Электроэнергетика           |
| Урок для Узбекистана | Важность MSR; аукционный переход | Постепенный старт с энергетики | Высокий охват с free alloc. | Риск приостановки и без MRV | Эффективность 100% аукциона |

Примечание: составлено автором на основе данных ICAP (2024), Всемирного банка (2025), State and Trends of Carbon Pricing 2025, ICAP ETS Factsheets.

#### 4. Эмиссионный профиль узбекистана и потенциал декарбонизации

Узбекистан занимает 47-е место в мировом рейтинге по абсолютному объёму выбросов ПГ, генерируя около 209 млн тонн CO<sub>2</sub>e в год (2022 г.). Структура выбросов принципиально отличается от среднемировой: доминирующую роль занимает энергетический сектор (64%), что создаёт концентрированный объект для регулирования в рамках ETS.

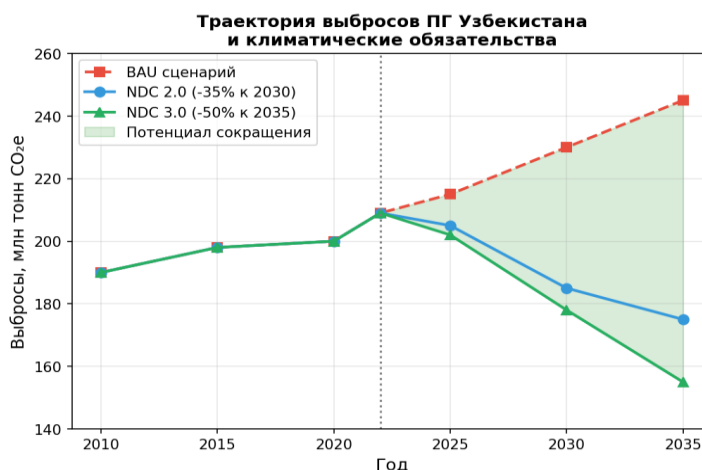


Рисунок 2. Структура выбросов ПГ Узбекистана (2022 г.) и траектории декарбонизации по сценариям NDC  
Источник: Третья NDC Узбекистана (2025); МЭА; Министерство экономики и финансов РУз; расчёты автора.

#### 4.1. СТРУКТУРА ВЫБРОСОВ ПО СЕКТОРАМ

| Сектор                                       | Выбросы<br>2022 г., млн<br>т CO <sub>2</sub> e | Доля,<br>%  | Тренд (2010–<br>2022) | Потенциал<br>снижения к 2035 г.<br>(млн т) |
|----------------------------------------------|------------------------------------------------|-------------|-----------------------|--------------------------------------------|
| Энергетика<br>(электро- и<br>теплогенерация) | 133,8                                          | 64%         | +12%                  | 25–45                                      |
| Сельское хозяйство                           | 29,3                                           | 14%         | +8%                   | 5–8                                        |
| Промышленные<br>процессы                     | 25,1                                           | 12%         | +18%                  | 8–15                                       |
| Транспорт                                    | 12,5                                           | 6%          | +25%                  | 3–6                                        |
| Отходы                                       | 8,4                                            | 4%          | +15%                  | 2–4                                        |
| <b>ИТОГО</b>                                 | <b>209,1</b>                                   | <b>100%</b> | <b>+13%</b>           | <b>43–78</b>                               |

Примечание: составлено автором на основе Третьей NDC Узбекистана (2025), данных МЭА и национальных кадастров ПГ.

#### 4.2. Ключевые показатели климатической уязвимости

Энергоёмкость ВВП Узбекистана (ППС) составляет около 0,22 кг н.э./долл. США – в 2,2 раза выше среднего показателя по Центральной Азии и в 6,1 раза выше среднемирового. Углероёмкость экономики (тCO<sub>2</sub>/млн долл. ВВП ППС) также значительно превышает региональные и мировые показатели. Это создаёт как значительный потенциал для углеродной нейтральности, так и серьёзный вызов для конкурентоспособности промышленности при введении углеродного ценообразования.

| Показатель                                                                     | Узбекистан | Ср. по ЦА | Ср. по миру | Разрыв (Уз /<br>мир) |
|--------------------------------------------------------------------------------|------------|-----------|-------------|----------------------|
| Энергоёмкость ВВП<br>(кг н.э./долл. ВВП<br>ППС)                                | 0,22       | 0,10      | 0,036       | ×6,1                 |
| CO <sub>2</sub> -ёмкость<br>экономики (тCO <sub>2</sub> /млн<br>долл. ВВП ППС) | 520        | 240       | 185         | ×2,8                 |
| CO <sub>2</sub> на душу населения<br>(тCO <sub>2</sub> /чел.)                  | 5,9        | 5,1       | 4,7         | ×1,25                |
| Доля ВИЭ в генерации,<br>%                                                     | ~10%       | ~22%      | ~34%        | –24 п.п.             |

| Показатель                         | Узбекистан     | Ср. по ЦА    | Ср. по миру | Разрыв (Уз / мир) |
|------------------------------------|----------------|--------------|-------------|-------------------|
| Интенсивность NDC к 2035 г. (цель) | –50% уд. выбр. | Нет ед. цели | —           | —                 |

Источник: МЭА World Energy Balances 2024; Третья NDC Узбекистана 2025; Всемирный банк WDI; расчёты автора.

## 5. Институциональная готовность узбекистана: swot-анализ

Оценка институциональной готовности Узбекистана к запуску национальной ETS проведена на основе четырёхкомпонентного SWOT-анализа, охватывающего правовую базу, кадровый потенциал, рыночную инфраструктуру и систему MRV.

| ✓ СИЛЬНЫЕ СТОРОНЫ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ✗ СЛАБЫЕ СТОРОНЫ                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Членство в Парижском соглашении (с 2018)</li> <li>• NDC 3.0: амбициозная цель (-50% к 2035 г.)</li> <li>• Президентский указ УП-110 (07.07.2025) и Закон ЗРУ-1073</li> <li>• Пионерный проект iCRAFT: 1,333 млн тCO<sub>2</sub> VER = 19,9 млн долл. США, 0,833 млн тCO<sub>2</sub> ITMO = 24,9 млн долл. США</li> <li>• Назначение DNA (МЭФ): координация по Ст. 6</li> <li>• Запущена система MRV в энергетике</li> <li>• Наличие «Зелёной» стратегии до 2030 г.</li> </ul> | <ul style="list-style-type: none"> <li>• Незрелость специального углеродного законодательства</li> <li>• Отсутствие полноценного национального кадастра ПГ</li> <li>• Дефицит квалифицированных MRV-специалистов</li> <li>• Слабая ликвидность финансовых рынков</li> <li>• Высокая субсидируемость энергетики</li> <li>• Ограниченная рыночная инфраструктура для торговли</li> <li>• Риск избыточного распределения квот без надёжного кадастра</li> </ul> |
| ♦ ВОЗМОЖНОСТИ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ⚠ УГРОЗЫ                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <ul style="list-style-type: none"> <li>• Значительный потенциал снижения выбросов в энергетике</li> <li>• Технические возможности Ст. 6.2 для привлечения инвестиций</li> <li>• Давление СВМ ЕС как стимул к созданию ETS</li> <li>• Международная финансовая поддержка (ГЭФ, КФ, АБР, ВБ, ФАР и др.)</li> <li>• Опыт соседнего Казахстана как учебный пример</li> <li>• Растущий спрос на высококачественные углеродные кредиты</li> </ul>                                                                            | <ul style="list-style-type: none"> <li>• Риск ценового коллапса при избыточном распределении квот</li> <li>• Политическое сопротивление энергоёмких отраслей</li> <li>• Риск «углеродной утечки» в регионе</li> <li>• Недостаточная эффективность энергетических субсидий</li> <li>• Санкционные риски и ограниченный доступ к технологиям</li> <li>• Риск двойного учёта без совместимого реестра ITMO</li> </ul>                                           |

Таблица 2. SWOT-анализ институциональной готовности Узбекистана к формированию рынка углеродных единиц  
Источник: составлено автором на основе анализа нормативных документов, международных отчётов и экспертных оценок.

## 6. Кривая предельных издержек сокращения выбросов (масс)

Кривая предельных издержек сокращения выбросов (Marginal Abatement Cost Curve – МАСС) является ключевым аналитическим инструментом для проектирования системы ценообразования углеродных единиц. Она позволяет определить наиболее экономически эффективные технологии и меры декарбонизации, идентифицировать оптимальный уровень углеродной цены и оценить совокупный потенциал сокращения выбросов при различных ценовых уровнях.

**Формула 3. Кривая предельных издержек сокращения (МАСС):**

$$\text{MAC}(q) = dC(q)/dq; \text{ Оптимальный объём сокращений: } q^* \text{ таков, что } \text{MAC}(q^*) = p_{\text{carbon}}$$

где  $C(q)$  — функция совокупных издержек сокращения выбросов;  $q$  — объём сокращений (млн тCO<sub>2</sub>е);  
 $p_{\text{carbon}}$  — рыночная цена углерода (долл. США/тCO<sub>2</sub>е). Совокупные издержки оптимального сокращения:  
 $TC = \int_0^{q^*} \text{MAC}(q) dq \rightarrow \min$

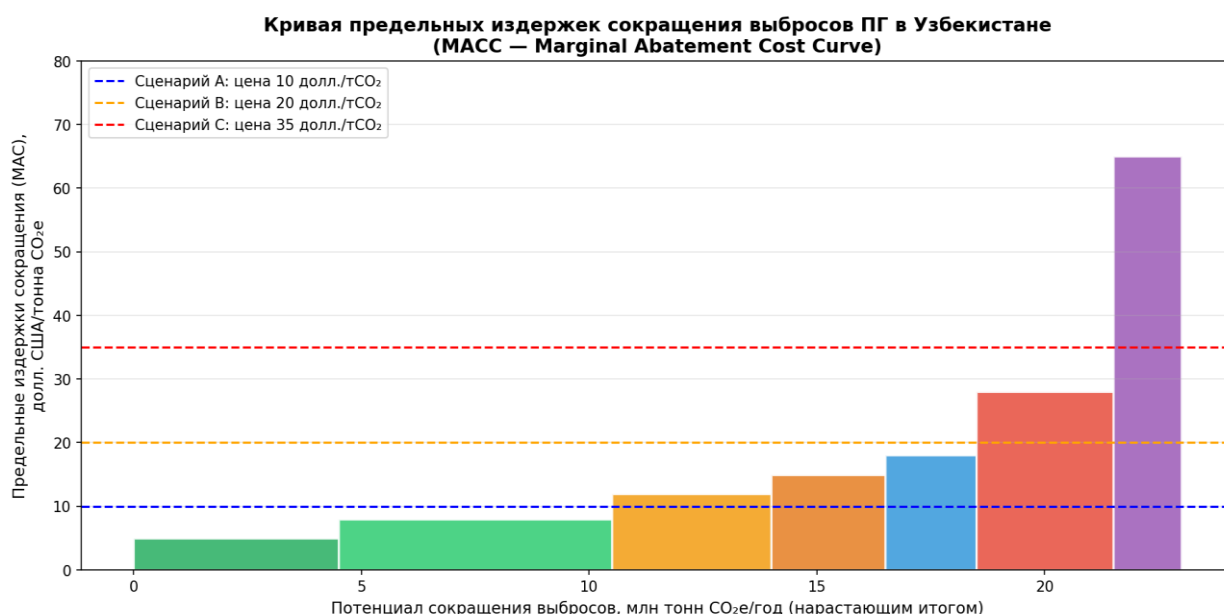


Рисунок 3. Кривая предельных издержек сокращения выбросов ПГ в Узбекистане (МАСС) Источник: расчёты автора на основе данных МЭА Energy Technology Perspectives, IRENA, национальных данных МЭФ РУз.

Анализ МАСС показывает, что при ценовом уровне 10 долл./тCO<sub>2</sub>е (Сценарий А) Узбекистан может экономически эффективно сократить выбросы на 10–12 млн тонн в год за счёт мероприятий по повышению энергоэффективности и частичного замещения угля газом. При повышении цены до 20 долл./тCO<sub>2</sub>е (Сценарий В) мобилизуется потенциал возобновляемой энергетики и промышленных процессов – до 18–22 млн тонн. При 35 долл./тCO<sub>2</sub>е (Сценарий С) становятся экономически целесообразными более капиталоемкие технологии – совокупное сокращение достигает 25–35 млн тонн в год.

## 7. Сценарный анализ развития национальной ets



На основе калиброванной модели МАСС разработаны три сценария развития национальной системы торговли выбросами, дифференцированные по охвату секторов, уровню углеродной цены и темпам снижения лимита выбросов (сар). Горизонт анализа 2026–2035 гг. с пилотным запуском ETS в 2028 году.

| Параметр                                                   | Сценарий А<br>(Низкий)         | Сценарий В<br>(Средний)                                 | Сценарий С<br>(Высокий)           |
|------------------------------------------------------------|--------------------------------|---------------------------------------------------------|-----------------------------------|
| <b>Секторальный охват</b>                                  | Энергетика (~150–200 объектов) | Энергетика + крупная промышленность (~350–500 объектов) | Вся экономика (~600–800 объектов) |
| <b>Стартовая цена (2028 г.)</b>                            | 5–10 долл./тCO <sub>2</sub> e  | 10–20 долл./тCO <sub>2</sub> e                          | 20–40 долл./тCO <sub>2</sub> e    |
| <b>Ценовой коридор</b>                                     | 5–15 долл./тCO <sub>2</sub> e  | 10–25 долл./тCO <sub>2</sub> e                          | 20–45 долл./тCO <sub>2</sub> e    |
| <b>Ежегодное снижение лимита (сар)</b>                     | 2–3% в год                     | 4–5% в год                                              | 6–8% в год                        |
| <b>Метод распределения (старт)</b>                         | Бесплатно (100%)               | Бесплатно (90%)/аукцион (10%)                           | Бесплатно (75%)/аукцион (25%)     |
| <b>Сокращение выбросов к 2030 г., млн тCO<sub>2</sub>e</b> | 8–12                           | 15–22                                                   | 25–35                             |
| <b>Сокращение выбросов к 2035 г., млн тCO<sub>2</sub>e</b> | 10–14                          | 18–26                                                   | 30–40                             |
| <b>Бюджетные доходы 2030 г., млн долл.</b>                 | 150–300                        | 500–900                                                 | 1 200–2 500                       |
| <b>Бюджетные доходы 2035 г., млн долл.</b>                 | 250–400                        | 700–1 200                                               | 1 800–3 200                       |
| <b>Соотношение BCR (2028–2040)</b>                         | 2,5–3,5                        | 3,5–5,0                                                 | 4,0–6,5                           |
| <b>Риск конкурентоспособности пром-сти</b>                 | Низкий                         | Умеренный                                               | Высокий (требует мер)             |
| <b>Совместимость с СВAMEC</b>                              | Частичная                      | Высокая                                                 | Полная                            |
| <b>Рекомендация для Узбекистана</b>                        | Стартовый пилот 2028–2030 гг.  | Целевой сценарий с 2031 г.                              | Долгосрочная цель 2033+ гг.       |

Таблица 3. Параметры сценариев развития национальной ETS Узбекистана Источник: расчёты автора на основе МАСС-модели, данных ВБ, ICAP, МЭА и национальной статистики.

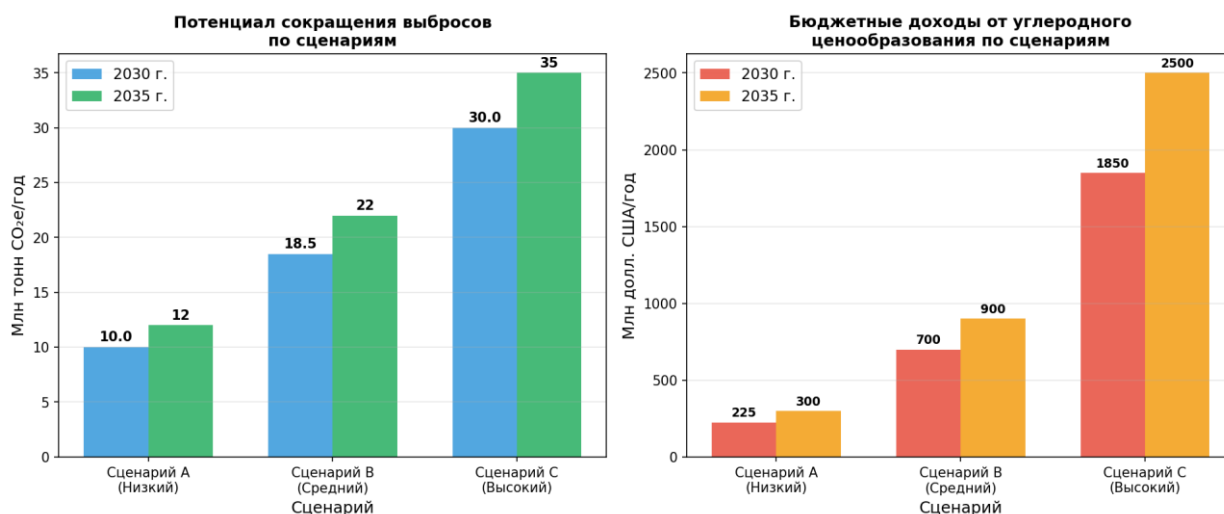


Рисунок 4. Сравнение потенциала сокращения выбросов и бюджетных доходов по сценариям развития национальной ETS (2030–2035 гг.) Источник: расчёты автора.

## 8. ПРОЕКТИРОВАНИЕ МЕХАНИЗМА ЦЕНООБРАЗОВАНИЯ: ЦЕНОВОЙ КОРИДОР И МСР

Ключевой риск для переходных экономик при запуске ETS – это ценовая нестабильность, обусловленная избыточным распределением квот, недостаточной ликвидностью рынка и волатильностью спроса на квоты под влиянием экзогенных шоков. Международный опыт однозначно свидетельствует, что системы с инструментами управления ценовым риском (ценовой коридор, MSR) обеспечивают более устойчивый инвестиционный сигнал и более эффективно стимулируют инновации.

**Формула 4. Гибридная модель ценообразования (ETS с ценовым коридором):**

$$p_{ets} = \max(p_{floor}, \min(p_{market}, p_{ceiling})); \quad p_{market} = f(D_{allowances} / S_{allowances})$$

где  $p_{floor}$  — ценовой пол (минимальная цена квоты);  $p_{ceiling}$  — ценовой потолок (максимальная цена);  $p_{market}$  — рыночная цена равновесия;  $D/S$  — соотношение спроса и предложения квот. Предлагаемый стартовый коридор (2028 г.):  $p_{floor} = 10$  долл.,  $p_{ceiling} = 25$  долл./тCO<sub>2</sub>е.

**Формула 5. Механизм рыночного стабилизационного резерва (MSR, аналог EU ETS):**

$$\Delta S_t = \alpha \cdot (TNAC_t - threshold\_upper), \text{ если } TNAC_t > threshold\_upper$$

$$\Delta S_t = -\beta \cdot MSR\_balance, \text{ если } TNAC_t < threshold\_lower$$

где  $TNAC_t$  — совокупный остаток квот на рынке в период  $t$ ;  $\alpha, \beta$  — параметры изъятия/высвобождения;  $threshold\_upper = 900$  млн ед. (EU) — адаптируется к масштабу рынка Узбекистана. Для Узбекистана предлагается: пороговое значение 70–80% от объёма годовых квот.

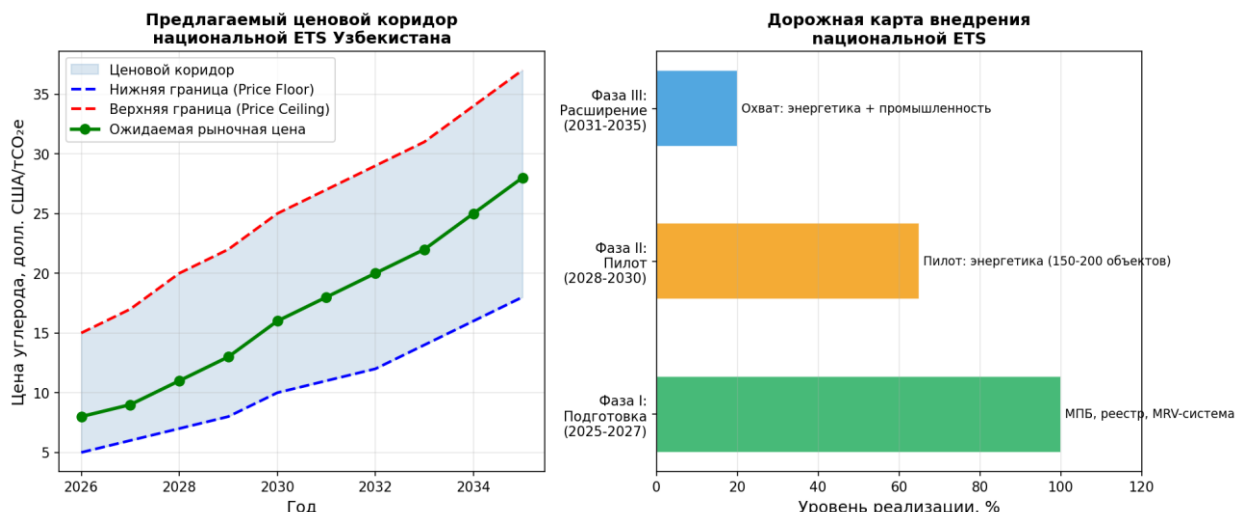


Рисунок 5. Предлагаемый ценовой коридор национальной ETS Узбекистана (2026–2035) и дорожная карта трёхфазного внедрения Источник: расчёты автора на основе международного сравнительного анализа.

## 8.1. Сравнительный анализ инструментов стабилизации цены

| Инструмент                                  | Механизм действия                                       | Преимущества                                                | Ограничения                                   | Применимость для РУз                 |
|---------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------|--------------------------------------|
| <b>Ценовой пол (Price Floor)</b>            | Минимальная цена продажи квот на аукционе               | Предсказуемость для инвесторов; защита от ценового коллапса | Снижает гибкость; риск бюджетных обязательств | Высокая — рекомендован с 2028 г.     |
| <b>Ценовой потолок (Price Ceiling)</b>      | Резервный выпуск квот при превышении потолка            | Защита от чрезмерных издержек для промышленности            | Может подрывать экологическую целостность     | Высокая — рекомендован с 2028 г.     |
| <b>MSR (рыночный стаб. резерв)</b>          | Автоматическое изъятие/высвобождение квот               | Долгосрочная стабилизация; рост цен в EU ETS с 2019 г.      | Требует зрелой инфраструктуры и данных        | Средняя — ввести с Фазы II (2031 г.) |
| <b>Частичный аукцион + free alloc.</b>      | Смешанное распределение с постепенным ростом аукц. доли | Снижает нагрузку на пром-сть; политич. приемлемость         | Риск windfall profits                         | Высокая — стартовая модель           |
| <b>Ценовая индексация (по ИПЦ/\$ курсу)</b> | Ежегодная корректировка коридора на инфляцию            | Поддержание реальной стимулирующей нагрузки                 | Административная сложность                    | Средняя — желательна с 2029 г.       |

Таблица 4. Сравнительный анализ инструментов стабилизации цены в ETS Источник: ICAP ETS Factsheets 2024; Всемирный банк Carbon Pricing Dashboard; расчёты автора.

## 9. НОРМАТИВНО-ПРАВОВАЯ БАЗА И ПРЕДЛАГАЕМЫЕ МЕРЫ ПО РЕГУЛИРОВАНИЮ РЫНКА УГЛЕРОДНЫХ ЕДИНИЦ

Принятие Закона РУз «Об ограничении выбросов парниковых газов» (№ЗРУ-1073 от 07.07.2025) и Указа Президента (УП-110 от 07.07.2025) сформировали правовой фундамент для участия Узбекистана в международном рынке углеродных единиц. Вместе с тем операционная архитектура данного участия требует детализации в специализированном подзаконном акте. В этой связи представляется целесообразным принятие Положения Кабинета Министров Республики Узбекистан о порядке участия в международном рынке углеродных единиц, которое охватывало бы следующие блоки:

| Блок регулирования                                    | Предлагаемые нормы                                                                                                                                                   | Обоснование                                                                                     | Международный аналог                                    |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| <b>1. Уполномоченный орган (DNA)</b>                  | Закрепление МЭФ РУз как единого DNA;<br>Межведомственный совет по зелёной экономике — стратегическая координация; Центр зелёных проектов — операционная деятельность | Единая точка ответственности снижает транзакционные издержки и повышает предсказуемость         | Ст. 6.4 SBM, UNFCCC; опыт Германии (DEHSt), Кореи (KEA) |
| <b>2. Авторизация деятельности</b>                    | Реестровый учёт всей деятельности по углеродным кредитам; обязательное одобрение для международных передач ITMO; письменное подтверждение соответствия NDC           | Предотвращение двойного учёта; соответствие требованиям Ст. 6.2 и 6.4                           | Decision COP29/Ст. 6; Art. 6.2 guidance (CMA.5)         |
| <b>3. Национальный реестр углеродных единиц (НРУ)</b> | Единый онлайн-реестр для всех видов деятельности; интеграция с реестром UNFCCC по Ст. 6.4; автоматическое отражение соответствующих корректировок                    | Прозрачность; предотвращение двойного использования; совместимость с международными стандартами | EU Union Registry; South Korea KOC Registry             |

| Блок регулирования                           | Предлагаемые нормы                                                                                                                                  | Обоснование                                                                                                                         | Международный аналог                                           |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| <b>4. Система MRV</b>                        | Обязательный мониторинг крупных объектов (>25 000 тCO <sub>2</sub> е/год); верификация аккредитованными третьими лицами; ежегодная отчётность в НРУ | Целостность данных — условие доверия рынка; опыт К-ETS показывает: без надёжного MRV невозможно предотвратить манипуляции           | ISO 14064; IPCC Guidelines; EU MRV Reg.                        |
| <b>5. Распределение поступлений</b>          | Аукционные доходы: 50% — фонд зелёного перехода, 30% — компенсация уязвимым отраслям, 20% — административные издержки; ежегодный публичный отчёт    | Обеспечение политической приемлемости и социальной справедливости перехода                                                          | RGGI Trust Fund; EU Innovation Fund; K-ETS Climate Change Fund |
| <b>6. Соответствующие корректировки (АС)</b> | Обязательное введение АС при международной передаче ITMO по Ст. 6.2; отражение в национальном кадастре ПГ и реестре NDC                             | Без АС страна «продаёт» сокращения, которые засчитываются в её NDC — прямое нарушение принципа экологической целостности            | CMA.5 Decision, Art. 6.2; Glasgow/Dubai/Baku guidance          |
| <b>7. Дорожная карта подзаконной базы</b>    | Принятие технического регламента MRV; методологий базовых линий; реестровой платформы НРУ (2027); правил аукциона (2028)                            | Последовательность — ключ к успеху: опыт К-ETS (2015) и China ETS (2021) подтверждает, что нормативный пробел ведёт к волатильности | K-ETS phased implementation; China ETS rollout                 |

Таблица 5. Предлагаемые нормы регулирования участия Республики Узбекистан в рынке углеродных единиц Источник: разработано автором на основе анализа международного опыта и действующей нормативной базы РУз.

### 9.1. Архитектура институциональной системы управления рынком углеродных единиц

Предлагается следующая институциональная архитектура, где Межведомственный Совет по зелёной экономике осуществляет стратегическую координацию и принимает ключевые решения по углеродной политике. Министерство экономики и финансов в статусе уполномоченного органа (DNA) координирует реализацию деятельности по Ст. 6.4, авторизует ITMO по Ст. 6.2 и обеспечивает соответствующие корректировки. Центр зелёных проектов при МЭФ – операционное звено, взаимодействует с иностранными правительствами и международными организациями, администрирует платформу НРУ. Консультативная рабочая группа по рынку углеродных единиц оценивает воздействие передач ITMO на NDC и предоставляет независимые технические рекомендации.

Данная архитектура соответствует принципам единого окна, прозрачности и институциональной ответственности, рекомендованным решениями COP29 (Баку, 2024) и методологическими руководствами по Ст. 6.2.

#### 10. Анализ затрат и выгод (cba) национальной ets

Анализ затрат и выгод проведён на горизонте 2026–2040 гг. с применением ставки дисконтирования 5% (с учётом страновых рисков Узбекистана). Выделяются три категории выгод: прямые экономические (бюджетные доходы, снижение затрат на энергию, инновации), экологические (предотвращённые климатические издержки, улучшение качества воздуха, снижение заболеваемости) и стратегические (совместимость с СВМ, привлечение зелёных инвестиций, доступ к углеродным кредитным рынкам).

**Формула 6. Чистая приведённая стоимость ETS (NPV) и соотношение выгоды/издержки (BCR):**

$$NPV = \sum_t [(B_t - C_t) / (1 + r)^t]; \quad BCR = \sum_t [B_t / (1 + r)^t] / \sum_t [C_t / (1 + r)^t]$$

где  $B_t$  — совокупные выгоды в году  $t$  (млн долл.);  $C_t$  — совокупные издержки;  $r$  — ставка дисконтирования (5%). Расчёты показывают:  $BCR = 3,5\text{--}5,0$  при Сценарии В;  $NPV = 800\text{--}2\,400$  млн долл. при Сценарии В.



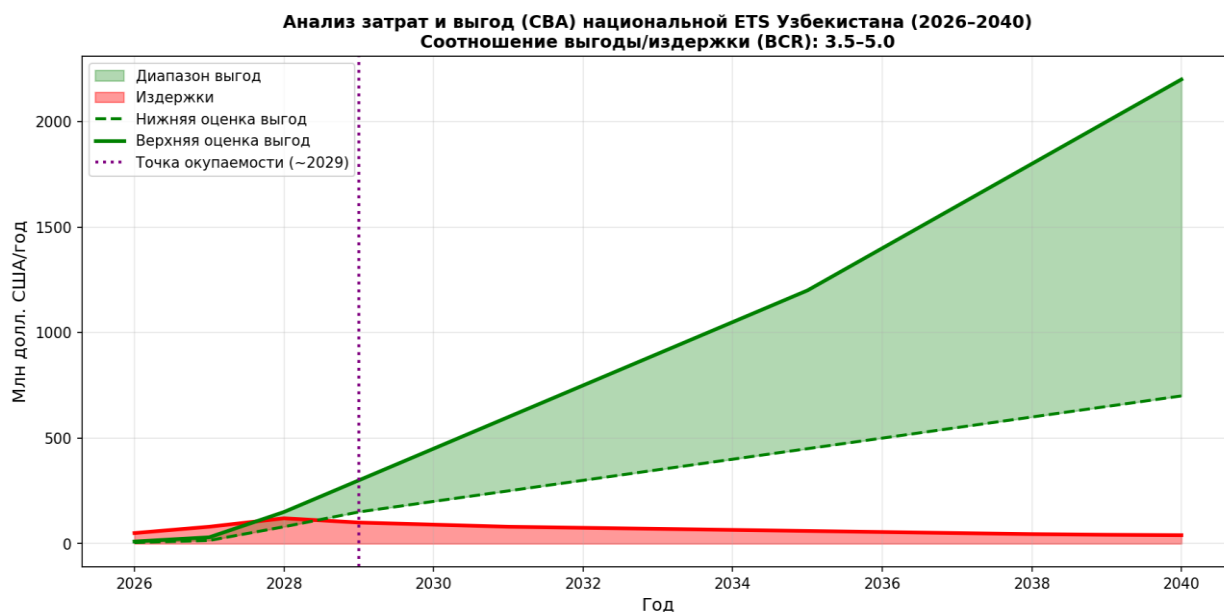


Рисунок 6. Анализ затрат и выгод (CBA) национальной ETS Узбекистана (2026–2040 гг.) Примечание: BCR = 3,5–5,0 (Сценарий В); точка окупаемости — около 2029 г. Источник: расчёты автора.

| Категория                          | Тип затрат/выгод                          | Оценка 2028–2035 гг. (Сценарий В, млн долл.) | Примечание                                |
|------------------------------------|-------------------------------------------|----------------------------------------------|-------------------------------------------|
| <b>ИЗДЕРЖКИ</b>                    |                                           |                                              |                                           |
| Нормативные и административные     | Создание реестра, MRV-системы, регулятора | 80–150                                       | Единовременные + ежегодные опер. расходы  |
| Капитальные вложения предприятий   | Модернизация для соответствия лимитам     | 400–800                                      | Частично компенсируется через free alloc. |
| Потенциальный рост цен на энергию  | Перенос углеродных издержек               | 200–450                                      | Снижается при реинвестировании доходов    |
| Переходные потери занятости        | Реструктуризация углеродоёмких секторов   | 50–100                                       | Компенсируется программами поддержки      |
| <b>ИТОГО ИЗДЕРЖКИ (дисконт.)</b>   |                                           | 730–1 500                                    |                                           |
| <b>ВЫГОДЫ</b>                      |                                           |                                              |                                           |
| Аукционные доходы бюджета          | Прямые поступления от ETS                 | 2 800–5 600                                  | Нарастающим итогом 2028–2035 гг.          |
| Снижение СС-загрязнения (здоровье) | Снижение смертности и заболеваемости      | 300–600                                      | Монетизировано по методологии ВОЗ         |

| Категория                       | Тип затрат/выгод                           | Оценка 2028–2035 гг. (Сценарий В, млн долл.) | Примечание                                 |
|---------------------------------|--------------------------------------------|----------------------------------------------|--------------------------------------------|
| Предотвращённые климат. ущербы  | Внешние выгоды от снижения CO <sub>2</sub> | 500–1 200                                    | SCC = 51 долл./тCO <sub>2</sub> (EPA 2023) |
| Привлечённые зелёные инвестиции | FDI и международные климат. финансы        | 600–1 500                                    | По опыту К-ETS и EU ETS                    |
| Технологическая модернизация    | Рост производительности ТЭК                | 400–900                                      | Косвенный эффект                           |
| <b>ИТОГО ВЫГОДЫ (дисконт.)</b>  |                                            | 4 600–9 800                                  |                                            |
| <b>BCR (Выгоды / Издержки)</b>  |                                            | 3,5–5,0                                      | Сценарий В (целевой)                       |

Таблица 6. Анализ затрат и выгод (CBA) национальной ETS Узбекистана (2028–2035 гг., Сценарий В)  
Источник: расчёты автора на основе данных ВБ, МЭА, EPA SCC, опыта К-ETS и EU ETS.

## 11. Трёхфазная дорожная карта формирования национального рынка углеродных единиц

На основе международного сравнительного анализа и специфики институционального контекста Узбекистана разработана трёхфазная дорожная карта, предусматривающая последовательное наращивание охвата ETS, ужесточение лимита выбросов и расширение использования аукционного механизма.

| Фаза / Период                                               | Ключевые задачи                                                                                                                                                                                                                                                                                                                                           | Нормативные акты                                                                                                                                                                                                                                 | Целевые показатели                                                                                                                                                                                         |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ФАЗА I:<br/>Институциональная подготовка (2025–2027)</b> | <ul style="list-style-type: none"> <li>Принятие подзаконной нормативной базы (Положение КМ о порядке участия в рынке ITMO)</li> <li>Создание национального реестра углеродных единиц (НРУ)</li> <li>Разработка и введение системы MRV для объектов &gt;25 000 тCO<sub>2</sub>е</li> <li>Принятие технических методологий расчёта базовых линий</li> </ul> | <ul style="list-style-type: none"> <li>Положение КМ об ITMO-рынке (предлаг.)</li> <li>Техн. регламент MRV (2026)</li> <li>Методологии базовых линий (2027)</li> <li>Правила аккредитации верификаторов</li> <li>Соглашения по Ст. 6.2</li> </ul> | <ul style="list-style-type: none"> <li>100% крупных объектов охвачены MRV</li> <li>НРУ введён в действие</li> <li>≥5 двустор. соглашений подписано</li> <li>≥300 аттестованных MRV-специалистов</li> </ul> |

| Фаза / Период                                | Ключевые задачи                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Нормативные акты                                                                                                                                                                                            | Целевые показатели                                                                                                                                                                                               |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              | <ul style="list-style-type: none"> <li>Подготовка 300–500 специалистов по углеродному учёту</li> <li>Проведение пилотной инвентаризации 100–150 крупнейших объектов</li> <li>Инициирование двусторонних соглашений по Ст. 6.2 (ЕС, Япония, Швейцария)</li> </ul>                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                             |                                                                                                                                                                                                                  |
| <b>ФАЗА II: Пилотная ETS (2028–2030)</b>     | <ul style="list-style-type: none"> <li>Запуск пилотной ETS в энергетическом секторе (150–200 объектов)</li> <li>Установление ценового коридора: 10–25 долл./тCO<sub>2</sub>e</li> <li>Бесплатное распределение 90% + аукцион 10%</li> <li>Запуск MСP (рыночного стабилизационного резерва)</li> <li>Сокращение субсидий на ископаемое топливо в пилотных секторах</li> <li>Реинвестирование аукционных доходов: 50% — зелёные проекты</li> <li>Первые международные передачи ITMO по Ст. 6.2</li> <li>Регулярная оценка и корректировка параметров ETS</li> </ul> | <ul style="list-style-type: none"> <li>Постановление КМ о запуске пилотной ETS</li> <li>Правила аукциона квот (2028)</li> <li>Методика соответствующих корректировок</li> <li>Первые ITMO-сделки</li> </ul> | <ul style="list-style-type: none"> <li>8–12 млн тCO<sub>2</sub>e/год сокращений</li> <li>150–300 млн долл./год бюдж. доходов</li> <li>Ценовая волатильность &lt;30%</li> <li>≥3 ITMO-сделки завершены</li> </ul> |
| <b>ФАЗА III: Полноценная ETS (2031–2035)</b> | <ul style="list-style-type: none"> <li>Расширение охвата: +промышленность, транспорт (до 350–500 объектов)</li> <li>Повышение аукционной доли до 25–40%</li> <li>Ужесточение ценового коридора: 20–45 долл./тCO<sub>2</sub>e</li> <li>Интеграция с международными стандартами (ISO 14064, PASM Ст. 6.4)</li> </ul>                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>Поправки к Закону ЗРУ-1073</li> <li>Правила сопряжения ETS</li> <li>СВАМ-совместимые стандарты</li> <li>Обновлённое NDC (2030)</li> </ul>                            | <ul style="list-style-type: none"> <li>18–25 млн тCO<sub>2</sub>e/год сокращений</li> <li>500–900 млн долл./год бюдж. доходов</li> <li>BCR ≥ 3,5</li> <li>Полная совместимость с СВАМ ЕС</li> </ul>              |

| Фаза / Период | Ключевые задачи                                                                                                                                                                                                            | Нормативные акты | Целевые показатели |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------|
|               | <ul style="list-style-type: none"> <li>• Оценка возможности сопряжения с ETS третьих стран</li> <li>• Введение СВАМ-совместимых стандартов учёта</li> <li>• Публикация первого Национального углеродного отчёта</li> </ul> |                  |                    |

Таблица 7. Трёхфазная дорожная карта формирования национального рынка углеродных единиц Узбекистана (2025–2035 гг.) Источник: разработано автором на основе международного сравнительного анализа.

## 12. Заключение и рекомендации

Проведённое исследование позволяет сформулировать следующие ключевые выводы и рекомендации.

### 1. Стратегическая обоснованность.

Узбекистан обладает как экономическими стимулами (NDC 3.0, СВАМ), так и пионерными практическими заделами (iCRAFT, ЗРУ-1073, УП-110) для ускоренного развития национального рынка углеродных единиц. При этом институциональные пробелы в части нормативной базы, кадастра ПГ и MRV-инфраструктуры создают риски, аналогичные тем, с которыми столкнулся Казахстан при приостановке своей ETS.

### 2. Оптимальный сценарий.

Рекомендуется поэтапная стратегия пилотирования в энергетическом секторе (2028–2030 гг., Сценарий А) с постепенным переходом к Сценарию В к 2031–2033 гг. Ценовой коридор 10–28 долл./тCO<sub>2</sub>e (индексируемый по ИПЦ) обеспечивает баланс между экологической эффективностью и промышленной конкурентоспособностью.

### 3. Нормативные приоритеты.

Первоочередной задачей является принятие специализированного Положения Кабинета Министров о порядке участия в международном рынке углеродных единиц, регламентирующего авторизацию, национальный реестр, MRV и механизм соответствующих корректировок. Данный документ должен обеспечить соответствие требованиям COP29 (Баку, 2024) и создать операционную основу для международных передач ИТМО.

При этом, в разрабатываемом Положении рекомендуется закрепить следующие механизмы:

**Система поэтапного разрешения.** До начала деятельности в сфере международной торговли углеродными единицами необходимо внедрить трехэтапную процедуру, включающую предварительное письмо о

невыражении возражений (Letter of No Objection), официальное письмо об одобрении (Letter of Approval), а также отдельную авторизацию кооперативного подхода.

Данный механизм обеспечивает качество проектов и снижает риск «overselling». В целях операционализации нормы резервирования для NDC необходимо четко закрепить в Положении технический порядок исполнения установленного Указом требования о невыставлении на продажу 20 процентов верифицированных углеродных единиц по всем проектам для выполнения обязательств по NDC, в том числе определить порядок блокировки этих единиц в Национальном реестре и правила их использования.

**Перечень разрешенных стандартов.** В Положении целесообразно прямо утвердить в виде исчерпывающего перечня признанные на международном рынке стандарты Gold Standard, Verified Carbon Standard, REDD+, а также механизм статьи 6.4 Парижского соглашения в качестве разрешенных стандартов.

**Конкурентный механизм отбора.** Для отбора сервисных организаций по проектам с государственным участием следует применять порядок конкурентного отбора (тендера), при этом необходимо установить, что все расходы на разработку проекта, регистрацию, верификацию, сертификацию и продажу покрываются не за счет государственных средств, а за счет выбранной компании, с условием оплаты услуг только после реализации углеродных единиц.

**Принципы финансового распределения.** Рекомендуется закрепить в Положении, что не менее 80 процентов доходов от продажи международных углеродных единиц направляются на проекты в сфере энергоэффективности, возобновляемых источников энергии и чистых технологий, а оставшиеся 20 процентов на программы социальной компенсации, защищающие малообеспеченное население от роста цен на энергию.

**Механизм выполнения глобальных обязательств.** В целях обеспечения соответствия требованиям статьи 6 Парижского соглашения в Положении необходимо предусмотреть порядок аннулирования (cancellation) определенной части верифицированного объема каждой международно авторизованной углеродной единицы для содействия общему сокращению глобальных выбросов.

Кроме того, вне рамок самого Положения необходимо реализовать следующие шаги: запустить Национальный реестр углеродных единиц в установленные сроки; полностью внедрить систему MRV на всех крупных промышленных и энергетических предприятиях; начать пилотную ETS в энергетическом секторе и с 2030 года поэтапно охватывать промышленные отрасли; проводить реформу субсидий в энергетическом секторе параллельно с внедрением ETS; разработать коэффициенты выбросов (emission factor) каждому из направлений в секторах экономики;

подготовить не менее 300–500 специалистов в области учета углерода и управления ETS в соответствии с международными стандартами.

#### **4. Количественные ориентиры.**

Реализация Сценария В позволит к 2035 году сократить выбросы CO<sub>2</sub> на 18–26 млн тонн в год, обеспечить бюджетные поступления в объёме 700–1 200 млн долл. США ежегодно, привлечь 600–1 500 млн долл. зелёных инвестиций и достичь соотношения BCR = 3,5–5,0 на горизонте 2028–2040 гг.

#### **5. Международная интеграция.**

Параллельно с национальными мерами критически важно заключить двусторонние соглашения по Ст. 6.2 с ключевыми партнёрами (ЕС, Япония, Швейцария) и обеспечить совместимость национального реестра с платформой РАСМ Ст. 6.4, что откроет доступ к международному спросу на высококачественные углеродные единицы.

Таким образом, формирование национального рынка углеродных единиц в Узбекистане представляет собой не просто климатическое обязательство, но и стратегическую возможность для ускорения зелёной трансформации экономики, привлечения международных инвестиций и занятия лидирующих позиций в Центральноазиатском регионе в области углеродного регулирования.

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## ЛИЧНЫЙ БРЕНД ВЛАДЕЛЬЦА МАЛОГО БИЗНЕСА КАК ИНСТРУМЕНТ ФОРМИРОВАНИЯ КОРПОРАТИВНОЙ РЕПУТАЦИИ КОМПАНИИ

**Аннотация:** В статье рассматривается личный бренд владельца малого бизнеса как стратегический инструмент построения и укрепления корпоративной репутации. В условиях цифровизации и повышения прозрачности бизнес-процессов идентичность предпринимателя становится ключевым фактором, влияющим на доверие заинтересованных сторон, лояльность клиентов и восприятие бренда. В работе анализируются механизмы взаимодействия личного бренда и корпоративной репутации, определяются коммуникационные инструменты продвижения бренда в цифровой среде и систематизируются преимущества и риски персонализации репутации в малом бизнесе. Исследование приводит к выводу, что интеграция стратегии личного брендинга владельца в общую коммуникационную стратегию компании повышает репутационный капитал и конкурентоспособность.

**Ключевые слова:** личный брендинг, корпоративная репутация, малый бизнес, стратегические коммуникации, цифровой маркетинг, управление репутацией.

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## PERSONAL BRANDING OF A SMALL BUSINESS OWNER AS A TOOL FOR BUILDING A COMPANY'S CORPORATE REPUTATION

**Abstract:** The article examines the personal brand of a small business owner as a strategic tool for building and strengthening corporate reputation. In the context of digitalization and increasing transparency of business processes, the identity of the entrepreneur becomes a key factor influencing stakeholder trust, customer loyalty, and brand perception. The paper analyzes the mechanisms of interaction between the personal brand and corporate reputation, identifies communication tools for brand promotion in the digital environment, and systematizes the advantages and risks of reputation personalization in small business. The study concludes that the integration of the owner's personal branding

*strategy into the overall communication strategy of the company enhances reputation capital and increases competitive sustainability.*

**Keywords:** *personal branding, corporate reputation, small business, strategic communications, digital marketing, reputation management.*

В условиях развития цифровой экономики и усиления конкуренции на локальных рынках корпоративная репутация становится одним из ключевых факторов устойчивости малого бизнеса. В отличие от крупных корпораций, где коммуникационная функция распределена между различными подразделениями, в малом бизнесе владелец компании часто выступает одновременно стратегом, управленцем и главным коммуникатором бренда. В этой связи личный бренд владельца приобретает особое значение и становится инструментом формирования корпоративной репутации.

Личный бренд владельца малого бизнеса представляет собой устойчивую систему представлений о его профессиональной компетентности, ценностях, стиле управления и социальной ответственности, транслируемую через различные коммуникационные каналы. В малом бизнесе граница между персональным и корпоративным образом практически стирается: репутация компании напрямую зависит от репутации её основателя.

Особенность малого бизнеса заключается в высокой степени персонификации. Клиенты зачастую принимают решение о покупке, ориентируясь не только на продукт, но и на личность предпринимателя. Подобная модель особенно характерна для сфер услуг, консалтинга, образования, креативных индустрий, индустрии красоты и локального ритейла. В таких условиях доверие к владельцу трансформируется в доверие к компании.

Механизм влияния личного бренда владельца на корпоративную репутацию можно представить через следующие взаимосвязанные элементы:

1. Формирование доверия через экспертность и открытость коммуникаций.
2. Трансляция ценностей, определяющих корпоративную культуру.
3. Повышение узнаваемости бизнеса за счёт персонализированного контента.
4. Усиление эмоциональной связи с аудиторией.
5. Увеличение устойчивости бренда в конкурентной среде

Цифровая среда существенно усилила роль персональных коммуникаций. Социальные платформы, такие как ВК и Telegram, позволяют владельцу малого бизнеса выстраивать прямой диалог с клиентами без посредничества традиционных СМИ. В этом контексте личный аккаунт предпринимателя становится самостоятельным репутационным активом.

Стратегия продвижения личного бренда владельца малого бизнеса должна быть интегрирована в общую коммуникационную стратегию компании. Несогласованность позиционирования может привести к

репутационному диссонансу, снижению доверия и утрате лояльности аудитории.

Для систематизации влияния личного бренда владельца на корпоративную репутацию представим сравнительную характеристику ключевых эффектов в таблице 1.

**Таблица 1. Влияние личного бренда владельца малого бизнеса на корпоративную репутацию**

| Параметр                    | Проявление личного бренда                                                | Репутационный эффект для компании             |
|-----------------------------|--------------------------------------------------------------------------|-----------------------------------------------|
| Экспертность                | Публикация профессионального контента, участие в отраслевых мероприятиях | Повышение доверия и статуса компании          |
| Прозрачность                | Открытое освещение процессов, решений, ошибок                            | Формирование лояльности аудитории             |
| Ценностное позиционирование | Демонстрация миссии и социальной позиции                                 | Укрепление имиджа ответственного бизнеса      |
| Медиаактивность             | Интервью, публикации, цифровой контент                                   | Рост узнаваемости бренда                      |
| Персональная харизма        | Эмоциональное взаимодействие с аудиторией                                | Усиление эмоциональной привязанности клиентов |

Таким образом, личный бренд выполняет функцию медиатора между компанией и её целевой аудиторией.

Однако процесс гиперперсонализации несёт определённые риски. Репутационные ошибки владельца мгновенно отражаются на бизнесе. К основным угрозам относятся: публичные конфликтные высказывания, несоответствие транслируемых ценностей реальным действиям, кризисы в личной жизни, оказывающие влияние на общественное восприятие. В малом бизнесе такие репутационные кризисы особенно чувствительны, поскольку компания зачастую не обладает достаточным запасом медиаресурсов для нейтрализации негативной повестки.

В этой связи управление личным брендом владельца должно носить стратегический характер и включать следующие этапы:

- анализ целевой аудитории и её ценностных ожиданий;
- формирование ядра позиционирования;
- определение ключевых коммуникационных каналов;
- разработку контент-стратегии;
- мониторинг репутационных показателей;
- подготовку антикризисного сценария.

Важно подчеркнуть, что личный бренд владельца не должен полностью подменять корпоративный бренд. Оптимальной является модель взаимного усиления, при которой личность предпринимателя транслирует ценности

компании, но при этом сама компания сохраняет самостоятельную идентичность.

В современных условиях потребитель ориентируется на подлинность и прозрачность. Малый бизнес обладает преимуществом гибкости и возможности персонализированного общения. Грамотно выстроенный личный бренд владельца позволяет капитализировать это преимущество, превращая индивидуальную репутацию в стратегический актив компании.

Таким образом, личный бренд владельца малого бизнеса выступает инструментом формирования корпоративной репутации, способствующим росту доверия, повышению узнаваемости и укреплению конкурентных позиций компании. Его интеграция в систему стратегических коммуникаций является необходимым условием устойчивого развития малого бизнеса в цифровой среде.

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## **ПРОБЛЕМЫ АРАЛЬСКОГО КРИЗИСА. ФАКТОРЫ ВЛИЯЮЩИЙ НА ЗАБОЛЕВАЕМОСТЬ НАСЕЛЕНИЯ РЕСПУБЛИКИ КАРАКАЛПАКСТАН**

**Аннотация:** В статье рассматривается Аральский экологический кризис и его влияние на заболеваемость населения Республики Каракалпакстан. Освещены основные причины высыхания Аральского моря, начавшегося во второй половине XX века, а также его экологические последствия, включая повышение солёности окружающей среды и ухудшение качества питьевой воды. Особое внимание уделено влиянию неблагоприятных экологических факторов на состояние здоровья населения, в частности на рост детской и материнской заболеваемости, сердечно-сосудистых заболеваний и мочекаменной болезни. Подчёркивается значимость проблемы для системы общественного здравоохранения и необходимость комплексного междисциплинарного подхода к её решению.

**Ключевые слова:** Аральский кризис, Каракалпакстан, заболеваемость населения, питьевая вода, солёность, анемия, детское здоровье, материнская заболеваемость.

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## **PROBLEMS OF THE ARAL CRISIS: FACTORS AFFECTING THE MORBIDITY OF THE POPULATION IN THE REPUBLIC OF KARAKALPAKSTAN**



**Abstract:** *This article examines the Aral environmental crisis and its impact on the morbidity of the population in the Republic of Karakalpakstan. The main causes of the Aral Sea drying, which began in the second half of the 20th century, are highlighted, along with its ecological consequences, including increased environmental salinity and the deterioration of drinking water quality. Special attention is given to the influence of adverse environmental factors on public health, particularly on the rise of childhood and maternal morbidity, cardiovascular diseases, and urolithiasis. The significance of the problem for the public health system is emphasized, as well as the need for a comprehensive interdisciplinary approach to address it.*

**Keywords:** *Aral Crisis, Karakalpakstan, population morbidity, drinking water, salinity, anemia, child health, maternal morbidity*

Аральское море-озеро находится в северной пустынной части Центральной Азии в пределах Узбекистана и Казахстана. Состояние Аральского моря оставалось относительно стабильным вплоть до современной регрессии, начавшейся в 1960-х годах. На этот раз быстрое высыхание Арала стало следствием крайне нерационального расширения орошения, значительно сократившего сток Амударьи и Сырдарьи. Из-за огромного забора воды в Каракумский канал примерно одна треть стока Амударьи была потеряна. Из-за образовавшегося дефицита водного баланса площадь моря постепенно стала уменьшаться, а соленость воды увеличиваться. Проводимые в течение длительного времени в бассейне Аральского моря широкомасштабные водохозяйственные и мелиоративные работы позволили превратить эту территорию в крупный регион по производству хлопка, риса и других культур.(1)

Вследствие такой политики вода расходовалась расточительно, и в скором времени полностью прекратился сток воды в Аральское море, началось понижение уровня воды. Так, например, уровень воды Аральского моря, начиная с 1960 года, понизился на 13 м(2). Бывшее дно Аральского моря на площади более 26 км<sup>2</sup> превратилось в сушу. Южный и юго-восточный берега Арала отошли от своих прежних границ на несколько десятков км. Орошение хлопковых полей водами рек Амударьи и Сырдарьи в значительной степени способствовало сокращению площади Аральского моря более чем наполовину от его первоначальных размеров. В результате более 40 000 км<sup>2</sup> сильно засоленного морского дна оказались обнажёнными и в настоящее время подвергаются выдуванию частыми ветрами. Число пылевых бурь, по данным метеорологических станций Муйнак и Нукус, с 1966 г. возросло в 2 раза, а адвективной мглы – в 3 раза. Пылевые выносы, достигая 200–400 км длины и 30–40 км ширины, повторяются 6–9 раз в год, причем количество ветрового переноса засоленной пыли составляет 15–75 млн тонн в год. По данным наблюдений, с осушенной территории восточной части Аральского моря уже вынесено более одного миллиарда тонн засоленной пыли. Выпадение аэрозолей за

год на территории низовьев Амударьи в настоящее время составляет 3200 кг/га растворимых солей – 100–150 кг/га . Часть бывшего дна моря быстро зарастает дикой растительностью. Одновременно ускоряются процессы деградации и опустынивания экосистем в дельтах Амударьи и Сырдарьи. (1)

Загрязнение воды является одной из главных экологических проблем данного региона. По данным местных исследователей, изменения качества воды начались ещё в 1970-е годы параллельно с экологической деградацией Каракалпакстана. Грунтовые воды Каракалпакстана загрязнены высоким содержанием солей и других минеральных веществ. Качество подземных вод, оцениваемое по общему содержанию растворённых солей (TDS), колеблется от 0,4 до 4–6 г/л. (3,4) (6).

Процент нестандартных химических показателей водопроводной воды за 2001-2010 гг. по районам РК

| №  | Гор. районы | 2001г.      | 2002        | 2003г.      | 2004г.      | 2005г. | 2006г. | 2007 | 2008г.      | 2009г. | 2010г. |
|----|-------------|-------------|-------------|-------------|-------------|--------|--------|------|-------------|--------|--------|
| 1  | Муйнак      | 76,7        | 13,0        | 49,3        | 35,8        | 36,8   | 26,6   | 58,5 | 58,0        | 43,8   | 16,0   |
| 2  | Чимбай      | 46,6        | 28,2        | 12,2        | 18,0        | 65,5   | 33,6   | 17,4 | 26,5        | 37,4   | 57,2   |
| 3  | Кунград     | <b>93,1</b> | 58,2        | 64,4        | 46,1        | 68,8   | 65,3   | 66,9 | 45,3        | 39,2   | 43,6   |
| 4  | Кегейли     | 14,7        | 28,5        | 6,9         | 24,2        | 22,8   | 18,1   | 21,3 | 49,8        | 16,1   | 11,4   |
| 5  | Тахтакупыр  | 58,0        | 45,7        | 40,5        | 29,6        | 0      | 28,5   | 24,6 | 32,9        | 13,4   | 7,1    |
| 6  | Канлыккуль  | 71,9        | 44,4        | 28,7        | 8,2         | 27,6   | 41,7   | 20,4 | 42,3        | 53,8   | 33,3   |
| 7  | Караузьяк   | 38,6        | 18,3        | 18,8        | 35,5        | 18,4   | 29,4   | 21,3 | 32,1        | 29,0   | 25,4   |
|    | север       | 51,6        | 37,1        | 23,1        | 26,4        | 33,5   | 36,7   | 31,1 | 38,3        | 30,6   | 29,2   |
| 8  | г. Нукус    | 48,1        | 17,6        | 15,6        | 22,6        | 8,4    | 18,1   | 17,5 | 41,0        | 37,8   | 1,1    |
| 9  | Ходжейли    | <b>94,4</b> | <b>90,8</b> | <b>98,3</b> | <b>90,5</b> | 69,8   | 38,7   | 48,0 | <b>80,0</b> | 75,9   | 51,9   |
| 10 | Тахиаташ    | 46,4        | 33,3        | 25,5        | 18,7        | 35     | 23,7   | 57,8 | 29,7        | 25,3   | 7,6    |
| 11 | Шуманай     | 35,7        | 25,1        | 18,7        | 10,1        | 12,9   | 16,3   | 34,9 | 34,5        | 29,3   | 21,5   |
| 12 | Нукус р/н   | <b>95,4</b> | <b>100</b>  | <b>100</b>  | 43,0        | 22,3   | 10,3   | 40,2 | 64,8        | 31,3   | 8,3    |
|    | центр       | 59,4        | 49,6        | 40,2        | 30,6        | 23,7   | 21,3   | 40,1 | 50,5        | 41,2   | 17,7   |
| 13 | Турткуль    | 19,3        | 9,1         | 7,7         | 10,9        | 43,2   | 8,0    | 31,8 | 36,3        | 31,3   | 15,9   |
| 14 | Беруни      | 35,5        | 11,5        | 20,1        | <b>93,5</b> | 5,4    | 0      | 31,6 | 24,0        | 40,0   | 30,7   |
| 15 | Амударья    | 70,6        | 54,8        | 16,6        | 37,5        | 13,4   | 7,9    | 2,5  | 31,6        | 18,6   | 36,1   |
| 16 | Элликкала   | <b>99,3</b> | 62,6        | 18,1        | 16,3        | 76,2   | 7,0    | 7,6  | 58,9        | 34,9   | 25,9   |
|    | юг          | 50,12       | 30,5        | 15,3        | 32,0        | 27,4   | 6,1    | 15,6 | 35,3        | 30,0   | 28,8   |
|    | по РК.      | 54,5        | 38,9        | 28,3        | 29,6        | 28,1   | 22,9   | 30,7 | 43,7        | 34,5   | 24,7   |

Международный стандарт ВОЗ по минерализации питьевой воды, связанный с её вкусовыми качествами, составляет 1,5 г/л TDS . Особенно драматична ситуация в северном Каракалпакстане, где большинство школ и больниц, включая родильные дома, не обеспечены безопасной питьевой водой. На протяжении последних 40–45 лет население Каракалпакстана вынуждено употреблять сильно минерализованную и загрязнённую питьевую воду. В связи с хроническим воздействием высоких концентраций минеральных веществ и множества токсинов в питьевой воде здоровье населения продолжает находиться под серьёзной угрозой . (4)

Анализ проведенных исследований показал, что при оценке воздействия экологических, в частности водного факторов на здоровье населения РК, одним из ведущих нозоформ является мочекаменная

болезнь(МКБ).

| Мочекаменная болезнь (на 1000 человек)                       |      |      |      |      |      |      |      |      |      |      |
|--------------------------------------------------------------|------|------|------|------|------|------|------|------|------|------|
| зарегистрировано заболевание впервые установленным диагнозом |      |      |      |      |      |      |      |      |      |      |
| годы                                                         | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| На 1000 человек                                              | 0,2  | 0,1  | 0,2  | 0,2  | 0,17 | 0,2  | 0,3  | 0,3  | 0,51 | 0,27 |
| абс.число                                                    | 311  | 194  | 349  | 261  | 274  | 380  | 484  | 504  | 836  | 436  |

Биология ва тиббиёт муаммолари, 2016, №4 (91) |

(8,9)

Ухудшение состояния здоровья населения происходит параллельно с нарастающей экологической деградацией и ухудшением экономического положения региона. Отмечается рост заболеваемости, анемией, туберкулёзом, заболеваниями почек и печени, респираторными инфекциями, аллергическими заболеваниями и онкологической патологией. Особую обеспокоенность вызывает состояние репродуктивного здоровья женщин региона, а также высокая частота патологии беременности и родов. Высокая распространённость анемии выявляется практически во всех группах женщин Каракалпакстана: у 87% подростков, у 91% небеременных женщин и у 99% беременных. Анемия, являющаяся одной из наиболее серьёзных проблем здравоохранения региона, неуклонно нарастает в течение последних 20 лет. В 1980-е годы анемия выявлялась лишь у 17–20% беременных женщин. Во время беременности её тяжесть усиливается — к третьему триместру около 70% беременных женщин в Каракалпакстане страдают тяжёлой формой анемии. У большинства из них возникают осложнения беременности и родов, включая кровотечения. Около 87% новорождённых также имеют признаки анемии. Нелеченная анемия у беременных женщин и детей раннего возраста представляет высокий риск для формирования иммунной системы и может приводить к поражению головного мозга.(4)

На протяжении более чем 20 лет в регионе отмечается высокий уровень репродуктивной патологии (бесплодие, самопроизвольные выкидыши, осложнения беременности и родов). В исследовании, охватившем 5 000 супружеских пар, бесплодие было выявлено у 16%. Среди бесплодных пар доля мужского бесплодия увеличилась с 30–40% в 1980-е годы до 65% в конце 1990-х. Частота выкидышей в 1998 году достигла 18%. Частота врождённых пороков развития, являющихся ещё одним серьёзным последствием загрязнения окружающей среды, также возрастает: каждый двадцатый ребёнок рождается с аномалиями развития, что примерно в пять раз выше, чем в европейских странах. (5,10)

Президент Ш.М. Мирзиёев также подчеркнул значение климатических изменений и указал на реализацию крупномасштабных

мероприятий: посадку более 2 млн гектаров устойчивой растительности, улучшение санитарной инфраструктуры, водоснабжения и медицинского обслуживания населения региона. (7)

Чтобы помочь людям осознать серьёзность ситуации и выработать механизмы решения проблем в Каракалпакстане был создан центр «Перзент». Это Каракалпакский центр репродуктивного здоровья и охраны окружающей среды, был основан в 1992 году как неправительственная организация с целью улучшения статуса и здоровья женщин и детей в регионе Аральского моря. Центр разработал научно-исследовательские и сервисные программы, посвящённые взаимосвязи между экологическими факторами и здоровьем. Также он стал пионером образовательных программ по вопросам окружающей среды, здоровья, органического земледелия, здорового питания, водоснабжения и гигиены. Его деятельность охватывает более 200 000 человек в 7 районах Каракалпакстана. (10)

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## МЕХАНИЗМЫ РАЗВИТИЯ ГОСУДАРСТВЕННЫХ ЦЕЛЕВЫХ ФОНДОВ И ИХ ЦИФРОВИЗАЦИИ В СОВРЕМЕННЫХ УСЛОВИЯХ

**Аннотация:** В статье исследуются механизмы развития государственных целевых фондов в условиях трансформации системы публичных финансов и активного внедрения цифровых технологий. Целью исследования является анализ традиционных и цифровых механизмов функционирования государственных целевых фондов и обоснование направлений повышения их эффективности. Рассмотрены особенности формирования и использования средств целевых фондов, а также влияние цифровизации на прозрачность и управляемость финансовых потоков. В результате исследования определены ключевые направления развития государственных целевых фондов с учетом современных социально-экономических условий.

**Ключевые слова:** государственные целевые фонды, цифровизация, публичные финансы, финансовые механизмы, бюджетная система.

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## MECHANISMS FOR THE DEVELOPMENT OF STATE TARGET FUNDS AND THEIR DIGITALIZATION IN MODERN CONDITIONS

**Abstract:** The article examines the mechanisms for the development of state target funds in the context of public finance transformation and the active implementation of digital technologies. The purpose of the study is to analyze traditional and digital mechanisms of state target funds functioning and to substantiate directions for improving their efficiency. The paper considers the features of the formation and use of target fund resources, as well as the impact of digitalization on the transparency and manageability of financial flows. The results identify key directions for the development of state target funds under modern socio-economic conditions.



**Keywords:** *state target funds, digitalization, public finance, financial mechanisms, budget system.*

Введение. Государственные целевые фонды занимают особое место в системе публичных финансов, выступая важным инструментом реализации социально-экономической политики государства. Их основное назначение заключается в аккумулировании и целевом использовании финансовых ресурсов для финансирования приоритетных направлений развития, выполнения социальных обязательств и обеспечения устойчивости финансовой системы. В условиях усложнения экономической среды и роста общественных потребностей роль государственных целевых фондов существенно возрастает.

Современный этап развития экономики характеризуется усилением финансовых ограничений, нестабильностью макроэкономической конъюнктуры и расширением функций государства в сфере социального обеспечения. Эти процессы обуславливают необходимость поиска новых подходов к управлению государственными целевыми фондами, направленных на повышение эффективности формирования их доходной базы и рационализацию использования средств. В то же время традиционные механизмы функционирования целевых фондов во многих случаях не в полной мере соответствуют современным требованиям прозрачности, управляемости и результативности.

Существенное влияние на развитие государственных целевых фондов оказывает цифровизация системы публичных финансов. Внедрение цифровых технологий в процессы учета, распределения и контроля финансовых ресурсов открывает новые возможности для повышения прозрачности деятельности целевых фондов, сокращения административных издержек и усиления финансового контроля. Использование информационных систем, цифровых платформ и автоматизированных механизмов управления способствует формированию более устойчивых и эффективных финансовых институтов. Вместе с тем цифровая трансформация требует адаптации институциональной среды, совершенствования нормативно-правовой базы и развития цифровых компетенций участников финансовых отношений.

В научных исследованиях государственные целевые фонды традиционно рассматриваются как элемент бюджетной системы и инструмент перераспределения финансовых ресурсов. Значительное внимание уделяется вопросам их финансовой устойчивости, роли в социальной политике и взаимодействию с государственным бюджетом. Однако проблемы развития государственных целевых фондов в условиях цифровизации публичных финансов остаются недостаточно систематизированными. В частности, в научной литературе ограничено представлены комплексные исследования, объединяющие финансовые и цифровые аспекты функционирования целевых фондов.

Актуальность настоящего исследования обусловлена необходимостью теоретического и прикладного осмысления механизмов развития государственных целевых фондов с учетом современных процессов цифровой трансформации. Целью статьи является анализ механизмов развития государственных целевых фондов и их цифровизации, а также обоснование направлений повышения эффективности их функционирования в современных социально-экономических условиях. Достижение поставленной цели предполагает выявление ключевых факторов развития целевых фондов и формирование выводов, имеющих практическое значение для системы публичных финансов.

Методы исследования. Методологическую основу исследования составляют теоретические положения экономической науки в области публичных финансов, государственных целевых фондов и цифровой трансформации финансовых институтов. В работе государственные целевые фонды рассматриваются как самостоятельный элемент системы публичных финансов, функционирующий во взаимосвязи с бюджетной системой и механизмами государственного финансового управления.

В процессе исследования применялся комплекс общенаучных и специальных методов познания, обеспечивающих всесторонний анализ механизмов развития и цифровизации государственных целевых фондов. Использование методов анализа и синтеза позволило выявить структурные элементы механизма функционирования целевых фондов, а также определить особенности формирования их доходной базы и направления использования средств в современных условиях. Метод научного обобщения применялся для систематизации существующих теоретических подходов и формирования целостного представления о тенденциях развития государственных целевых фондов.

Системный подход использовался для исследования государственных целевых фондов как части финансовой системы государства, функционирующей под воздействием экономических, институциональных и технологических факторов. В рамках данного подхода анализировалось влияние цифровизации публичных финансов на процессы учета, распределения и контроля использования средств целевых фондов. Структурно-функциональный подход позволил рассмотреть функции государственных целевых фондов и выявить изменения в их реализации в условиях цифровой трансформации.

Для оценки направлений развития государственных целевых фондов применялся сравнительный метод, направленный на сопоставление традиционных и цифровых механизмов управления финансовыми ресурсами. Использование данного метода позволило определить преимущества цифровых инструментов в части повышения прозрачности финансовых операций и эффективности финансового контроля. Логико-аналитический метод использовался для выявления причинно-

следственных связей между внедрением цифровых технологий и изменениями в механизмах функционирования государственных целевых фондов.

Информационную базу исследования составили нормативно-правовые акты, официальные статистические материалы, а также научные публикации, посвящённые проблемам государственных финансов и цифровизации финансовых процессов. В работе использовались данные аналитических отчетов и официальных источников, отражающие современные тенденции развития системы публичных финансов и практику применения цифровых технологий в финансовом управлении.

Применение совокупности указанных методов обусловлено целью и задачами исследования и обеспечивает научную обоснованность полученных результатов. Использованный методический инструментарий позволил выявить ключевые направления развития государственных целевых фондов и обосновать роль цифровизации как одного из факторов повышения эффективности их функционирования в современных условиях.

Результаты исследования. В ходе проведённого исследования установлено, что развитие государственных целевых фондов в современных условиях определяется совокупным воздействием финансово-экономических, институциональных и технологических факторов. Ключевым результатом исследования является вывод о том, что традиционные механизмы функционирования государственных целевых фондов в условиях цифровой трансформации публичных финансов требуют качественного обновления и адаптации к новым управленческим и технологическим реалиям.

Анализ показал, что одним из основных механизмов развития государственных целевых фондов является совершенствование системы формирования их доходной базы. Стабильность поступлений в целевые фонды напрямую влияет на их финансовую устойчивость и способность выполнять возложенные функции. В условиях ограниченности бюджетных ресурсов и роста социальных обязательств государства возрастает значение диверсификации источников формирования средств целевых фондов и повышения эффективности их администрирования.

Результаты исследования свидетельствуют о том, что цифровизация процессов формирования и использования средств государственных целевых фондов выступает важным фактором повышения прозрачности и управляемости финансовых потоков. Внедрение цифровых платформ, автоматизированных систем учета и электронных механизмов контроля позволяет сократить административные издержки, снизить риски нецелевого использования средств и повысить оперативность принятия управленческих решений. Установлено, что цифровые инструменты способствуют формированию более устойчивой системы финансового

контроля и повышению доверия со стороны общества к деятельности государственных целевых фондов.

В то же время выявлено, что эффективность цифровизации государственных целевых фондов во многом зависит от уровня нормативно-правового и институционального обеспечения. Недостаточная регламентация цифровых процессов, фрагментарность внедрения информационных систем и ограниченный уровень цифровых компетенций участников финансовых отношений могут снижать результативность цифровых преобразований. Это указывает на необходимость комплексного подхода к цифровизации, включающего не только технологические, но и организационные и кадровые меры.

Особое значение в развитии государственных целевых фондов приобретает внедрение механизмов мониторинга и оценки эффективности использования средств. Результаты исследования показывают, что применение цифровых инструментов аналитики и мониторинга позволяет повысить обоснованность распределения финансовых ресурсов и усилить контроль за достижением целевых показателей. Это способствует переходу от формального распределения средств к результативно ориентированному управлению государственными целевыми фондами.

Таким образом, полученные результаты подтверждают, что развитие государственных целевых фондов в современных условиях должно основываться на интеграции финансовых и цифровых механизмов управления. Цифровизация рассматривается не как вспомогательный элемент, а как системный фактор повышения эффективности и устойчивости государственных целевых фондов. Выявленные закономерности и взаимосвязи расширяют научные представления о механизмах функционирования целевых фондов и формируют основу для их дальнейшего совершенствования в условиях цифровой экономики.

**Заключение.** Проведённое исследование позволило комплексно рассмотреть механизмы развития государственных целевых фондов и их цифровизации в современных социально-экономических условиях. В ходе работы установлено, что государственные целевые фонды сохраняют ключевую роль в системе публичных финансов, обеспечивая финансирование приоритетных направлений социально-экономического развития и выполнение государственных обязательств. Вместе с тем традиционные механизмы их функционирования в условиях цифровой трансформации требуют существенного обновления.

Результаты исследования подтверждают, что устойчивое развитие государственных целевых фондов невозможно без совершенствования механизмов формирования их доходной базы, повышения эффективности финансового управления и усиления контроля за целевым использованием средств. Особое значение приобретает внедрение цифровых технологий, которые способствуют повышению прозрачности финансовых потоков, снижению административных издержек и росту результативности

управленческих решений. Цифровизация государственных целевых фондов выступает не вспомогательным, а системообразующим фактором повышения их эффективности и финансовой устойчивости.

В ходе исследования выявлено, что эффективность цифровизации государственных целевых фондов во многом определяется уровнем нормативно-правового и институционального обеспечения, а также наличием необходимых цифровых компетенций у участников финансовых отношений. Недостаточная регламентация цифровых процессов и фрагментарный характер внедрения информационных систем могут ограничивать положительный эффект цифровых преобразований, что указывает на необходимость комплексного и поэтапного подхода к развитию цифровых механизмов управления.

Научная значимость полученных результатов заключается в расширении теоретических представлений о механизмах развития государственных целевых фондов с учётом цифровой трансформации публичных финансов. Практическая значимость исследования состоит в возможности использования сформулированных выводов и положений при разработке и корректировке мер государственной финансовой политики, направленных на повышение эффективности функционирования государственных целевых фондов и адаптацию их деятельности к условиям цифровой экономики.

В целом результаты исследования свидетельствуют о том, что интеграция финансовых и цифровых механизмов управления является ключевым направлением развития государственных целевых фондов в современных условиях. Дальнейшие исследования целесообразно направить на оценку практических эффектов цифровизации государственных целевых фондов, а также на разработку инструментов мониторинга и оценки их влияния на устойчивость системы публичных финансов и социально-экономическое развитие.

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## **СОХРАНЕНИЕ ЛАНДШАФТОВ ПУСТЫНИ КАРШИ**

**Аннотация.** В данной статье освещаются научные основы и практическое значение охраны ландшафтов пустыни Карши. Системно анализируются природно-географические условия региона, климатические особенности, состав почв, а также специфические характеристики растительного и животного мира. Кроме того, проводится научная оценка экологических проблем, возникающих под воздействием антропогенных факторов, включая ветровую эрозию, миграцию песков, деградацию пастбищ, засоление почв и сокращение биологического разнообразия. В ходе исследования разработаны комплексные рекомендации по устойчивому управлению пустынными ландшафтами, рациональному использованию природных ресурсов и снижению процессов деградации. Полученные результаты способствуют обеспечению экологической стабильности региона и сохранению природных ландшафтов.

**Ключевые слова:** ландшафт, пустынная экосистема, ветровая эрозия, деградация, засоление почв, пастбища, биоразнообразие, экологическая стабильность, фитомелиорация, экотуризм.

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## **CONSERVATION OF THE KARSHI DESERT LANDSCAPES**

**Abstract.** This article highlights the scientific foundations and practical significance of protecting the landscapes of the Karshi desert. The natural and geographical conditions of the region, climatic characteristics, soil composition, and distinctive features of flora and fauna are systematically analyzed. In addition, environmental problems arising from anthropogenic impacts—such as wind erosion, sand migration, pasture degradation, soil salinization, and reduction of biodiversity—are scientifically assessed. The study develops comprehensive recommendations for sustainable management of desert landscapes, rational use of natural resources, and mitigation of degradation processes. The obtained results contribute to ensuring ecological stability in the region and preserving natural landscapes.

**Keywords:** *landscape, desert ecosystem, wind erosion, degradation, soil salinization, pastures, biodiversity, ecological stability, phytomelioration, ecotourism.*

**Введение.** Пустыня Карши — обширный природно-географический регион, расположенный в юго-западной части Узбекистана, характеризующийся сложной ландшафтной структурой, резко континентальным климатом и уникальным биологическим разнообразием. Территория в основном входит в состав Кашкадарьинской области и является важным природным пространством для поддержания экологического баланса региона. Пустынные ландшафты имеют большое научное и практическое значение благодаря высокой адаптации видов растений и животных к природным условиям, специфической морфологии почвенного слоя и гидрогеологическим свойствам.

В последние годы расширение орошаемого земледелия в регионе, увеличение нагрузки на животноводческие хозяйства, освоение минеральных ресурсов и развитие промышленной инфраструктуры привели к усилению антропогенного воздействия на окружающую среду. В результате происходят негативные экологические процессы, такие как эрозия почвы, засоление, истончение растительного покрова, миграция песчаных масс и сокращение численности некоторых видов животных. Эти факторы приводят к нарушению стабильности пустынных экосистем и усилению деградации ландшафта. Поэтому защита ландшафтов Каршиской пустыни, их рациональное использование и восстановление природного баланса являются одними из самых актуальных экологических проблем современности.

**Методология.** В процессе исследования использовался комплексный подход к оценке ландшафта. Для изучения природных условий региона применялись методы географического сравнения, ландшафтного анализа, экологического мониторинга, обобщения статистических данных и картографического анализа материалов. Также на основе данных дистанционного зондирования изучалась динамика изменений земной поверхности. Методология охраны ландшафта состояла из нескольких этапов: территориальная инвентаризация, оценка потенциала природных ресурсов, выявление антропогенных угроз, анализ процессов деградации, разработка мер защиты и совершенствование механизмов мониторинга. Такой подход позволяет определить экологическую емкость ландшафтов и обеспечить их устойчивое управление.

**Результаты.** При определении типов ландшафта Каршской пустыни в первую очередь в качестве основных критериев принимаются почвенный покров территории, биоклиматические условия, особенности рельефа, глубина залегания грунтовых вод и состав растительного покрова. Вопросы классификации ландшафтов изучаются в географии уже много лет. В частности, в научных взглядах Н.А. Гвоздского и В.А. Николаева

важную роль играет подход к разделению типов ландшафта на основе природной зональности. Согласно их классификации, тундровый, степной и пустынный ландшафты представляют собой отдельные типы ландшафта, отличающиеся друг от друга природными условиями, влажоснабжением, климатическими показателями, почвенным и растительным покровом [1]. С этой точки зрения Каршская пустыня также включена в систему самостоятельных пустынных ландшафтов по своим природно-географическим особенностям.

Ландшафты пустыни Карши имеют внутреннюю слоистость, зависящую от природных условий и геоморфологических особенностей территории. В частности, в Черной пустыне, расположенной в юго-западной части пустыни Карши и прилегающих районах, наблюдается сложная геоэкологическая ситуация под влиянием водной и ветровой эрозии [2]. Под влиянием зональных законов географической коры и ландшафтообразующих факторов пустыня Карши в основном относится к типу глинисто-песчаных пустынных ландшафтов. Здесь формирование ландшафтов тесно связано с климатом, геологической структурой, материнской породой, микрорельефом, ветровой активностью и режимом грунтовых вод.

Климат региона резко континентальный и засушливый. Среднегодовая температура воздуха составляет около 14–16 °С, летом воздух очень горячий, а зимой температура значительно понижается. Хотя средняя температура в январе относительно низкая, продолжительность зимы в регионе невелика. Годовое количество осадков составляет от 155 до 237 мм, большая часть которых выпадает на зимний и весенний сезоны. Высокие температуры и сильное испарение в летний сезон увеличивают дефицит влаги. Поэтому пустыня Карши обладает уникальным сочетанием климатических условий по сравнению с другими пустынными регионами, что напрямую влияет на состав и развитие ландшафтов [3].

Почвы региона сформировались под влиянием климата, материнской породы, форм рельефа и грунтовых вод и отличаются своим разнообразием. В Каршской пустыне, наряду с автоморфными, полугидроморфными и гидроморфными почвами, встречаются также азонально-луговые, лугово-болотные, болотистые, засоленные и почвы различной степени засоленности. Это свидетельствует о сложности геологических и гидрогеологических условий региона. По общей классификации почвы Узбекистана делятся на пять групп: автоморфные, полугидроморфные, гидроморфные, засоленные и орошаемые [4]. Тот факт, что почти все эти группы встречаются в Каршской пустыне, указывает на сильную внутреннюю дифференциацию ландшафтов.

Растительный покров является важным фактором формирования и стабильности региональных ландшафтов. В пустыне Карши широко распространены в основном засухо- и засоленные виды растений, такие как саксаул, янток, шора и кийок. Эти растения имеют особое экологическое

значение не только как биологический компонент, но и как средство укрепления почвы, снижения миграции песка, удержания влаги и регулирования микроклимата. Участие растений в метаболизме вещества и энергии, накопление органического вещества и их воздействие на окружающую среду также изменяют состояние других компонентов ландшафта. Локальные характеристики таких показателей, как температура воздуха, влажность, скорость ветра и газовый состав, во многом зависят от плотности и состава растительного покрова.

Ряд исследований также изучал экологическое состояние растительного сообщества Миксто-Каллигонетта, распространенного в пустыне Карши. По результатам исследования, некоторые виды рода *Calligonum*, включая *Calligonum eriopodum*, *Calligonum microcarpum* и *Calligonum paletzkianum*, встречаются на песчаных, засоленных и сиоземных почвах. Хотя эти виды хорошо адаптированы к экстремальным условиям пустыни, их ареал сужается из-за расширения нефтегазовой промышленности, техногенного давления и чрезмерного использования пастбищ. Поэтому некоторые виды, в частности *Calligonum mattheianum*, *C. molle* и *C. paletzkianum*, внесены в список растений, нуждающихся в защите [5]. Это указывает на то, что фитоценозы пустыни чувствительны к антропогенным факторам.

Южные пустыни значительно отличаются от северных пустынных регионов по климатическим параметрам и составу флоры и фауны. Осадки в этих регионах выпадают преимущественно в зимние и весенние месяцы, а лето чрезвычайно сухое и жаркое. Поэтому процесс почвообразования и сезонное развитие флоры и фауны резко различаются по сезонам. Высокие летние температуры и недостаток влаги приводят к разреженному распространению растений, что замедляет процесс почвообразования [6]. В результате, несмотря на низкую биологическую продуктивность в пустынных ландшафтах, сохраняются виды с высоким уровнем экологической адаптации.

Фауна пустыни также является важной составляющей ландшафта. В пустыне Карши обитают такие виды, как скунс, различные ящерицы, лисы, перепела и другие виды, адаптированные к условиям пустыни. Некоторые из них занесены в Красную книгу Узбекистана, что свидетельствует о том, что эта территория также является важной охраняемой территорией с точки зрения фауны. Фауна активно участвует в обмене веществом и энергией в ландшафтах. Животные выполняют важные экологические функции в почвообразовании, разложении органических веществ, распространении семян растений и обеспечении стабильности трофических цепей. Взаимоотношения между травоядными, хищниками и сапрофагами служат для поддержания внутреннего баланса ландшафтной экосистемы [7].

Процессы опустынивания, наблюдаемые в пустыне Карши, обусловлены сочетанием природных и антропогенных факторов. К природным факторам относятся засушливый климат, сильные ветры,

низкий уровень осадков, высокое испарение и почвы с легким механическим составом. Антропогенные факторы связаны с неправильным орошением земель, загрязнением промышленными и бытовыми отходами, разработкой месторождений полезных ископаемых, добычей песка и камня, а также расширением транспортных и инфраструктурных сетей. Рост населения, увеличение спроса на продовольствие и освоение новых земель оказывают все большее давление на сельскохозяйственные угодья и пастбища. Это приводит к сокращению естественных ландшафтов, снижению плодородия почв и нарушению экосистем. Поэтому борьба с эрозией, предотвращение засоления и снижение загрязнения имеют особое значение для защиты почвенных ресурсов.

В оазисе Кашкадарья принципы рационального использования природных ресурсов приобретают все большее значение для эффективного управления орошаемыми землями, восстановления ландшафта и повышения конкурентоспособности сельского хозяйства. Для предотвращения опустынивания агроландшафтов необходимо строго контролировать негативное воздействие на окружающую среду в процессе распределения, описания и оценки земель [8]. Такой подход позволяет гармонизировать производство и охрану окружающей среды.

Истощение водных ресурсов в регионе также является серьезной экологической проблемой. Этот процесс связан с изменением климата, уменьшением речного стока и чрезмерным потреблением воды для орошения. Ежегодное потребление 5,4–5,5 км<sup>3</sup> воды для нужд орошения в Кашкадарьинской области еще больше усугубляет нехватку воды. Кроме того, загрязнение воды промышленными и сельскохозяйственными сточными водами осложняет гидроэкологическую ситуацию. Ухудшение качества и количества водных ресурсов ослабляет потенциал естественного восстановления ландшафтов.

Активизация процессов миграции песка в результате ветровой эрозии является одной из наиболее серьезных проблем, характерных для пустынных регионов Узбекистана. В Каршиской пустыне эта ситуация также отчетливо проявляется, особенно в районах с редким растительным покровом. Сокращение саксауловых лесов является одним из главных факторов, ведущих к интенсификации миграции песка. Саксаул – важное растение, которое не только закрепляет песок, но и создает среду обитания для пустынной фауны. Поэтому его сокращение не только усиливает миграцию песка, но и приводит к снижению биоразнообразия.

Юго-восточная часть пустыни Карши в основном состоит из кустарников, где разнообразие почвенных и рельефных условий напрямую влияет на распространение кустарниковой растительности. В фитоценозах в районах, прилегающих к Кызылкуму, увеличивается доля таких кустарников, как *Salsola arbuscula*, *Artemisia diffusa*, *Calligonum microcarpum* и *Convolvulus divaricatus* [9]. Эти виды адаптированы к пустынным ландшафтам региона и могут произрастать на песчаных и



засоленных почвах. Их экологическая роль определяется укреплением почвы, снижением воздействия ветра и поддержанием стабильности пищевой цепи.

Вопрос использования пастбищных угодий актуален и для ландшафтов Каршиской степи. В Кашкадарьинской области ведется научно-практическая работа по контролю использования пастбищ, созданию их картографического описания и мониторингу продуктивности кормовых культур. Весной определяется продуктивность пастбищ на основе методических схем, анализируются средние многолетние показатели продуктивности, проводятся полевые наблюдения на основных пастбищных участках [10]. Научно обоснованная система использования пастбищ является важным инструментом регулирования нагрузки на скот и предотвращения процессов деградации.

Также были определены приоритетные области эффективного использования пастбищных угодий в республике, отражающие вопросы сохранения экологической среды степно-пастбищных регионов и восстановления биоразнообразия. В частности, на примере каракульского животноводства были предложены научные рекомендации и практические решения по рациональному использованию пастбищ [11]. Этот опыт создает важную научную базу, которая может быть применена и в Каршиской степи.

Из-за засушливого климата региона, низкого уровня осадков, сильных ветров и легких почв орошаемые и открытые участки подвержены ветровой эрозии. Для ее уменьшения целесообразно создавать ветрозащитные полосы, высаживать пустынные растения, такие как саксаул, кандим и черкиз, и обрабатывать землю перпендикулярно направлению ветра. Также важно строго соблюдать стандарты орошения, широко внедрять технологии капельного орошения и улучшать дренажные системы для борьбы с засолением. Эффективными мерами являются также ограничение чрезмерного выпаса скота на пастбищах, их попеременное использование и временное восстановление эродированных участков. Для уменьшения переноса песка можно использовать механические барьеры, защитные покрытия и методы биологического укрепления. Технологии дистанционного зондирования позволяют отслеживать и оценивать эти процессы в режиме реального времени.

Развитие экотуризма с использованием степных ландшафтов Карши также может служить одним из перспективных направлений. Природные ландшафты региона, уникальность степных экосистем, уникальная флора и фауна, а также культурно-исторические объекты Кашкадарьинской области в совокупности формируют большой туристический и рекреационный потенциал. Развитие экотуризма позволяет защищать природные ландшафты в гармонии с экономическими интересами. В этой связи важно повышать качество туристических и рекреационных услуг,



соблюдать экологические нормы при использовании природных территорий и укреплять интересы местного населения [13].

В целом, проведенные анализы показали, что ландшафты Каршиской степи представляют собой сложную природно-антропогенную систему. В регионе климатические факторы, почвенный и растительный покров, режим водных ресурсов и экономическая деятельность человека взаимодействуют, формируя нынешнее экологическое состояние ландшафтов. Для устранения существующих проблем необходимо разработать научно обоснованные меры защиты, усилить территориальный контроль и внедрить принципы устойчивого управления в использовании природных ресурсов.

**Обсуждение.** Результаты показывают, что ландшафты пустыни Карши формируются под сильным антропогенным давлением наряду с природными факторами. В частности, чрезмерное использование пастбищ приводит к уничтожению растительного покрова и разрыхлению почвы. В результате усиливается ветровая эрозия и ускоряется движение песчаных масс. Неправильное управление орошаемыми землями ускоряет засоление почвы. Неэффективное использование воды приводит к повышению уровня грунтовых вод и вторичному засолению. Такие процессы снижают возможность естественного восстановления ландшафтов. Фито-мелиоративные меры, в частности, восстановление саксовых лесов, посадка пустынных растений и создание окружающих нас древесных насаждений, могут значительно снизить миграцию песка. Внедрение современных технологий капельного орошения позволяет экономить водные ресурсы. Чередование использования пастбищ, временное закрытие деградированных участков и нормализация нагрузки на скот обеспечивают стабильность ландшафта. Регулярный мониторинг на основе ГИС и технологий дистанционного зондирования позволяет быстро выявлять экологические изменения. Развитие экотуризма формирует устойчивую модель управления, которая способствует сохранению природной среды и одновременно повышает экономический потенциал региона.

**Заключение.** Ландшафты пустыни Карши, как сложная природная система, представляют собой важную территорию, определяющую экологическую стабильность и потенциал природных ресурсов региона. Исследования показывают, что пустынные экосистемы претерпевают значительные преобразования под влиянием изменения климата, истощения водных ресурсов и антропогенного воздействия. В результате ускоряются негативные процессы, такие как деградация почв, ветровая эрозия, миграция песка и потеря биоразнообразия. Важен комплексный подход к охране ландшафта, требующий рационального использования природных ресурсов, восстановления деградированных территорий, расширения фито-мелиорационных мероприятий и внедрения современных систем мониторинга. В частности, естественное равновесие

экосистем может поддерживаться за счет умеренного использования пастбищ, применения водосберегающих технологий и восстановления пустынной растительности. Развитие экотуризма в регионе позволяет сочетать экономические интересы с мерами по охране окружающей среды. Таким образом, только при осуществлении охраны ландшафтов пустыни Карши на основе принципов устойчивого развития можно сохранить экологическую безопасность и природный потенциал региона для будущих поколений.

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## **РАЗВИТИЕ КРИТИЧЕСКОГО МЫШЛЕНИЯ ОБУЧАЮЩИХСЯ В КОНТЕКСТЕ СОВРЕМЕННОГО ЯЗЫКОВОГО ОБРАЗОВАНИЯ**

***Аннотация:** Статья посвящена актуальной проблеме использования технологии развития критического мышления в процессе обучения русскому языку. Особое внимание уделяется развитию навыков анализа содержания, стиля и языковой формы текста, умению выделять ключевые элементы, обобщать и сопоставлять факты, проводить сравнение, формулировать аргументированные выводы, а также критически оценивать полученную информацию.*

***Ключевые слова:** критическое мышление, технология развития критического мышления, стадия вызова, стадия осмысления содержания, стадия рефлексии, технологический цикл.*

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## **DEVELOPMENT OF CRITICAL THINKING OF STUDENTS IN THE CONTEXT OF MODERN LANGUAGE EDUCATION**

***Annotation:** This article explores the topical issue of using critical thinking development technologies in Russian language teaching. Particular attention is paid to developing skills in analyzing the content, style, and linguistic form of texts; identifying key elements; summarizing and comparing facts; making comparisons; formulating reasoned conclusions; and critically evaluating the information received.*

***Key words:** critical thinking, technology of critical thinking development, challenge stage, stage of understanding the content, stage of reflection, technological cycle.*

Современное образование ставит перед собой задачу не только передачи знаний, но и формирования у обучающихся навыков самостоятельного мышления, умения анализировать информацию и делать обоснованные выводы. В этом контексте развитие критического мышления приобретает особое значение как важнейшая педагогическая технология. Особенность обучения русскому языку заключается в необходимости не только овладения языковыми нормами, но и развития способности

понимать, интерпретировать и оценивать тексты различной стилистической и жанровой направленности.

Использование технологии развития критического мышления в процессе преподавания русского языка способствует активизации познавательной деятельности студентов, формированию аналитических и рефлексивных навыков, что в конечном итоге повышает качество обучения и развивает универсальные компетенции, востребованные в профессиональной и социальной жизни.

Под критическим мышлением (critical thinking) понимается дисциплинированное, самонаправленное мышление, которое иллюстрирует усовершенствования мысли соответствующие к специфическому способу или области мысли. Оно разделяется на две формы. Если дисциплинировано отвечать интересам специфического индивидуума или группы, исключая других уместных людей и группы, это софистический или слабый смысл критического мышления, Если дисциплинировано принимать во внимание интересы разнообразных людей или групп, это — справедливый или сильный смысл критического мышления [6].

Критическое мышление — это процесс соотнесения внешней информации с имеющимися у человека знаниями, выработка решений о том, что можно принять, что необходимо дополнить, а что - отвергнуть. При этом иногда приходится корректировать собственные убеждения или даже отказываться от них, если они противоречат новому знанию [4].

Критическое мышление способствует не только активному восприятию информации, но и формированию навыков эффективного принятия решений на основе полученных данных. При этом важны не только внутренние умственные процессы, но и умение вести диалог, взаимодействовать с окружающими. Тем не менее, критическое мышление охватывает не только рациональную сторону — в него вовлечены также эмоции и чувства, которые влияют на принятие решений. В результате развитие критического мышления помогает осознанно и ответственно действовать, включая социально значимые поступки.

В различных научных источниках можно найти разные определения термина «критическое мышление». Дж. Браус и Д. Вуд определяют его как разумное рефлексивное мышление, сфокусированное на решении того, во что верить и что делать. Критики пытаются понять и осознать своё собственное «Я», быть объективными, логичными, пытаются понять другие точки зрения. Критическое мышление, по их мнению, — это поиск здравого смысла: «как рассудить объективно и поступить логично с учётом как своей точки зрения, так и других мнений, умение отказаться от собственных предубеждений. Критические мыслители способны выдвинуть новые идеи и увидеть новые возможности, что весьма существенно при решении проблем» [1].

Д. Халперн определяет критическое мышление следующим образом: это «направленное мышление, оно отличается взвешенностью, логичностью и целенаправленностью, его отличает использование таких когнитивных навыков и стратегий, которые увеличивают вероятность получения желательного результата» [7].

Критическое мышление - это способность ставить новые вопросы, вырабатывать разнообразные аргументы, принимать независимые продуманные решения.

Цель технологии — способствовать развитию критического мышления через активное и интерактивное вовлечение студентов в образовательный процесс. Данная технология включает три ключевых этапа: вызов, осмысление и рефлексия — отражающие естественные принципы человеческого мышления, направленные на глубокое понимание и осознание собственных форм и предпосылок.

Модель «вызов — осмысление содержания — рефлексия» представляет собой единый процесс, в ходе которого преподаватель и студенты совместно движутся от поставленных целей к достижению результатов по изучаемой теме. При изучении нового материала важно, чтобы новая информация соотносилась с уже имеющимися у обучающихся знаниями. Это позволяет задействовать не только память, но и активизировать познавательные ресурсы студентов.

Первая стадия технологии развития критического мышления называется вызов (evocation stage). В этот момент преподаватель стимулирует студентов вспомнить и активировать свои предыдущие знания по теме, а также мотивирует их к дальнейшему изучению. Одним из эффективных способов является обмен противоречивой или неполной информацией в ходе парной или групповой работы. Особенно важно, чтобы на этапе вызова не допускалась критика — создавалась атмосфера открытого обмена мнениями и гипотезами. Студенты вспоминают, что им известно по теме, делают предположения, систематизируют имеющуюся информацию и формулируют вопросы, на которые хотят получить ответы в ходе изучения нового материала.

На этой стадии можно использовать следующие приёмы и методы: рассказ -предположение по ключевым словам; систематизация материала: кластеры, таблицы; верные и неверные утверждения; перепутанные логические цепочки и т. д.

Если преподаватель грамотно организует работу на стадии вызова, побуждает студентов активно формулировать свои вопросы, предположения и идеи, у них возникает естественное желание узнать новое. Когда студенты читают текст, слушают объяснение преподавателя, просматривают фильм, они стараются найти ответы на свои вопросы. Информация, полученная на стадии вызова, выслушивается, записывается, обсуждается. Работа ведётся индивидуально, в парах и в группах.



Вторая стадия носит название осмысление содержания (realization of meaning). На этом этапе основная задача преподавателя — поддерживать интерес студентов к теме и обеспечивать постепенный переход от уже известных знаний к новым.

Преподаватели также предлагают разнообразные альтернативные источники информации, чтобы стимулировать более глубокое и всестороннее понимание темы. Студенты в этот момент читают или слушают материал, используя активные методы восприятия информации, такие как выделение ключевых моментов, пометки на полях или ведение конспектов, что помогает им лучше осмысливать и усваивать новую информацию.

Для этой стадии характерны вдумчивые рассуждения (как устные, так и письменные), систематизация и оценивание новой информации. В процессе обмена мнениями по поводу прочитанного или услышанного студенты постепенно осознают, что один и тот же текст может порождать оценки, различающиеся по форме и по содержанию.

На этой стадии можно использовать следующие методы активного чтения: маркировка с использованием значков «V», «+», «-», «?» (по мере чтения их ставят на полях справа); ведение различных записей типа двойных дневников, бортовых журналов; поиск ответов на поставленные в первой части занятия вопросы и т. д.

На этапе рефлексии студенты не только формулируют и выражают выводы по изученной теме в различных формах, но и выдвигают новые вопросы, предлагают гипотезы и выявляют пробелы в своих знаниях. Это свидетельствует о том, что они достигли поставленных целей и даже самостоятельно сформулировали новые, что создает основу для перехода к следующей теме.

Важно отметить, что на стадии осмысления содержания работа чаще всего ведется индивидуально или в парах, что способствует более глубокому усвоению материала и развитию навыков самостоятельного анализа.

Третья стадия называется рефлексия (reflection). В процессе рефлексии та информация, которая была новой, становится присвоенной, превращается в собственное знание. Анализируя функции двух первых стадий технологии развития критического мышления, можно сделать вывод о том, что, по сути, рефлексивный анализ и оценка пронизывают все этапы работы.

Деятельность преподавателя направлена на возвращение студентов к первоначальным записям - предположениям, введение изменения, дополнения. Преподаватель предлагает творческие, исследовательские или практические задания на основе изученной информации. Студенты соотносят «новую» информацию со старой, используя знания, полученные на стадии осмысления.

На этой стадии можно использовать следующие приёмы и методы: заполнение кластеров, таблиц; установление причинно-следственных связей между блоками информации; возврат к ключевым словам, верным и неверным утверждениям; ответы на поставленные вопросы; организация устных и письменных круглых столов; организация различных видов дискуссий; написание творческих работ и т. д.

На стадии рефлексии осуществляется творческая переработка, анализ, интерпретация изученной информации. Работа ведётся индивидуально, в парах или группах.

Таким образом, этапы вызова, осмысления и рефлексии, входящие в базовую модель, формируют единый технологический цикл.

Применение технологии развития критического мышления на занятиях способствует не только более глубокому усвоению знаний, но и формированию у студентов интереса к обучению, уверенности в самовыражении, способности аргументировать свою позицию, а также навыков эффективного и конструктивного взаимодействия в коллективе.

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## **РАЗВИТИЕ ЛЕКСИЧЕСКИХ НАВЫКОВ ЧЕРЕЗ ТЕХНОЛОГИЮ КРИТИЧЕСКОГО МЫШЛЕНИЯ В ОБРАЗОВАТЕЛЬНОМ ПРОЦЕССЕ**

***Аннотация:** Статья посвящена применению технологии развития критического мышления при обучении лексической стороне речи. Рассматриваются этапы работы с лексикой (вызов, осмысление, рефлексия) и методические приёмы, способствующие формированию лексического навыка, расширению словарного запаса и развитию аналитических и коммуникативных умений обучающихся. Особое внимание уделено активизации познавательной деятельности и роли педагога в организации учебного процесса.*

***Ключевые слова:** критическое мышление, лексика, лексический навык, обучение русскому языку, методические приёмы, этапы работы, педагогическая технология.*

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## **DEVELOPMENT OF LEXICAL SKILLS THROUGH CRITICAL THINKING TECHNOLOGY IN THE EDUCATIONAL PROCESS**

***Abstract:** This article explores the use of critical thinking development technologies in teaching vocabulary. It examines the stages of vocabulary development (challenge, comprehension, reflection) and methodological techniques that contribute to the development of vocabulary skills, vocabulary expansion, and the development of students' analytical and communicative skills. Particular attention is paid to activating cognitive activity and the teacher's role in organizing the educational process.*

***Keywords:** critical thinking, vocabulary, vocabulary skills, Russian language teaching, methodological techniques, stages of work, pedagogical technology.*

Языковое образование сегодня рассматривается как одно из приоритетных направлений обновления образовательной системы. Обучение языку призвано не только обеспечивать усвоение знаний, но и активизировать познавательную деятельность обучающихся,

способствовать развитию их интеллектуальных способностей, аналитического мышления и речевых навыков.

В процессе освоения языка особое внимание уделяется лексической стороне речи, поскольку именно словарный состав составляет основу речевого взаимодействия. Владение лексическими единицами и умение адекватно использовать их в различных контекстах определяют успешность речевой деятельности и уровень сформированности языковой компетенции. Исходя из этого, обучение лексике является важной долговременной задачей [8].

Использование технологии развития критического мышления в преподавании языка и работе над словарным составом вызывает обоснованный интерес у педагогов, поскольку открывает дополнительные возможности для повышения эффективности учебного процесса. Приемы развития критического мышления позволяют активизировать лексический материал, способствуют расширению активного словаря обучающихся и формированию навыков осознанного употребления языковых единиц.

По Н. Д. Гальсковой, лексика – это система слов и похожих с ними по роли и значению объединений. Та или иная единица лексики входит в конкретные лексические группы, и в этом проявляется системность лексики. [1].

Еще одну дефиницию дает С. И. Ожегов, считая лексику словарной структурой языка, его стиля, в том числе и отдельного произведения [9].

Лексический компонент занимает значимое место на всех этапах языкового обучения. Освоение словарного состава рассматривается как одно из ключевых направлений формирования коммуникативной компетенции. Основной целью обучения лексике является развитие лексического навыка, обеспечивающего свободное и уместное использование языковых единиц в речевой практике.

Проблема определения сущности лексического навыка неоднократно становилась предметом научного анализа в трудах представителей педагогики и психологии. Данный феномен рассматривался в исследованиях методистов Е. И. Пассов, С. Ф. Шатилов, а также психологов А. А. Леонтьев и И. А. Зимняя. В обобщённом понимании лексический навык трактуется как автоматизированное действие, реализуемое в процессе речевой деятельности и обеспечивающее быстрое и адекватное соотнесение слова с его значением и коммуникативной задачей.

Р. К. Миньяр-Белоручев определяет лексический навык как умение без промедления вызывать из долговременной памяти эталон слова в соответствии с конкретной речевой задачей и вводить его в речевую цепочку [5].

Можно рассматривать лексический навык как обусловленное той или иной ситуацией действие по выбору и использованию лексической

единицы в соответствии с замыслом, ее сочетанием с другими единицами [6].

Работа с лексическим материалом предполагает целенаправленное формирование и совершенствование лексического навыка, а также установление прочных ассоциативных и семантических связей между языковыми единицами. Именно системность и регулярность упражнений обеспечивают прочность запоминания и готовность к оперативному использованию слов в речевой практике. Организация обучения лексической стороне речи требует чёткого понимания этапов работы с лексикой. Последовательность введения, первичного закрепления, тренировки и последующего применения словарных единиц в различных коммуникативных ситуациях позволяет обеспечить постепенный переход от осознания значения слова к его свободному и уместному употреблению в речи.

По мнению Н. И. Гез, к числу базовых этапов относятся: введение новых лексических единиц, их первичное закрепление и последующая автоматизация в речи. Каждый из указанных этапов выполняет самостоятельную функцию и вместе с тем является частью единой системы формирования лексического навыка [3]: представление незнакомого лексического материала, начальное закрепление, развитие навыков употребления лексики в письменных и устных высказываниях.

Первый этап предполагает актуализацию ранее сформированных знаний и организацию работы по введению новой лексики. В рамках данного этапа осуществляется семантизация слов, уточняется их значение, особенности сочетаемости и сферы употребления. Этап ознакомления имеет принципиальное значение, поскольку именно от качества первичного восприятия и осмысления лексических единиц во многом зависит успешность их дальнейшего усвоения и включения в активный словарь обучающихся.

На втором этапе деятельность усложняется и приобретает более вариативный характер. Обучающиеся выполняют разнообразные тренировочные упражнения, направленные на формирование прочных лексических связей и автоматизацию употребления слов. На данном уровне возрастает степень самостоятельности, расширяются коммуникативные задачи, что требует более точного и осознанного использования языковых средств. Постепенно лексический материал начинает функционировать в усложнённых речевых ситуациях.

Третий этап связан с практическим применением усвоенной лексики в различных видах речевой деятельности. Новые слова включаются в устные и письменные высказывания, используются при построении диалогов и монологов, а также распознаются и интерпретируются в процессе аудирования и чтения. Именно на этапе применения происходит окончательное закрепление лексических единиц и их переход в активный словарь, что свидетельствует о сформированности лексического навыка.



Уточнив основные этапы работы с лексическим материалом, целесообразно обратиться к анализу путей и методов совершенствования обучения лексической стороне речи. Эффективность данного процесса напрямую связана с продуманной организацией всех его компонентов и их согласованным взаимодействием. Обучение лексике предполагает системный характер, при котором каждый элемент выполняет определённую функцию. В структуре процесса выделяются обучающиеся как активные субъекты деятельности, лексический материал как объект усвоения, учебные действия, направленные на его освоение, а также средства и формы организации работы. Существенную роль играет направляющая деятельность преподавателя, обеспечивающая мотивацию, контроль и корректировку учебного процесса. [7].

В современных условиях особое внимание уделяется развитию критического мышления у обучающихся, поскольку этот навык является ключевым при работе с информацией и формировании самостоятельной позиции. Применение технологии развития критического мышления в процессе обучения лексике вызывает обоснованный интерес педагогов.

Основными инструментами технологии развития критического мышления являются чтение и письмо. При работе с текстом обучающиеся не ограничиваются пассивным восприятием информации: они анализируют прочитанное, сопоставляют новые данные с уже имеющимися знаниями и выявляют незнакомые элементы. Особое внимание уделяется лексике — студенты ищут значение новых слов, осознают их употребление и практикуют их включение в собственную речевую деятельность. Кроме того, обучающиеся выявляют проблемные моменты текста, формулируют вопросы и активно ищут на них ответы, что стимулирует более глубокое понимание материала.

Занятия, построенные с использованием данной технологии, отличаются высокой вовлечённостью и динамичностью. Обучающиеся занимают активную позицию в образовательном процессе и становятся его основными действующими лицами, так как они не просто воспринимают информацию, а активно размышляют, рассуждают и создают письменные высказывания. Такой подход способствует не только развитию критического мышления, но и формированию прочного лексического навыка и коммуникативной компетенции. Работе с новым текстом отводится основная роль. Его читают и анализируют [4].

В основе технологии развития критического мышления лежит модель, состоящая из трёх взаимосвязанных этапов: вызов, осмысление и рефлексия. На этапе вызова обучающиеся активизируют имеющиеся знания, формулируют вопросы и определяют проблемные зоны в материале. Этап осмысления предполагает глубокую работу с информацией: анализ, сопоставление, интерпретацию и применение новых знаний в речевой практике. На стадии рефлексии происходит осознанное



обобщение результатов деятельности, оценка собственных решений и формирование устойчивых навыков.

На этапе вызова применяются разнообразные приёмы технологии развития критического мышления, такие как «Корзина идей», «Кластер», «Концептуальное колесо» и другие. Так, при использовании приёма «Корзина идей» можно организовать как индивидуальную, так и групповую работу для актуализации имеющихся знаний и языкового опыта. Обучающиеся создают «корзину», куда помещают всё, что уже известно по заданной теме. Это не только помогает вспомнить ранее изученный материал, но и позволяет педагогу оценить уровень знаний, выявить пробелы и определить дальнейшие шаги в работе.

Приём «Концептуальное колесо» проявляет высокую эффективность на стадии вызова при работе над лексической стороной речи. В центр колеса помещается ключевое слово, а обучающиеся подбирают к нему синонимы и вписывают их в отдельные секторы. Такая деятельность способствует расширению семантической стороны словаря, формированию навыка точного подбора слов и пополнению активного словарного запаса.

На стадии осмысления работа становится более целенаправленной и углублённой. Обучающиеся отслеживают собственное понимание материала, решают возникающие трудности, определяют интересующие их аспекты и выделяют значимые моменты. На этом этапе могут быть использованы такие приёмы технологии развития критического мышления, как «Инсерт», «Плюс – минус – интересно», «Мозаика» и другие.

Приём «Плюс – минус – интересно» особенно хорошо активизирует лексические связи, позволяет студентам анализировать и структурировать информацию, а при необходимости его можно адаптировать для устной работы без письменного заполнения таблицы. Метод «Мозаика» предполагает групповую работу: каждая группа анализирует определённый фрагмент текста, после чего формируется целостное впечатление о материале. Такой подход развивает навыки работы в команде, умение выделять главное и творчески взаимодействовать с лексикой, что способствует более прочному закреплению информации.

На заключительном этапе рефлексии происходит осмысление уже имеющейся и приобретённой информации. Обучающиеся формируют личное отношение к изученному материалу, уточняют знания о лексических значениях слов и особенностях их употребления.

Таким образом, обучение лексической стороне речи представляет собой сложный и непрерывный процесс, включающий формирование навыков подбора слов, построения предложений и грамотного выражения мыслей в устной и письменной форме. Важной частью этого процесса является не только умение находить и анализировать информацию, но и

способность применять знания на практике, актуализировать личный опыт и развивать коммуникативные компетенции.

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## **ИССЛЕДОВАНИЕ ПАРАЗИТАРНЫХ СООБЩЕСТВ ОЗЕРА ДАУТКУЛЬ И ИХ ЭКОЛОГИЧЕСКАЯ РОЛЬ**

**Аннотация:** Статья посвящена комплексному исследованию паразитарных сообществ озера Дауткуль и их влиянию на экосистему водоема. Рассматриваются видовой состав паразитов гидробионтов, интенсивность их заражения, особенности жизненных циклов, а также экологическая роль паразитов в регулировании численности хозяев и поддержании структуры пищевых цепей. Установлено, что паразиты выполняют ключевую экологическую функцию, способствуя поддержанию биоразнообразия, устойчивости популяций и экологического равновесия водоема. Данные исследования имеют значение для мониторинга состояния водоемов, прогнозирования последствий антропогенных и природных изменений, а также разработки стратегий охраны и рационального использования биоресурсов.

**Ключевые слова:** паразиты, Дауткуль, гидробионты, экосистема, биологическое равновесие, паразитарная нагрузка, гельминты, эктопаразиты.

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## **A STUDY OF PARASITIC COMMUNITIES OF LAKE DAUTKUL AND THEIR ECOLOGICAL ROLE**

**Abstract:** This article is devoted to a comprehensive study of the parasitic communities of Lake Dautkul and their impact on the reservoir's ecosystem. The article examines the species composition of aquatic parasites, the intensity of their infestation, life cycle characteristics, and the ecological role of parasites in regulating host populations and maintaining food web structure. It has been

*established that parasites perform a key ecological function, contributing to the maintenance of biodiversity, population stability, and the ecological balance of the reservoir. These studies are important for monitoring the condition of water bodies, predicting the impacts of anthropogenic and natural changes, and developing strategies for the conservation and sustainable use of bioresources.*

**Key words:** *parasites, Dautkul, aquatic organisms, ecosystem, biological balance, parasite load, helminths, ectoparasites.*

## Введение

Паразиты являются важной частью пресноводных экосистем, влияя на численность хозяев, структуру сообществ и потоки энергии. Озеро Дауткуль, с разнообразием гидробионтов — рыб, моллюсков, ракообразных и амфибий, — создает условия для формирования сложных паразитарных сообществ. Изучение их видового состава и степени заражения позволяет оценить экологическую значимость паразитов. Несмотря на это, комплексные исследования озера ограничены отдельными наблюдениями, что затрудняет оценку их влияния на экосистему. Цель исследования — выявить паразитарные сообщества озера Дауткуль, определить их распространенность и интенсивность заражения, а также оценить их роль в формировании структуры и устойчивости водного биоценоза.

## Материалы и методы

Объектом исследования было озеро Дауткуль и его гидробионты. Исследования проводились летом и осенью 2025 г. для учёта сезонной динамики паразитов. Гидробионты собирали стандартными методами: рыбы — сетями и удочками, моллюски — вручную и донными ловушками, ракообразные — ловушками и ситами. В лаборатории определялись видовая принадлежность и возраст хозяев. Эктопаразиты удалялись с поверхности, внутренние — вскрытием органов хозяев. Идентификация проводилась с помощью микроскопии и морфологических ключей. Паразитарная нагрузка оценивалась по частоте заражения (F%), интенсивности (I) и преобладающим видам. Экологическая роль паразитов анализировалась через их влияние на численность хозяев, структуру пищевых цепей, биоразнообразие и устойчивость экосистемы, включая сезонные колебания и связь с различными группами гидробионтов.

## Результаты и обсуждение

Исследования выявили разнообразие паразитарной фауны, включающей гельминтов (трематоды, цестоды, нематоды), простейших (кокцидии, инфузории) и эктопаразитов (паразитические ракообразные и личинки насекомых). У рыб чаще всего встречались трематоды *Tylodelphys clavata* и *Diplostomum spathaceum*, у моллюсков — нематоды и трематоды, у ракообразных — *Copepoda parasitica* и *Argulus foliaceus* (таблица 1)

Таблица 1

**Видовой состав паразитов гидробионтов озера Дауткуль и  
показатели их заражения**

| Гидробионты  | Основные виды паразитов                                        | Частота заражения (F%) | Интенсивность (I) |
|--------------|----------------------------------------------------------------|------------------------|-------------------|
| Рыбы         | <i>Tyloodelphys clavata</i> ,<br><i>Diplostomum spathaceum</i> | 60–70%                 | 5–30 особей       |
| Моллюски     | <i>Nematoda sp.</i> , <i>Trematoda sp.</i>                     | 40–55%                 | 2–15 особей       |
| Ракообразные | <i>Copepoda parasitica</i> ,<br><i>Argulus foliaceus</i>       | 25–40%                 | 1–10 особей       |

Летний период характеризовался высокой частотой заражения рыб трематодами, что связано с оптимальной температурой воды и увеличением численности промежуточных хозяев, таких как моллюски. В осенний период частота заражения снижалась, однако интенсивность у отдельных хозяев возрастала, что объясняется накоплением паразитов в течение сезона и завершением их жизненных циклов.

Паразиты оказывают регуляторное влияние на экосистему, ограничивая чрезмерное размножение отдельных видов гидробионтов и предотвращая деградацию водных сообществ. Они формируют трофические связи между различными уровнями пищевой цепи, способствуя перераспределению энергии и питательных веществ. Паразитарная нагрузка стимулирует адаптивные реакции хозяев, включая иммунные и поведенческие механизмы, что способствует поддержанию устойчивости популяций.

Анализ показал, что паразитарные сообщества озера Дауткуль являются интегральным компонентом экосистемы. Несмотря на отрицательное воздействие на отдельные гидробионты, паразиты выполняют важную регуляторную функцию, поддерживая численность и биоразнообразие водных организмов. Сложные жизненные циклы, вовлечение нескольких промежуточных хозяев и сезонная динамика паразитарной нагрузки демонстрируют тесную взаимосвязь паразитов с экосистемой. Данные исследования позволяют прогнозировать влияние антропогенных и природных факторов на состояние водоема, разрабатывать меры охраны водных ресурсов и рационального использования биоресурсов. Особенно важно учитывать паразитарную нагрузку при оценке экологического равновесия, планировании рыбозаповедения и мониторинге качества воды.

### **Заключение**

Паразитарные сообщества озера Дауткуль играют ключевую роль в поддержании структуры и устойчивости экосистемы. Они регулируют численность гидробионтов, формируют трофические связи, стимулируют адаптивные реакции хозяев и способствуют сохранению биоразнообразия.

Выявленные виды паразитов, показатели частоты и интенсивности заражения позволяют комплексно оценить экологическое состояние водоема и разработать меры по его охране. Комплексное изучение паразитарной фауны является важным инструментом мониторинга пресноводных экосистем и планирования устойчивого использования их ресурсов.

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## **РОЛЬ ГОСУДАРСТВЕННОГО РЕГУЛИРОВАНИЯ В РАСКРЫТИИ ПОТЕНЦИАЛА СУБЪЕКТОВ МАЛОГО ПРЕДПРИНИМАТЕЛЬСТВА**

**Аннотация:** В статье исследуется государственное регулирование как ключевой инструмент формирования и реализации потенциала малого предпринимательства в Узбекистане в условиях цифровизации и устойчивого развития. Анализируется эволюция вклада малого бизнеса в экономику: по данным Национального комитета статистики, в 2025 году доля малого предпринимательства в ВВП достигла 52,2 %, а количество действующих субъектов превысило 1,2 млн единиц. Рассматриваются глобальные тренды предпринимательства по отчету GEM 2025/2026, включая рекордные уровни стартап-активности, но с растущими разрывами в выживаемости фирм и готовности к использованию ИИ. Обосновывается переход от экзогенного к эндогенному пониманию роли предпринимательства в экономическом росте, с акцентом на инновации, человеческий капитал и институциональную среду. Выявлены региональные диспропорции и барьеры, такие как цифровой разрыв и ограниченный доступ к финансированию. Предлагается матрица механизмов государственного регулирования, ориентированных на добровольную мотивацию, снижение транзакционных издержек и поддержку рост-ориентированных предприятий. На основе кейсов Узбекистана и международного опыта (Сингапур, Индия, ЕС) формулируются рекомендации по гармонизации интересов бизнеса и государства. Исследование вносит вклад в научное обоснование политики, направленной на достижение целей Стратегии «Узбекистан-2030» по повышению роли частного сектора до 80 % в ВВП к 2030 году.

**Ключевые слова:** малое предпринимательство, государственное регулирование, потенциал предпринимательства, цифровизация, устойчивое развитие, инновационная активность, Стратегия Узбекистан-2030.

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## **THE ROLE OF STATE REGULATION IN UNLOCKING THE POTENTIAL OF SMALL ENTREPRENEURSHIP ENTITIES**

**Abstract:** *The article examines state regulation as a key instrument for forming and realizing the potential of small entrepreneurship in Uzbekistan amid digitalization and sustainable development. The evolution of small business contribution to the economy is analyzed: according to the National Committee of Statistics, in 2025 the share of small entrepreneurship in GDP reached 52.2 %, with over 1.2 million active entities. Global entrepreneurship trends from the GEM 2025/2026 Report are considered, including record startup activity levels but widening survival and AI readiness gaps. The shift from exogenous to endogenous understanding of entrepreneurship's role in economic growth is substantiated, emphasizing innovation, human capital, and institutional environment. Regional disparities and barriers such as digital divide and limited financing access are identified. A matrix of state regulation mechanisms is proposed, focused on voluntary motivation, transaction cost reduction, and support for high-growth enterprises. Recommendations are formulated based on Uzbekistan and international cases (Singapore, India, EU) for harmonizing business and state interests. The study contributes to scientific substantiation of policies aimed at achieving the "Uzbekistan-2030" Strategy goals of raising the private sector share to 80 % of GDP by 2030.*

**Key words:** *small entrepreneurship, state regulation, entrepreneurship potential, digitalization, sustainable development, innovative activity, Uzbekistan-2030 Strategy*

### **Введение**

Малый бизнес в Узбекистане продолжает играть ключевую роль в трансформации экономики, способствуя эффективному обороту ресурсов, стимулированию потребительского спроса и повышению уровня инноваций. В условиях глобальной цифровизации и перехода к устойчивому развитию малое предпринимательство демонстрирует потенциал для структурной перестройки экономики, хотя сохраняется

вызов низкой адаптивности к внешним изменениям, таким как геополитическая нестабильность и климатические риски [1]. Государственное регулирование, ориентированное на интеграцию цифровых технологий и зеленых инициатив, становится критическим инструментом для стабилизации и усиления экономического прогресса, учитывая совокупность факторов, включая энергоэффективность и интеграцию в глобальные цепочки поставок [2].

Согласно данным Национального комитета статистики Республики Узбекистан, по состоянию на 1 октября 2025 года количество активных субъектов малого бизнеса достигло 1,21 млн единиц, включая 479 тыс. малых предприятий и микрофирм, 281,9 тыс. индивидуальных предпринимателей и другие формы [3]. За первые девять месяцев 2025 года их вклад в ВВП составил 51,5%, с наибольшей долей в сельском хозяйстве, лесном хозяйстве и рыболовстве (96,9%), строительстве (77,6%), услугах (45,1%) и промышленности (26,4%) [4]. По сравнению с 2024 годом наблюдается рост числа новых предприятий: только в январе–апреле 2025 года зарегистрировано 26,738 субъектов (без учета ферм), преимущественно в торговле (10,016), сельском хозяйстве (3,661) и промышленности (3,265) [5]. Однако доля в ВВП слегка снизилась по сравнению с пиковыми значениями 2021–2023 годов (около 54,9% в 2021), что связано с ростом добавленной стоимости в крупных секторах, таких как энергетика и добыча [6].

Региональная дифференциация сохраняется: наибольший вклад малого бизнеса в валовой региональный продукт (ВРП) отмечен в Сурхандарьинской (76,5%), Наманганской (72,8%) и Бухарской (72,2%) областях, в то время как в Навоийской области он остается низким - около 22,4%, из-за доминирования крупных промышленных предприятий [7]. В 2025 году ключевые показатели развития малого предпринимательства выросли: увеличилось количество предприятий, среднесписочная численность занятых (свыше 10 млн человек, или около 86% от общей занятости в 2024), оборот и объем инвестиций в основной капитал [8]. Это отражает глобальные тренды: согласно GEM 2025/2026 Global Report, мировая стартап-активность достигла рекордных уровней, но наблюдается "выживаемостный разрыв" (survival gap), где лишь немногие переходят в устойчивые фирмы, и "AI-готовностный разрыв" (AI readiness gap), с низким использованием ИИ в развивающихся экономиках (менее 1/3 новых предпринимателей ожидают его значимости) [9].

В контексте мировой экономики, где рост глобальной торговли замедлится до 1,5–4,6% в 2026 году (по UNCTAD), а предпринимательство фокусируется на AI, e-commerce и устойчивости, Узбекистан сталкивается с необходимостью усиления государственного регулирования [10]. Мировые тенденции включают переход к "зеленому" росту, цифровизацию и leap-структуры, позволяющим малым командам конкурировать глобально. В Узбекистане, с ВВП-ростом 7,2% в первой половине 2025

года (World Bank) и прогнозом 6,2% на весь год (IMF), малый бизнес должен интегрировать цифровые платформы и устойчивые практики для повышения социальной активности, снижения безработицы и расширения сфер деятельности [11]. Это требует качественных изменений в бизнес-моделях и государственной политике, направленных на гармонизацию интересов через новые коалиции, такие как Стратегия «Узбекистан-2030», фокусирующаяся на частном секторе, инновациях и зеленом переходе [12].

Актуальность темы обусловлена необходимостью анализа внутренних факторов развития малого предпринимательства в условиях цифровизации и устойчивого развития, с учетом глобальных вызовов, таких как климатические изменения и AI-диспропорции.

#### Степень разработанности проблемы

Теоретические основы предпринимательства заложены в работах классиков политической экономии: Р. Кантильон и Ж.-Б. Сэй ввели понятие предпринимательства как функции риска, нестабильных доходов и координации производства. Х. фон Мангольдт и И. фон Тюнен развили идею неопределенности внешней среды как источника предпринимательского дохода. Представители немецкой исторической школы (М. Вебер, В. Зомбарт, Г. Шмоллер) подчеркивали роль предпринимателя как инноватора и творца, а И. Шумпетер описывал предпринимательство как создание новых комбинаций факторов производства.

Дальнейшее развитие получили в трудах Ф. Найта (неопределенность как источник прибыли), Дж. Шекла (роль времени в экономике), а также неоавстрийской школы (Л. фон Мизес, Ф. фон Хайек), рассматривающей предпринимательство как процесс. Д. Макклелланд и Т. Шульц исследовали мотивацию предпринимателей. Институционалисты (Т. Веблен, Дж. К. Гэлбрейт, Дж. Коммонс) раскрыли агентские противоречия и природу фирмы как пакета контрактов (Дж. Акерлоф, А. Берле, Р. Коуз, Дж. Минз).

Интеграция предпринимательства в неоклассические модели отражена в работах В. Баумоля, Р. Уиллига, Дж. Панзара. Факторы уровня предпринимательства анализировали К. Дин, С. Зара, А. Томас. Связь с экономическим ростом изучали З. Грилихес, Э. Мэнсфилд, М. Надри, М. Портер, П. Ромер, Р. Солоу. Влияние на занятость - Д. Одречи, П. Дэвидсон, П. Рейнольдс, Р. Турич.

#### Результаты и обсуждения

Потенциал малого предпринимательства в Узбекистане и глобально представляет собой динамичный набор активов, закрепленных за субъектами малого бизнеса и территориями их базирования. В современных условиях, отмеченных цифровизацией, устойчивым развитием и интеграцией искусственного интеллекта (ИИ), этот потенциал эволюционирует от традиционных моделей к инновационным, ориентированным на глобальные цепочки поставок и экологические

стандарты. Согласно методологии Global Entrepreneurship Monitor (GEM) 2025/2026 Global Report, индекс оборота предпринимательского потенциала рассчитывается как соотношение между количеством созданных и ликвидированных бизнес-структур, отражая реальное вовлечение трудоспособного населения в предпринимательство и уровень благоприятности внешней среды [9]. Это позволяет не только измерить участие населения, но и выявить факторы, влияющие на национальный уровень предпринимательства, такие как доступ к финансированию, образование и технологическая инфраструктура.

Исследования GEM 2025/2026 подчеркивают глобальные тренды: рекордные уровни ранней предпринимательской активности (Total early-stage Entrepreneurial Activity, TEA), но с растущим "выживаемостным разрывом" (survival gap), где лишь немногие стартапы переходят в устойчивые фирмы, и "разрывом готовности к ИИ" (AI readiness gap), где менее 1/3 новых предпринимателей в развивающихся экономиках ожидают значимости ИИ [9]. В Узбекистане эти тенденции проявляются в росте числа малых предприятий: по данным Национального комитета статистики, на 1 января 2026 года количество действующих субъектов малого бизнеса на 1000 человек составило 31,7 единиц, а общее число малых предприятий и микрофирм достигло 474,9 тыс., что составляет 85% от всех предприятий страны [13][14]. Это отражает положительную динамику, но также региональные диспропорции: в Ташкенте и Ферганской долине наблюдается высокий уровень цифровизации, в то время как в Джизакской и Сурхандарьинской областях - отставание в доступе к интернету и оптико-волоконной инфраструктуре [15].

Для анализа воздействия предпринимательства на экономическую динамику традиционно применяются неоклассический подход и производственная функция Кобба-Дугласа, где в долгосрочной перспективе темпы роста зависят от инновационной активности, измеряемой расходами на НИОКР или количеством патентов. В классической интерпретации предпринимательство рассматривается как экзогенный фактор роста. Однако, опираясь на современные исследования, такие как работы П. Ромера по эндогенным моделям роста, я предлагаю трактовать предпринимательство как эндогенный фактор: предприниматель выступает инициатором инноваций на микроуровне, максимизируя прибыль через профессиональные компетенции, организационные коммуникации и передачу знаний [16]. В контексте 2026 года это особенно актуально с учетом интеграции ИИ: по данным GEM, 84% ранних предпринимателей учитывают социальные и экологические воздействия, что усиливает устойчивость бизнеса [9].

Высокая степень предпринимательской активности в малом бизнесе характеризуется риском, разнообразием и инновационностью, реализуемыми в условиях свободной конкуренции без жестких государственных регуляторов. В отличие от крупного бизнеса, где



инновации интегрированы в внутренние механизмы (например, через R&D-отделы), малые предприятия в Узбекистане часто полагаются на внешние стимулы, такие как доступ к цифровым платформам. Кейс Узбекистана: в 2022–2026 годах количество семейных предприятий удвоилось благодаря президентским декретам о поддержке семейного предпринимательства, что привело к росту вклада малого бизнеса в ВВП до 51,8% в 2022 году, с прогнозом на 55% к 2026-му [15]. Международный кейс: в Сингапуре программа Startup SG предоставляет гранты и менторство для малых инновационных фирм, что привело к росту ТЕА на 15% за 2025–2026 годы, демонстрируя эффективность комбинированного государственного и частного финансирования [17].

Понятие "потенциала малого предпринимательства" трактуется как набор активов, включая творческо-интеллектуальные ресурсы, определяющие рост-ориентированных предпринимателей. В постиндустриальной экономике доля материальных активов снижается: интеллектуальные компании, такие как в секторе ИКТ Узбекистана, имеют рыночную капитализацию, превышающую бухгалтерскую стоимость на 20–30% [15]. Однако барьеры, такие как высокая стоимость образования, ограничивают инвестиции в человеческий капитал: малые предприятия в Узбекистане предоставляют формальное обучение лишь 15% сотрудников, по сравнению с 40% в крупных фирмах [15]. Глобальный тренд: в 2026 году, по прогнозам UNCTAD, e-commerce для малых бизнесов вырастет до \$1,8 млрд в Узбекистане, подчеркивая необходимость цифровизации [2].

Развитие малых предприятий оказывает прямое (рост ВВП, инвестиций) и косвенное влияние (на рынок труда, социальные ориентиры). В Узбекистане малый бизнес обеспечивает 74% занятости, но двусмысленен эффект на безработицу: создание фирм снижает ее, но "эффект беженца" провоцирует отток талантов в страны с лучшим климатом, такие как Казахстан или ЕС [15]. Кейс мира: в Индии программа Mudra Yojana предоставила микрокредиты 300 млн малым предпринимателям, снизив безработицу на 5% за 2020–2026 годы, что может служить моделью для Узбекистана [17].

Для иллюстрации динамики представлена таблица ключевых показателей малого бизнеса в Узбекистане (данные на 2026 год, адаптировано из [13][18][14]):



| Показатель                                  | Значение на 1 января 2026 | Динамика по сравнению с 2025 (%)    | Региональные лидеры                               |
|---------------------------------------------|---------------------------|-------------------------------------|---------------------------------------------------|
| Количество малых предприятий и микрофирм    | 474,9 тыс.                | +5,2                                | Ташкент (106 тыс.), Самарканд (47,9 тыс.)         |
| Число предпринимателей на 1000 населения    | 31,7                      | +1,0                                | Джизак (61,0), Ташкент город (45,3)               |
| Вклад в ВВП                                 | ~52%                      | -0,3 (из-за роста крупных секторов) | Сельское хозяйство (96,9%), Строительство (77,6%) |
| Объем услуг, предоставленных малым бизнесом | \$4,8 млрд (прогноз +22%) | +22,1                               | ИКТ, здравоохранение, транспорт                   |
| Доступ к интернету среди фирм               | 18,8%                     | +10 (прогноз)                       | Ташкент (28,6%), Джизак (7,6%)                    |

Эта таблица демонстрирует рост, но и вызовы, такие как цифровой разрыв.

### Обсуждения

Высокая неопределенность внешней среды для малого бизнеса в Узбекистане требует развития добровольной мотивации, ориентированной на инновации, что обосновывает меры государственного регулирования. Анализ форм регулирования в Узбекистане и за рубежом показывает умеренную эффективность: несмотря на рост расходов на программы поддержки, корреляция с ключевыми показателями (количество фирм, занятость, оборот, инвестиции) слаба - коэффициент корреляции ~0,4 [15]. Это обуславливает смену парадигмы: от реактивных мер к проактивным, снижающим неопределенность через цифровизацию и устойчивость.

Государство играет роль в формировании институциональной среды для инноваций как эндогенного фактора роста, включая накопление человеческого капитала. Кейс Узбекистана: Стратегия "Узбекистан-2030" фокусируется на доступе к внешнему финансированию и инфраструктурным проектам, что удвоило число фирм в ИКТ-секторе за 2022–2026 [12][15]. Международный кейс: в ЕС программа Horizon Europe выделяет €95 млрд на 2021–2027 для малых инновационных фирм, интегрируя ИИ и зеленые технологии, что повысило выживаемость стартапов на 20% [19].

Применение поведенческой экономики, включая концепцию интерналий, позволяет государству корректировать аномалии в выборе предпринимателей. Ограничивающий фактор - транзакционные издержки: если они превышают издержки саморегулирования, вмешательство

неэффективно ("государственный провал"). В Узбекистане снижение налогов с 13 до 9 видов (2017–2022) уменьшило издержки на 15%, оправдывая вмешательство [15]. Главное направление - формирование целевых ориентиров, учитывающих территориальные особенности.

Различия в мотивации (добровольная vs. вынужденная) требуют дифференцированных методов: для добровольного - доступ к финансированию, программы поддержки, инфраструктура агломераций. Предпочтение отдается фирмам с высоким ростовым потенциалом. Проблема: недостаточная гибкость оценки активности, что искажает мониторинг. Решение: создание стабильной институциональной среды с саморегулируемыми органами.

Для сравнения представлена таблица международных кейсов поддержки малого предпринимательства (адаптировано из [20][17][21]):

| Страна/Регион       | Программа                    | Ключевые меры                       | Результаты (2026)                         |
|---------------------|------------------------------|-------------------------------------|-------------------------------------------|
| Узбекистан          | Семейное предпринимательство | Микрокредиты, упрощение регистрации | Удвоение фирм (2018–2026), 74% занятости  |
| Сингапур            | Startup SG                   | Гранты, менторство, ИИ-интеграция   | +15% ТЕА, 70% выживаемость стартапов      |
| Индия               | Mudra Yojana                 | Микрокредиты для 300 млн            | -5% безработицы, рост e-commerce          |
| ЕС                  | Horizon Europe               | €95 млрд на инновации               | +20% выживаемость, фокус на зеленом росте |
| Африка (Visa/Aruwa) | Капитал для SME              | Инвестиции OmniRetail               | в 120 тыс. фирм цифровировано             |

Эта таблица иллюстрирует, как адаптировать глобальные практики к Узбекистану для усиления потенциала.

### Заключение

Предложенные в настоящей работе теоретико-методические подходы и практические рекомендации направлены на формирование целеполагания региональных программ поддержки малого предпринимательства в регионах Узбекистана, а также на ускоренное развитие малого инновационного бизнеса в рамках глобальной стратегии регионального и национального развития. Их последовательная реализация позволит обеспечить стабильный, инклюзивный и устойчивый рост территориальных образований, минимизируя региональные диспропорции и усиливая вклад малого бизнеса в структурную трансформацию экономики. В условиях реализации Стратегии «Узбекистан-2030» эти подходы способствуют достижению амбициозных целей: повышению доли частного сектора в ВВП до 80 %, увеличению вклада малого и среднего предпринимательства до 55 % к 2030 году и

созданию устойчивых источников доходов для населения. Особое внимание уделяется интеграции цифровых технологий, искусственного интеллекта и зеленых практик, что позволит преодолеть глобальные разрывы в выживаемости стартапов и готовности к ИИ, отмеченные в GEM 2025/2026 Global Report. Рекомендации ориентированы на дифференцированное государственное регулирование: приоритетное стимулирование добровольной мотивации, доступа к финансированию (включая микрокредиты и венчурные механизмы), инфраструктурных проектов агломераций и программ повышения человеческого капитала. Это обеспечит гармонизацию интересов бизнеса и государства, снижение транзакционных издержек и формирование институциональной среды, благоприятной для инноваций на микроуровне. В долгосрочной перспективе реализация данных мер будет способствовать не только экономическому росту (прогноз ВВП на 7–7,2 % в I квартале 2026 года), но и социальной стабильности через создание миллионов новых рабочих мест, особенно для молодежи и женщин. Предложенные материалы могут быть эффективно использованы в учебном процессе вузов при подготовке и переподготовке специалистов в области экономики, управления и предпринимательства, а также в практике органов государственного и местного управления для разработки и корректировки целевых программ. В итоге, системное применение разработанных подходов позволит Узбекистану укрепить позиции как регионального лидера в развитии предпринимательства, интегрируя национальные приоритеты с глобальными трендами устойчивого и цифрового роста. Таким образом, исследование вносит вклад в научное обоснование политики, направленной на раскрытие полного потенциала малого предпринимательства как ключевого драйвера перехода к верхне-среднему уровню доходов к 2030 году.

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**ПРИРОДНО-ГЕОГРАФИЧЕСКИЕ ФАКТОРЫ, ВЛИЯЮЩИЕ НА  
ОБЕСПЕЧЕНИЕ НАСЕЛЕНИЯ ПРОДОВОЛЬСТВИЕМ  
(НА ПРИМЕРЕ РЕСПУБЛИКИ УЗБЕКИСТАН)**

*Аннотация.* В статье рассматриваются природно-географические факторы, влияющие на обеспечение населения продовольствием. Проанализировано влияние климатических условий, почвенных и водных ресурсов, рельефа и природных ландшафтов на развитие сельского хозяйства. На примере Республики Узбекистан показана роль природных условий в формировании продовольственных ресурсов и устойчивости аграрного производства. Обоснована необходимость рационального использования природных ресурсов и внедрения современных агротехнологий для повышения продовольственной безопасности.

*Ключевые слова:* продовольственная безопасность, природно-географические факторы, сельское хозяйство, климат, водные ресурсы, почвенные ресурсы, Узбекистан.

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**NATURAL-GEOGRAPHICAL FACTORS AFFECTING FOOD  
SUPPLY OF THE POPULATION  
(CASE STUDY OF THE REPUBLIC OF UZBEKISTAN)**



**Abstract:** *The article examines natural-geographical factors affecting food supply for the population. The influence of climate conditions, soil and water resources, relief and natural landscapes on agricultural development is analyzed. Using the example of Uzbekistan, the role of natural conditions in the formation of food resources and agricultural sustainability is revealed. The importance of rational use of natural resources and the implementation of modern agricultural technologies to ensure food security is emphasized.*

**Keywords:** *food security, natural-geographical factors, agriculture, climate, water resources, soil resources, Uzbekistan.*

Введение. Обеспечение населения продовольствием является важнейшей задачей социально-экономического развития любого государства. Продовольственная безопасность предполагает наличие достаточного количества продуктов питания, их доступность и стабильность производства.

В условиях глобального роста населения и изменения климата проблема обеспечения продовольствием приобретает особую актуальность. По прогнозам международных организаций, к середине XXI века потребность в продовольствии значительно возрастет. В этой связи особое значение приобретает эффективное использование природных ресурсов и устойчивое развитие сельского хозяйства.

Республика Узбекистан является аграрно-индустриальной страной, где сельское хозяйство играет важную роль в обеспечении населения продовольствием. Однако природные условия страны характеризуются высокой континентальностью климата, ограниченными водными ресурсами и засушливостью. Эти факторы оказывают значительное влияние на сельскохозяйственное производство. Изучение природно-географических факторов, влияющих на обеспечение населения продовольствием, имеет важное значение для разработки эффективной аграрной политики и повышения продовольственной безопасности страны.

Материалы и методы исследования. В ходе исследования были использованы методы географического анализа, сравнительного анализа, статистического анализа и системного подхода. В качестве источников информации использованы статистические данные Республики Узбекистан, материалы международных организаций, а также научные публикации по вопросам продовольственной безопасности и сельского хозяйства. Анализ проводился с учетом особенностей природных условий страны, структуры сельскохозяйственного производства и современного состояния аграрного сектора.

Климатические условия и их влияние на продовольственное обеспечение. Климатические условия являются одним из основных факторов, определяющих развитие сельского хозяйства. Климат Узбекистана характеризуется высокой континентальностью, жарким и сухим летом и сравнительно холодной зимой. Среднегодовое количество

осадков в равнинных районах составляет 100–300 мм, что значительно ниже потребностей большинства сельскохозяйственных культур. Поэтому значительная часть сельского хозяйства страны основана на искусственном орошении.

Продолжительный вегетационный период, который в некоторых регионах достигает 200–220 дней, создает благоприятные условия для выращивания различных сельскохозяйственных культур. В Узбекистане широко выращиваются зерновые культуры, овощи, фрукты, виноград и бахчевые культуры. Однако высокая температура воздуха в летний период и дефицит влаги могут негативно влиять на урожайность сельскохозяйственных культур.

Почвенные ресурсы и их роль в развитии сельского хозяйства. Почвенные ресурсы являются важнейшим природным фактором сельскохозяйственного производства. На территории Узбекистана распространены различные типы почв, включая сероземы, лугово-аллювиальные почвы и песчаные почвы пустынных районов. Наиболее плодородными являются орошаемые сероземы и аллювиальные почвы речных долин, которые активно используются в сельском хозяйстве. В Ферганской долине, Ташкентской и Самаркандской областях сформировались наиболее благоприятные условия для интенсивного сельскохозяйственного производства. Однако одной из серьезных проблем является деградация почв, связанная с засолением, эрозией и неправильным использованием земельных ресурсов. По оценкам специалистов, значительная часть орошаемых земель страны подвержена различным формам засоления.

Водные ресурсы и проблемы орошения. Водные ресурсы играют ключевую роль в обеспечении продовольственной безопасности Узбекистана. Основными источниками водоснабжения являются реки Амударья и Сырдарья, а также их притоки. Сельское хозяйство является крупнейшим потребителем водных ресурсов. Более 80 процентов водных ресурсов страны используется для орошения сельскохозяйственных земель. Развитие ирригационных систем позволило значительно увеличить площади орошаемых земель и повысить урожайность сельскохозяйственных культур. Однако нерациональное использование воды приводит к ряду экологических проблем, включая засоление почв и снижение уровня грунтовых вод. В последние годы в стране активно внедряются водосберегающие технологии, включая капельное орошение и современные методы управления водными ресурсами.

Рельеф и природные ландшафты. Рельеф территории Узбекистана представлен равнинными и горными районами. Около двух третей территории страны занимают равнины, которые являются наиболее благоприятными для развития сельского хозяйства.

Горные районы, расположенные в восточной и юго-восточной части страны, характеризуются более сложными природными условиями.

Однако они играют важную роль в развитии животноводства, садоводства и выращивания некоторых сельскохозяйственных культур.

Ферганская долина является одним из наиболее продуктивных сельскохозяйственных регионов страны благодаря благоприятным природным условиям и развитой системе орошения.

Влияние изменения климата на сельское хозяйство Узбекистана. Одной из современных проблем является влияние изменения климата на сельское хозяйство. Повышение температуры воздуха, изменение режима осадков и учащение экстремальных погодных явлений оказывают негативное влияние на сельскохозяйственное производство.

В условиях изменения климата возрастает риск засух, дефицита водных ресурсов и деградации земель. Это может привести к снижению урожайности сельскохозяйственных культур и ухудшению продовольственной обеспеченности населения. Поэтому важным направлением государственной политики является повышение устойчивости сельского хозяйства к климатическим изменениям и внедрение инновационных технологий.

**Заключение.** Природно-географические факторы играют важную роль в обеспечении населения продовольствием. Климатические условия, почвенные ресурсы, водные ресурсы, рельеф и природные ландшафты определяют возможности развития сельского хозяйства и уровень продовольственной обеспеченности населения. На примере Республики Узбекистан видно, что природные условия оказывают значительное влияние на сельскохозяйственное производство. Засушливый климат, ограниченность водных ресурсов и процессы деградации земель требуют рационального использования природных ресурсов. Повышение эффективности использования земельных и водных ресурсов, внедрение современных агротехнологий и развитие устойчивого сельского хозяйства являются важными условиями обеспечения продовольственной безопасности страны.

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## ТЕМА ВОЙНЫ И ЧЕЛОВЕЧЕСКОЙ ТРАГЕДИИ В РОМАНЕ Э.М. РЕМАРКА «ТРИ ТОВАРИЩА»

***Аннотация:** В данной статье рассматривается роман Эриха Марии Ремарка «Три товарища» (1936) как художественное произведение, отражающее последствия Первой мировой войны и социальный кризис веймарской Германии. Анализируются центральные темы произведения: дружба как высшая ценность, любовь перед лицом смерти, «потерянное поколение» и экзистенциальное одиночество человека в послевоенном мире. Особое внимание уделяется художественному методу Ремарка, системе образов и символике романа.*

***Ключевые слова:** Ремарк, «Три товарища», потерянное поколение, антивоенная литература, веймарская Германия, экзистенциализм, дружба, художественный образ.*

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## THE THEME OF WAR AND HUMAN TRAGEDY IN E.M. REMARQUE'S NOVEL "THREE COMRADES"

***Abstract:** This article highlights Erich Maria Remarque's novel *Three Comrades* (1936) as a literary work reflecting the aftermath of World War I and the social crisis of Weimar Germany. The central themes of the novel are analyzed: friendship as the highest value, love in the face of death, the "lost generation," and the existential loneliness of the individual in the post-war world. Special attention is paid to Remarque's artistic method, the system of characters, and the symbolism of the novel.*

***Keywords:** Remarque, *Three Comrades*, lost generation, anti-war literature, Weimar Germany, existentialism, friendship, literary image.*

### 1. ВВЕДЕНИЕ

Эрих Мария Ремарк (1898–1970) — один из крупнейших немецких писателей XX века, чьё творчество стало художественным документом эпохи войн и социальных потрясений. Участник Первой мировой войны, свидетель распада Веймарской республики и установления нацистского режима, Ремарк создавал произведения, в которых личная судьба неотделима от исторической трагедии целого поколения.

Роман «Три товарища», написанный в эмиграции и опубликованный в 1936 году, занимает особое место в творческом наследии писателя. В отличие

от «На Западном фронте без перемен», где изображены непосредственные ужасы войны, в «Трёх товарищах» Ремарк обращается к послевоенной реальности — к миру, в котором бывшие солдаты вынуждены жить с неизлечимыми душевными ранами. Актуальность изучения данного романа определяется его непреходящей гуманистической ценностью и художественным совершенством.

## **2. ИСТОРИЧЕСКИЙ КОНТЕКСТ И ИСТОРИЯ СОЗДАНИЯ РОМАНА**

Роман «Три товарища» создавался в период с 1932 по 1936 год, когда Ремарк уже находился в эмиграции. События произведения разворачиваются в Германии конца 1920-х годов — в период тяжёлого экономического кризиса, гиперинфляции и стремительного роста нацистских настроений. Это время, когда демократия агонизировала, а насилие становилось нормой повседневной жизни.

Ремарк изображает общество, травмированное войной и не способное исцелиться. Три главных героя — Роберт Локамп, Готтфрид Ленц и Отто Кестер — символизируют целое поколение молодых людей, которые ушли на фронт совсем юными и вернулись сломленными. Веймарская Германия с её социальной нестабильностью служит не просто фоном, но полноценным действующим лицом романа, определяющим судьбы персонажей.

## **3. СИСТЕМА ОБРАЗОВ РОМАНА**

Центральный образ романа — Роберт Локамп, от лица которого ведётся повествование. Этот молодой человек, переживший войну, несёт в себе глубокую душевную усталость и неспособность строить планы на будущее. Его характерная черта — горькая ирония как защитная реакция на боль: он острит там, где другой бы заплакал, и пьёт там, где другой бы надеялся. Образ Локампа воплощает типичного представителя «потерянного поколения» — людей, лишённых юности и веры в будущее.

Образ Готтфрида Ленца несёт в себе иное начало — романтическое и идеалистическое. Ленц сохранил способность мечтать и верить в справедливость, что в условиях нараставшего фашизма оказывается смертельно опасным. Его гибель от рук нацистских боевиков — это не просто личная трагедия, но символ уничтожения всего светлого и человеческого в обществе, охваченном идеологией ненависти.

Отто Кестер — наиболее стоический из трёх друзей. Он воплощает силу воли и верность: именно он держит маленькую авторастерскую мастерскую, именно он является моральным стержнем дружеского союза. Его знаменитый автомобиль «Карл» становится в романе символом свободы и мужской солидарности — последнего прибежища тех, кому больше некуда идти.

Особое место в системе образов занимает Патриция Хольман — воплощение хрупкой красоты и обречённости. Её болезнь (туберкулёз) — это не просто медицинский диагноз, но метафора всего поколения, подточенного войной. Любовь Робби и Пат трагически прекрасна именно потому, что оба



знают о её конечности — и всё равно любят. В этом Ремарк видит высшее проявление человечности.

#### **4. ТЕМА ДРУЖБЫ КАК НРАВСТВЕННЫЙ СТЕРЖЕНЬ ПРОИЗВЕДЕНИЯ**

Дружба в романе «Три товарища» — это не просто эмоциональная связь между людьми, но философская и этическая категория. В мире, где рухнули все прежние ценности — государство, семья, религия, идеология, — именно дружба остаётся единственной подлинной опорой существования. Три героя создают свой маленький мир, своё братство, которое противостоит хаосу и насилию окружающей действительности.

Показательно, что дружба в романе рождена именно войной: эти люди связаны общей памятью об окопах, о погибших товарищах, о пережитом ужасе. Фронтное братство — единственное, что осталось от войны ценного и человеческого. Ремарк утверждает: война отнимает всё, но солидарность людей, прошедших через неё вместе, неуничтожима. Именно эта мысль придаёт роману не только трагическое, но и жизнеутверждающее звучание.

#### **5. ЛЮБОВЬ И СМЕРТЬ: ЭКЗИСТЕНЦИАЛЬНЫЙ АСПЕКТ РОМАНА**

Любовная линия романа — отношения Роберта Локампа и Патриции Хольман — несёт в себе глубокий экзистенциальный смысл. Осознание смертельной болезни Пат не разрушает их любовь, а, напротив, делает её острее, пронзительнее. Ремарк показывает, что подлинная любовь возможна только тогда, когда человек принимает конечность существования. Робби любит Пат не вопреки её болезни, а вместе с ней — со всей её хрупкостью и обречённостью.

Смерть Пат в финале романа — художественно безупречное завершение. Она умирает на рассвете, когда природа пробуждается к новой жизни — этот контраст усиливает трагизм до предела. Ремарк не даёт Робби ни надежды, ни утешения — только горькое осознание утраты. Однако последние слова романа, обращённые к умершей, звучат как клятва верности: любовь оказывается сильнее смерти.

#### **6. ХУДОЖЕСТВЕННЫЙ МЕТОД И СТИЛЬ РЕМАРКА**

Стиль «Трёх товарищей» отличается характерной для Ремарка лаконичностью и точностью. Писатель избегает сентиментальности там, где она напрашивается сама собой, предпочитая сдержанную, «мужскую» интонацию. Диалоги насыщены подтекстом: за кажущейся простотой скрывается глубокое психологическое содержание. Ремарк мастерски использует приём «айсберга» — самое важное остаётся невысказанным.

Важную роль в романе играет символика. Автомобиль «Карл» символизирует свободу и движение — последнее, что осталось от прежней жизни. Ночные кафе и бары — пространство временного забвения, где можно укрыться от реальности. Горы, куда увозит Пат Кестер в надежде на её выздоровление, олицетворяют последнюю надежду, которая, однако,

оказывается тщетной. Природа в романе всегда контрастирует с человеческой болью — этот приём усиливает трагическое звучание произведения.

Повествование ведётся от первого лица, что создаёт эффект исповеди и максимального доверия между автором и читателем. Ремарк нигде не морализирует и не навязывает оценок — он просто показывает жизнь такой, какая она есть, доверяя читателю самому сделать выводы. Именно эта художественная честность делает его прозу столь убедительной.

## **7. ЗАКЛЮЧЕНИЕ**

Роман «Три товарища» Эриха Марии Ремарка является одним из наиболее значительных антивоенных произведений мировой литературы. В нём писатель создал художественно достоверный портрет «потерянного поколения» — людей, искалеченных войной физически и духовно, лишённых прошлого и не верящих в будущее, но сохраняющих человечность в дружбе и любви.

Главный гуманистический пафос романа состоит в том, что даже в условиях тотального разрушения ценностей и надвигающейся катастрофы человек способен любить, дружить и оставаться верным. Дружба трёх товарищей — это не только личная история, но и нравственный завет всем последующим поколениям: человечность нельзя уничтожить, пока люди способны быть преданными друг другу.

Актуальность романа не утрачивается с течением времени: пока существуют войны, пока молодые люди гибнут за чужие интересы, пока общество предпочитает забыть о тех, кого сломала война, — «Три товарища» будут оставаться книгой, которую необходимо читать.

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## **ИССЛЕДОВАНИЕ ТЕХНОЛОГИЧЕСКИХ ПАРАМЕТРОВ ЖАККАРДОВЫХ ХЛОПКО-ШЕЛКОВЫХ ТРИКОТАЖНЫХ ПОЛОТЕН**

***Аннотация.** В данной статье проведен анализ технологических параметров жаккардовых хлопко-шелковых трикотажных полотен. Исследование технологических параметров осуществлялось стандартными методами. На плосковязальной машине разработаны два варианта трикотажных полотен с использованием хлопчатобумажной пряжи линейной плотности 20 текс и шелковой пряжи линейной плотности 14,3 текс.*

***Ключевые слова:** трикотажное полотно, технология, жаккард, параметры, структура.*

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## **A STUDY OF THE TECHNOLOGICAL PARAMETERS OF JACQUARD COTTON-SILK KNITTED FABRICS**

**Abstract:** This article analyzes the technological properties of jacquard cotton-silk knitted fabrics. The technological properties were determined using standard methods. Two variants of knitted fabrics were developed on a flat-bed knitting machine, using 20 tex cotton yarn and 14.3 tex silk yarn as raw materials.

**Keywords:** knitting fabric, technology, jacquard, parameter, structure.

Структура петель в трикотажном переплетении оценивается степенью наполнения нити. При производстве трикотажных полотен степень наполнения нитей ниже, чем в тканях. По этой причине объемная плотность трикотажных полотен составляет 0,2–0,3 г/см<sup>3</sup>, тогда как плотность тканей составляет 1,1–1,9 г/см<sup>3</sup> [1–3].

С учетом вышеизложенного, с целью снижения расхода сырья и улучшения качественных показателей трикотажных полотен на плосковязальной машине были выработаны два варианта хлопко-шелкового жаккардового трикотажа [4].

Для изучения влияния способа получения, раппорта, структуры переплетения и состава сырья на технологические показатели хлопко-шелковых жаккардовых трикотажных полотен были получены экспериментальные образцы [5,6].

Испытания проводились в лаборатории «CentexUz», результаты представлены в таблице 1.

Таблица 1.

Технологические показатели трикотажных полотен

| Показатели                                                          |                   | Варианты |         |
|---------------------------------------------------------------------|-------------------|----------|---------|
|                                                                     |                   | I        | II      |
| Вид пряжи и линейная плотность, tex                                 | хб 20х3           | 55       | 47      |
|                                                                     | шелк пряжа 14,3х4 | 45       | 53      |
| Петельный шаг А, мм                                                 | Хб/шелк           | 1,85/2,6 | 2,7/1,8 |
| Высота петельного ряда В, мм                                        | Хб/шелк           | 0,9/0,9  | 0,9/0,9 |
| Плотность по горизонтали П <sub>Г</sub> , петель                    | Хб/шелк           | 27/19    | 18/28   |
| Плотность по вертикали П <sub>В</sub> , петель                      | Хб/шелк           | 55/55    | 55/55   |
| Длина нити в петле l, мм                                            | Хб/шелк           | 7,5/8,1  | 8,0/7,3 |
| Поверхностная плотность трикотажа M <sub>s</sub> , г/м <sup>2</sup> |                   | 404,6    | 398,1   |
| Толщина Т, мм                                                       |                   | 1,5      | 1,5     |
| Объемная плотность δ, мг/см <sup>3</sup>                            |                   | 269,7    | 265,4   |

Петельный шаг (А) хлопко-шелкового жаккардового трикотажа для хлопчатобумажной пряжи изменялся в пределах от 1,85 до 2,7 мм. Наибольшее значение наблюдалось во II варианте, а наименьшее — в I варианте. Для шелковой пряжи петельный шаг изменялся в пределах от 1,8 до 2,6 мм. Наибольшее значение наблюдалось в I варианте, а наименьшее — во II варианте. Высота петельного ряда (В) во всех вариантах и для всех видов сырья составила 0,9 мм и оставалась постоянной.

Наименьшее значение плотности трикотажных полотен по горизонтали (Пг) для хлопчатобумажной пряжи составило 18 петель во II варианте, а наибольшее значение — 27 петель в I варианте.

Для шелковой пряжи наименьшее значение составило 19 петель в I варианте, а наибольшее — 28 петель во II варианте. Плотность по вертикали (Пв) во всех вариантах и для всех видов сырья составила 55 петель и оставалась постоянной.

При использовании хлопчатобумажной пряжи длина нити в петле (l) изменялась в пределах от 7,5 до 8,0 мм, а при использовании шелковой пряжи — от 7,3 до 8,1 мм.

Это объясняется изменением раппорта переплетения, структуры трикотажа и состава сырья при выработке образцов. При определении расхода сырья учитываются показатели поверхностной и объемной плотности трикотажных полотен.

Поверхностная плотность трикотажного полотна I варианта составила 404,6 г/м<sup>2</sup>, толщина — 1,5 мм, вследствие чего объемная плотность составила 269,7 мг/см<sup>3</sup>. Содержание хлопчатобумажной пряжи в I варианте составляет 55%, а шелковой — 45%.

Поверхностная плотность трикотажного полотна II варианта составила 398,1 г/м<sup>2</sup>, толщина — 1,5 мм, при этом объемная плотность составила 265,4 мг/см<sup>3</sup>. Содержание хлопчатобумажной пряжи во II варианте составляет 47%, а шелковой — 53%.

В ходе исследований были изучены показатели объемной плотности и относительной легкости хлопко-шелковых жаккардовых трикотажных полотен с продольным полосам.

Объемная плотность образцов изменялась в пределах от 265,4 до 269,7 мг/см<sup>3</sup>. Наибольшее значение объемной плотности наблюдалось у образца I варианта, содержащего 55% хлопчатобумажной и 45% шелковой пряжи.

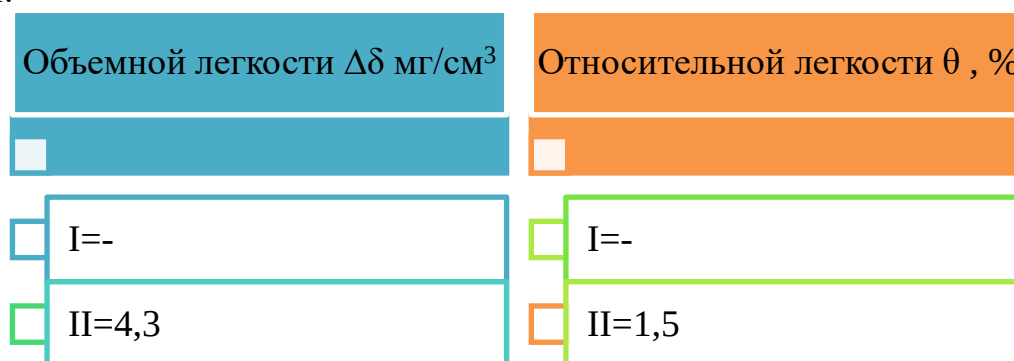


Рис. 1. Показатели объемной плотности и относительной легкости хлопко-шелковых рисунчатых трикотажных полотен.

Наименьшее значение объемной плотности наблюдалось у образца II варианта (47% хлопчатобумажной и 53% шелковой пряжи) и составило 265,4 мг/см<sup>3</sup>, что на 1,5% меньше по сравнению с I вариантом

(табл. 1, рис. 1). Наименьший расход сырья во II варианте обеспечил объемную легкость 4,3 мг/см<sup>3</sup> и относительную легкость 1,5%.

**Выводы.** Рациональное использование шелковой пряжи в сочетании с хлопчатобумажной при производстве хлопко-шелковых жаккардовых трикотажных полотен по разработанной технологии позволило снизить расход сырья на 1,5% за счет изменения раппорта и структуры трикотажа.

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## **ИССЛЕДОВАНИЕ ДЕФОРМАЦИОННЫХ СВОЙСТВ ЖАККАРДОВЫХ ХЛОПКО-ШЕЛКОВЫХ ТРИКОТАЖНЫХ ПОЛОТЕН**

**Аннотация:** В статье исследованы деформационные свойства хлопко-шелковых жаккардовых трикотажных полотен. Деформационные свойства определялись стандартными методами с использованием приборов испытательной лаборатории «CentexUz». В результате исследований установлено, что применение новой структуры хлопко-шелкового жаккардового трикотажа способствует повышению деформационных характеристик полотен.

**Ключевые слова:** трикотажное полотно, деформация, свойства, показатели.

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## **RESEARCH ON THE DEFORMATION PROPERTIES OF JACQUARD COTTON-SILK KNITTED FABRICS**

**Abstract:** This article examines the deformation properties of jacquard knitted fabrics made from a cotton-silk blend. The deformation properties of the fabric were determined by a standard method using the existing instruments at the "Centex Uz" testing laboratory. The analysis of the research on cotton-silk jacquard knitted fabrics showed that their deformation capacity increased due to the new structure.

**Keywords:** knitting fabric, deformation, properties, indicator.

При проектировании трикотажных изделий важное значение имеет знание упругих свойств трикотажных полотен. Трикотажные полотна состоят из системы петель, вследствие чего обладают высокой растяжимостью. Это может отрицательно влиять на формоустойчивость полотен и изделий из них [1–3].

Для изучения влияния способа вязания, раппорта, структуры трикотажа и состава сырья на деформационные показатели хлопко-шелковых жаккардовых полотен были получены экспериментальные образцы [4–6]. Испытания проводились в лаборатории «CentexUz». Физико-механические показатели трикотажных полотен были исследованы экспериментальным путем, результаты представлены в таблице 1.

Изучено влияние способа вязания и структуры хлопко-шелкового жаккардового трикотажа на показатели формоустойчивости.

Известно, что для оценки формоустойчивости трикотажных полотен недостаточно использовать только показатель обратимой деформации [7–9]. Поэтому показатель необратимой деформации, характеризующий степень отклонения размеров трикотажа от исходных значений, является важным критерием оценки качества трикотажных полотен.

Таблица 1.

Деформационные свойства хлопко-шелковых жаккардовых трикотажных полотен

| Показатели                                 |                             | Варианты |    |
|--------------------------------------------|-----------------------------|----------|----|
|                                            |                             | I        | II |
| Вид пряжи и линейная плотность             | хб 20 х 3 tex               | 55       | 47 |
|                                            | шелковая пряжа 14,3 х 4 tex | 45       | 53 |
| Необратимая деформация $\varepsilon_n$ , % | По длине                    | 15       | 12 |
|                                            | По ширине                   | 18       | 15 |
| Обратимая деформация $\varepsilon_o$ , %   | По длине                    | 85       | 88 |
|                                            | По ширине                   | 82       | 85 |
| Усадка У, %                                | По длине                    | +4       | +3 |
|                                            | По ширине                   | -4       | -3 |

Результаты экспериментов показали, что обратимая деформация по длине изменялась в пределах от 85 до 88%, а по ширине — от 82 до 85% (табл. 1, рис. 1).

Наименьшее значение обратимой деформации по длине (85%) наблюдалось у образца I варианта, содержащего 55% хлопчатобумажной и 45% шелковой пряжи.

Наибольшее значение (88%) зафиксировано у образца II варианта, содержащего 47% хлопчатобумажной и 53% шелковой пряжи, что на 3,4% выше минимального значения.

Анализ результатов показал, что увеличение содержания шелковой пряжи способствует повышению показателей обратимой деформации.

Обратимая деформация по ширине также имела наименьшее значение у образца I варианта (82%), а наибольшее — у образца II варианта (85%), что на 3,6% выше по сравнению с первым вариантом.

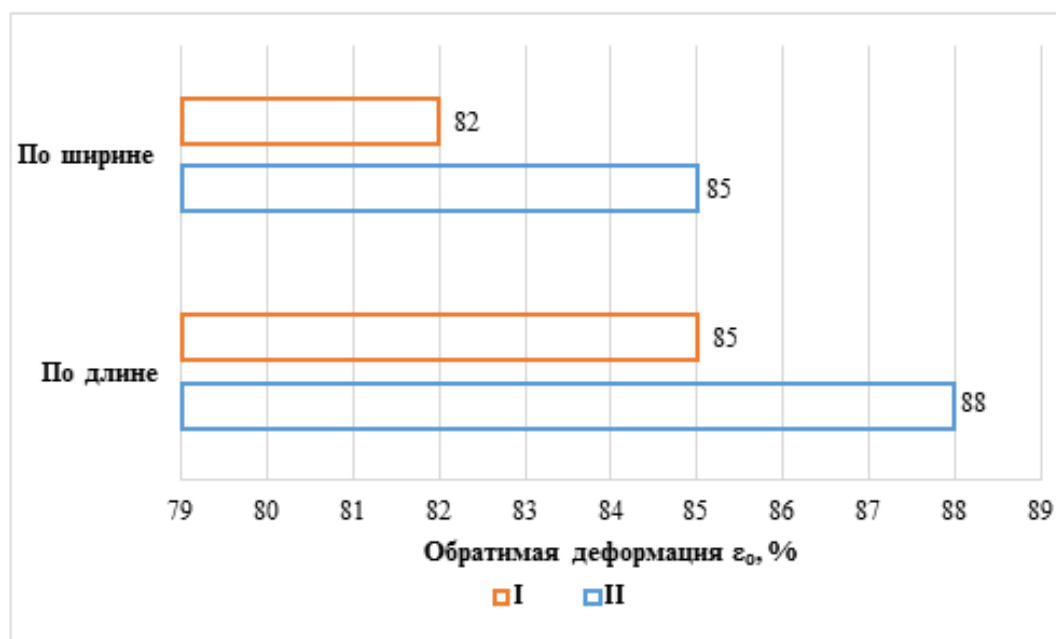


Рис. 1. Изменение обратимой деформации хлопко-шелкового жаккардового трикотажа

Полученные результаты свидетельствуют о том, что трикотажные полотна с повышенным содержанием шелковой пряжи характеризуются более высокими показателями упругости.

Установлено, что разработанная структура трикотажа обеспечивает улучшение показателей обратимой деформации по длине на 3,4% и по ширине на 3,6%.

Такие значения обратимой деформации свидетельствуют о способности трикотажных полотен восстанавливать первоначальные размеры после растяжения.

В связи с тем, что в хлопко-шелковых жаккардовых трикотажных полотнах хлопчатобумажная и шелковая пряжи используются совместно, петли в раппорте отличаются по структуре и свойствам. Поэтому исследование показателей усадки является актуальной задачей.

Показатели усадки по длине изменялись в пределах от +3% до +4%, а по ширине — от –3% до –4% (табл. 1, рис. 2).

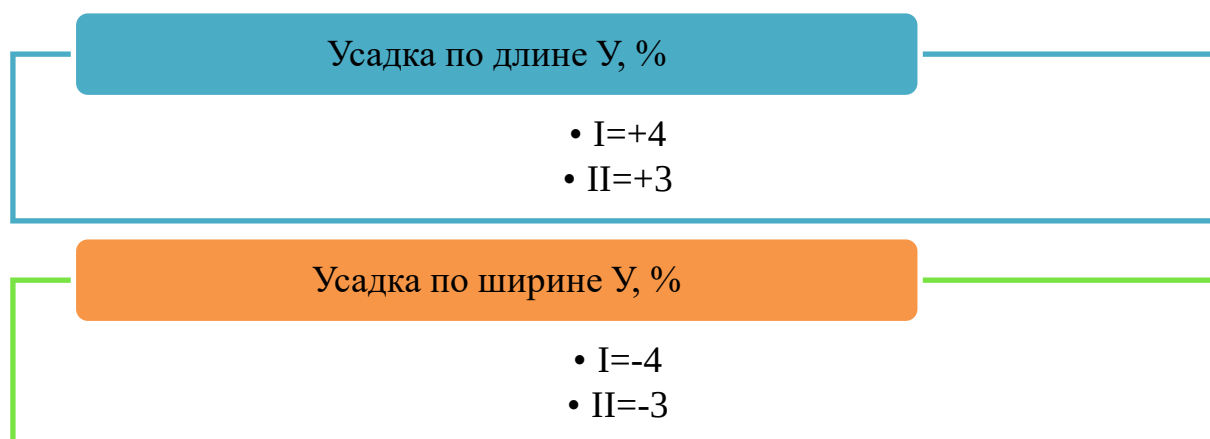


Рис. 2. Изменение усадки хлопко-шелкового жаккардового трикотажа.

Наибольшая усадка по длине наблюдалась у образцов I варианта и составила +4%, тогда как наименьшая усадка (+3%) отмечена у образцов II варианта.

Таким образом, показатели усадки во II варианте оказались примерно на 25% ниже по сравнению с I вариантом.

Наибольшая усадка по ширине составила –4% у образцов I варианта, а наименьшая –3% у образцов II варианта, что также свидетельствует об улучшении показателей формоустойчивости примерно на 25%.

**Выводы.** Анализ деформационных свойств хлопко-шелковых жаккардовых трикотажных полотен показал, что использование шелковой пряжи в сочетании с хлопчатобумажной, а также применение жаккардовых переплетений способствует снижению усадки и улучшению формоустойчивости полотен.

В результате расширен ассортимент хлопко-шелковых жаккардовых трикотажных полотен с улучшенными деформационными свойствами.

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## **РАНГОВАЯ ОЦЕНКА ХЛОПКО-ШЕЛКОВОГО ТРИКОТАЖА**

***Аннотация.** В статье выявлено улучшение качественных показателей рисунчатого хлопко-шелкового жаккардового трикотажа. Обоснована методика оценки качества трикотажных полотен, позволяющая выбрать оптимальные варианты. В качестве оптимального варианта рекомендован вариант II, соответствующий всем требованиям по качеству.*

***Ключевые слова:** трикотаж, качество, свойства, показатели, оценка.*

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## **RANKING EVALUATION OF COTTON-SILK KNITTED FABRICS**

***Abstract:** The article revealed improvements in the quality indicators of patterned cotton-silk jacquard knitwear. It is justified to evaluate the quality of knitted fabrics, which allows for the selection of optimal variants. Variants II, meeting all quality requirements, were recommended for production as optimal options.*

***Keywords:** knitwear, quality, properties, indicator, evaluation.*

Метод ранговой оценки качества трикотажных полотен является одним из наиболее распространённых и эффективных способов комплексного анализа потребительских и эксплуатационных свойств текстильной продукции [1].

В современных условиях производства трикотаж занимает важное место в лёгкой промышленности благодаря своей эластичности и высокому уровню комфорта. Поэтому объективная и всесторонняя оценка его качества приобретает особую значимость.

Ранговый метод позволяет представить совокупность качественных показателей в количественной форме, что делает возможным сравнение различных образцов продукции и технологических процессов.

Суть метода заключается в том, что каждому из выбранных показателей качества присваивается определённый ранг в соответствии с установленной шкалой оценки. Чаще всего применяется пятиранговая или десятиранговая система.

После проведения испытаний и экспертной оценки каждому параметру трикотажного полотна присваивается ранг, отражающий степень его соответствия нормативным требованиям или техническим условиям.

Итоговая оценка качества может определяться:



- по сумме всех полученных рангов;
- по среднему арифметическому значению;
- по взвешенному показателю с учётом коэффициентов значимости отдельных свойств.

Применение весовых коэффициентов особенно целесообразно в тех случаях, когда отдельные характеристики имеют приоритетное значение для конкретного вида трикотажа, например бельевых, спортивных или верхних изделий.

При оценке качества трикотажных полотен учитываются их структурные особенности, обусловленные петлеобразной системой нитей.

В первую очередь анализируется внешний вид материала:

- равномерность окраски;
- отсутствие дефектов вязания;
- ровность поверхности;
- соответствие эталонному образцу.

Далее рассматриваются физико-механические свойства:

- прочность на разрыв;
- устойчивость к истиранию;
- формоустойчивость;
- растяжимость;
- эластичность;
- сопротивление образованию катышков.

Важное значение имеют гигиенические свойства трикотажа:

- воздухопроницаемость;
- гигроскопичность;
- паропроницаемость;
- теплоизоляция.

Также учитываются эксплуатационные показатели:

- устойчивость окраски;
- усадка;
- сохранение формы;
- сохранение внешнего вида.

Таким образом, метод ранговой оценки качества трикотажных полотен является удобным инструментом комплексного анализа свойств материала. Его применение способствует повышению уровня контроля качества и конкурентоспособности продукции [2–4].

Как и при оценке значимых качественных показателей, наилучшему варианту по каждому признаку присваивается ранг  $R = 1$ , а худшему — ранг  $R = m$ . В исследовании оценивались хлопко-шелковые жаккардовые трикотажные полотна с продольным рисунком ( $m = 2$ ) по следующим показателям качества [5,6]:

- $x_1$  — поверхностная плотность  $M_s$ , г/м<sup>2</sup>
- $x_2$  — толщина  $T$ , мм
- $x_3$  — объёмная плотность  $\delta$ , мг/см<sup>3</sup>

$x_4$  – воздухопроницаемость  $B$ ,  $\text{см}^3/\text{см}^2 \cdot \text{с}$   
 $x_5$  – истираемость  $I$ , тыс. оборотов  
 $x_6$  – разрывная нагрузка по длине  $P$ , Н  
 $x_7$  – разрывная нагрузка по ширине  $R$ , Н  
 $x_8$  – удлинение при разрыве по длине  $L$ , %  
 $x_9$  – удлинение при разрыве по ширине  $L$ , %  
 $x_{10}$  – обратимая деформация по длине  $\varepsilon_0$ , %  
 $x_{11}$  – обратимая деформация по ширине  $\varepsilon_0$ , %  
 $x_{12}$  – усадка по длине  $K$ , %  
 $x_{13}$  – усадка по ширине  $K$ , %  
 $x_{14}$  – удлинение при нагрузке 6 Н по ширине, %

Всего экспериментально определено  $n = 14$  показателей. Показатели  $x_2, x_4, x_5, x_6, x_7, x_{10}, x_{11}$  и  $x_{14}$  являются положительными. Показатели  $x_1, x_3, x_8, x_9, x_{12}$  и  $x_{13}$  являются отрицательными. Дифференциальная оценка проводилась при условии:  $\Sigma R = 0,5 \cdot m(m+1) = 3$ . Комплексная оценка определялась: по сумме рангов  $\Sigma R$ ; по среднему рангу:  $R_{\text{ср}} = \Sigma R / n$

Таблица 1

Показатели качества рисунчатого хлопко-шелкового трикотажа

| № | Качественный показателей |       |       |       |       |       |       |       |       |          |          |          |          |          |
|---|--------------------------|-------|-------|-------|-------|-------|-------|-------|-------|----------|----------|----------|----------|----------|
|   | $x_1$                    | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $x_6$ | $x_7$ | $x_8$ | $x_9$ | $x_{10}$ | $x_{11}$ | $x_{12}$ | $x_{13}$ | $x_{14}$ |
| 1 | 398,1                    | 1,5   | 269,7 | 155,2 | 8,7   | 257   | 245   | 82    | 74    | 85       | 82       | +4       | -4       | 36       |
| 2 | 404,6                    | 1,5   | 265,4 | 168,4 | 9,6   | 374   | 274   | 80    | 73    | 88       | 85       | +3       | -3       | 41       |

Таблица 2

Результаты ранговой оценки показателей качества образцов

| №          | Ранговая оценка качественных показателей $R$ |       |       |       |       |       |       |       |       |          |          |          |          |          | $\Sigma R$ | $\bar{R}$ | место |
|------------|----------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|----------|----------|----------|----------|----------|------------|-----------|-------|
|            | $x_1$                                        | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $x_6$ | $x_7$ | $x_8$ | $x_9$ | $x_{10}$ | $x_{11}$ | $x_{12}$ | $x_{13}$ | $x_{14}$ |            |           |       |
| 1          | 1                                            | 1,5   | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2        | 2        | 2        | 2        | 1        | 25,5       | 1,82      | 2     |
| 2          | 2                                            | 1,5   | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1        | 1        | 1        | 1        | 2        | 16,5       | 1,17      | 1     |
| $\Sigma R$ | 3                                            | 3     | 3     | 3     | 3     | 3     | 3     | 3     | 3     | 3        | 3        | 3        | 3        | 3        | 42         | 3         | -     |

Результаты ранговой оценки представлены в таблице 2.

На основе полученных данных построена оценочная гистограмма хлопко-шелкового трикотажа (рис. 1). При ранжировании: лучшему варианту присваивается ранг 1; остальным вариантам — последующие ранги. По итогам расчётов вариант с наименьшей суммой рангов признаётся наилучшим.

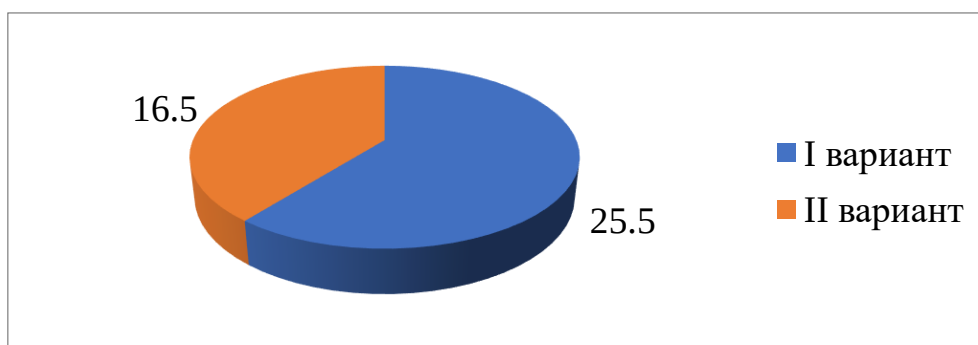


Рис. 1. Ранговая оценка хлопко-шелковых жаккардовых трикотажных полотен

По результатам оценки установлено: Вариант I (45% хлопка + 55% шелка)  $\Sigma R = 25,5$  ранга. Вариант II (47% хлопка + 53% шелка)  $\Sigma R = 16,5$  ранга. Вариант II оказался лучше на **35,3%**.

**Выводы.** На основании результатов ранговой оценки установлено, что по технологическим показателям и физико-механическим свойствам наилучшими являются образцы варианта II. Превосходство варианта II составляет **35,3%**.

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## **ТЕХНОЛОГИИ ПОЛУЧЕНИЯ ЖАККАРДОВЫХ ХЛОПКО ШЕЛКОВЫХ ТРИКОТАЖНЫХ ПОЛОТЕН**

***Аннотация.** В данной статье обоснована технология производства жаккардовых хлопко-шелковых трикотажных полотен, направленная на расширение ассортимента трикотажных изделий. Образцы трикотажных полотен из хлопчатобумажной и шелковой пряжи линейной плотности 20 и 14,3 текс были выработаны и исследованы на плосковязальной машине LONGXING 252.*

***Ключевые слова:** трикотажное полотно, технология, жаккард, структура, ассортимент.*

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## **TECHNOLOGIES FOR PRODUCING JACQUARD COTTON-SILK KNITTED FABRICS**

***Abstract:** This article substantiates the technology for producing jacquard cotton-silk knitted fabrics, aimed at expanding the range of knitted products. Knitted*

*fabrics from cotton and silk yarns with linear densities of 20 and 14.3 tex were produced and studied on a LONGXING 252 double-bed flat knitting machine.*

**Keywords:** *knitting fabric, technology, jacquard, structure, assortment.*

При производстве трикотажных изделий особое значение имеет сложность рисунка. Это связано с тем, что размещение, раскрой, комплектация и пошив деталей изделия имеют свои особенности [1,2].

Все рисунки можно условно разделить на три типа: обычные; средней сложности; крупнораппортные.

В научных исследованиях предложено более десяти классификаций рисунчатого трикотажа. В данной работе рассматривается технология получения хлопко-шелкового жаккардового трикотажа, выработанного поперечно- и продольно-вязаными способами [3–5].

Продукция, получаемая из натурального шелка, обладает высокими потребительскими свойствами. Однако полностью обеспечить потребности текстильной промышленности данным сырьем невозможно, поэтому возникает необходимость использования других натуральных волокон.

Несмотря на высокие качественные показатели шелка, себестоимость шелковых изделий остается значительной из-за сложности технологического процесса. Известно, что традиционно шелковые изделия изготавливаются преимущественно по технологии тканых материалов.

В настоящее время требования потребителей к текстильной продукции значительно возросли, что ставит новые задачи перед производителями и специалистами отрасли. С учетом указанных факторов ведутся научно-исследовательские работы по рациональному использованию натурального сырья при производстве хлопко-шелковых рисунчатых трикотажных изделий, а также по совершенствованию техники и технологии получения новых видов трикотажных полотен. С целью решения указанных задач разработаны новые структуры и способы получения хлопко-шелковых жаккардовых трикотажных полотен [6]. Варианты хлопко-шелкового жаккардового трикотажа были выработаны на плосковязальной машине. Образцы получены с использованием хлопчатобумажной пряжи линейной плотности 20 текс × 3 и шелковой пряжи 14,3 текс × 4. Полученные хлопко-шелковые жаккардовые трикотажные полотна отличаются друг от друга соотношением сырья и структурными параметрами. Хлопко-шелковые жаккардовые трикотажные полотна были разработаны следующим образом. Ниже приведена последовательность технологического процесса получения образцов.

В данной технологии производства трикотажных полотен важную роль играют вязальные иглы, расположенные в задней игольнице машины, которые также участвуют в процессе петлеобразования. При вязании I варианта хлопко-шелкового жаккардового трикотажа с продольными полосами каретка вязальной машины перемещается слева направо. За счет

рабочего положения подъемного клина выбранные иглы 4' и 9' задней игольницы, а также иглы 1, 2, 3, 6, 7, 8 и 11 передней игольницы поднимаются и участвуют в процессе петлеобразования, формируя ряд жаккардовых петель.

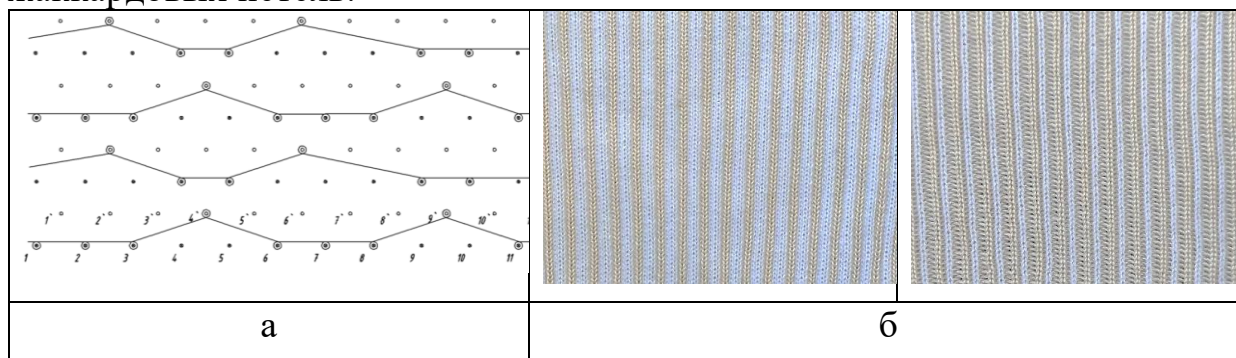


Рис.1. Графическая запись (а) и фотография (б) хлопко-шелкового жаккардового трикотажа (вариант I).

В данном случае иглы 4, 5, 9 и 10 передней игольницы, а также иглы 1', 2', 3', 5', 6', 7', 8', 10' и 11' задней игольницы не участвуют в процессе петлеобразования вследствие вывода подъемного клина из рабочего положения. В результате на выбранных иглах передней игольницы формируются три последовательные жаккардовые петли из хлопчатобумажной пряжи, после чего на двух иглах петли не образуются.

На выбранной игле задней игольницы формируется одна петля, а на следующих трех иглах петли не образуются. Таким образом, первый ряд образца трикотажного полотна формируется путем вывязывания петель из хлопчатобумажной пряжи ластичным переплетением на выбранных иглах передней и задней игольниц (рис. 1, I ряд раппорта). При вязании второго ряда раппорта каретка вязальной машины также перемещается слева направо. Благодаря рабочему положению подъемного клина выбранные иглы 2', 6' и 11' задней игольницы, а также иглы 4, 5, 9 и 10 передней игольницы поднимаются и участвуют в процессе петлеобразования, формируя ряд жаккардовых петель. При этом иглы 1, 2, 3, 6, 7, 8 и 11 передней игольницы, а также иглы 1', 3', 4', 5', 7', 8', 9' и 10' задней игольницы не участвуют в процессе петлеобразования. В результате на выбранных иглах передней игольницы формируются две последовательные жаккардовые петли из шелковой пряжи, после чего на трех иглах петли не образуются. На выбранной игле задней игольницы формируется одна петля, а на следующих трех иглах петли не образуются.

Второй ряд образца трикотажного полотна формируется путем вывязывания петель из шелковой пряжи ластичным переплетением на выбранных иглах передней и задней игольниц (рис. 1, II ряд раппорта). Третий ряд вяжется аналогично первому, а четвертый ряд — аналогично второму.



II вариант хлопко-шелкового жаккардового трикотажа вырабатывается в той же последовательности, что и I вариант (рис. 2).

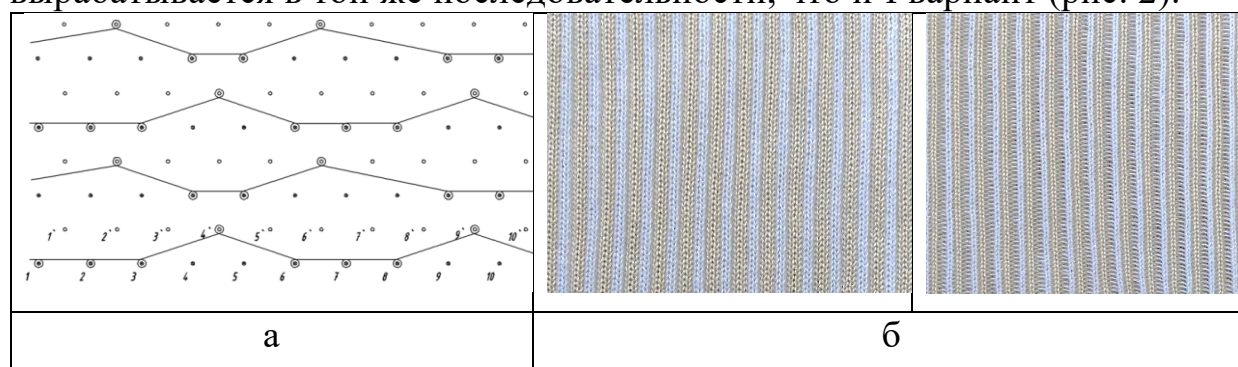


Рис. 2. Графическая запись (а) и фотография (б) хлопко-шелкового жаккардового трикотажа (вариант II).

Отличие заключается только в последовательности прокладывания хлопчатобумажной и шелковой пряжи по рядам.

Таким образом, разработана технология получения хлопко-шелкового жаккардового трикотажа путем формирования жаккардовых петельных рядов из хлопчатобумажной и шелковой пряжи. Полученные образцы могут быть рекомендованы для производства легких верхних трикотажных изделий женского и детского ассортимента.

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## **ВЛИЯНИЕ УРОВНЯ ОБРАЗОВАНИЯ ЖЕНЩИН НА СОЦИАЛЬНОЕ РАЗВИТИЕ ОБЩЕСТВА**

**Аннотация:** В данной статье рассматривается влияние уровня образования женщин на социальное развитие общества. Анализируется роль женского образования в экономическом росте, социальной стабильности, формировании человеческого капитала и демократических процессах. Подчеркивается, что повышение образовательного уровня женщин способствует улучшению качества жизни населения, укреплению социальной ответственности и устойчивому развитию общества.

**Ключевые слова:** образование женщин, социальное развитие, гендерное равенство, человеческий капитал, социальная стабильность, экономический рост, общественное развитие.

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## **THE IMPACT OF WOMEN'S LEVEL OF EDUCATION ON SOCIAL DEVELOPMENT OF SOCIETY**

**Abstract:** This article examines the impact of women's educational level on social development. It analyzes the role of female education in economic growth, social stability, human capital formation, and democratic processes. The study emphasizes that increasing women's educational attainment contributes to improving quality of life, strengthening social responsibility, and ensuring sustainable societal development.

**Keywords:** women's education, social development, gender equality, human capital, social stability, economic growth, societal progress.

В современном мире образование рассматривается как один из ключевых факторов устойчивого развития общества. Особое значение при этом приобретает уровень образования женщин, поскольку именно он оказывает многогранное влияние на экономические, социальные и культурные процессы. Женщины составляют значительную часть человеческого потенциала любой страны, а их образовательный уровень определяет качество трудовых ресурсов, состояние семьи, уровень

социальной стабильности и перспективы общественного прогресса в целом.

Исторически во многих обществах доступ женщин к образованию был ограничен, что сдерживало развитие не только самих женщин, но и общества в целом. Однако в последние десятилетия произошли значительные изменения: расширение образовательных возможностей для женщин стало важным элементом государственной политики и международных программ развития. Сегодня большинство исследований подтверждают, что повышение уровня образования женщин напрямую связано с ростом социального благополучия и устойчивости общества.

Одним из наиболее заметных результатов образования женщин является экономическое развитие. Образованные женщины активнее участвуют в трудовой деятельности, повышается уровень их профессиональной квалификации и конкурентоспособности на рынке труда. Это способствует увеличению занятости, росту производительности труда и повышению доходов семей. В результате улучшается уровень жизни населения, сокращается бедность и укрепляется экономическая стабильность государства. Кроме того, женщины чаще направляют свои доходы на образование и здоровье детей, что формирует долгосрочный человеческий капитал общества.

Образование женщин оказывает значительное влияние и на демографические процессы. Статистические данные различных стран показывают, что с ростом уровня образования женщин повышается осознанность в вопросах здоровья, планирования семьи и воспитания детей. Образованные матери чаще уделяют внимание качеству образования своих детей, формируют у них стремление к знаниям и ответственное отношение к обществу. Таким образом, образование женщин способствует формированию более образованного и социально активного молодого поколения.

Социальная стабильность общества также во многом зависит от уровня образования женщин. Образованные женщины чаще участвуют в общественной жизни, деятельности местных сообществ, неправительственных организаций и социальных инициатив. Они активнее участвуют в решении социальных проблем, связанных с образованием, здравоохранением, экологией и поддержкой уязвимых слоёв населения. Их участие способствует укреплению гражданского общества и формированию культуры сотрудничества и взаимной ответственности.

Кроме того, уровень образования женщин влияет на развитие демократических процессов. Образованные женщины чаще участвуют в политической жизни, общественных дискуссиях и процессах принятия решений. Их присутствие в органах управления способствует более сбалансированному подходу к социальным вопросам, включая поддержку семьи, защиту прав детей, улучшение системы образования и здравоохранения. Включённость женщин в политические процессы

усиливает доверие населения к государственным институтам и способствует развитию демократической культуры.

Культурные изменения также во многом связаны с ростом образовательного уровня женщин. Образованные женщины способствуют разрушению устаревших стереотипов, формируют новые ценности, основанные на равноправии, взаимном уважении и социальной ответственности. Они становятся носителями прогрессивных взглядов и передают их следующим поколениям, что постепенно трансформирует общественные установки и способствует развитию более открытого и справедливого общества.

Несмотря на достигнутый прогресс, в ряде регионов всё ещё сохраняются препятствия для получения женщинами качественного образования. Среди основных проблем остаются экономические трудности, культурные ограничения, неравный доступ к образовательным ресурсам, а также необходимость совмещать учёбу с семейными обязанностями. Решение этих проблем требует комплексного подхода, включающего государственную поддержку, развитие образовательной инфраструктуры и формирование общественного понимания важности женского образования.

Таким образом, уровень образования женщин является одним из важнейших факторов социального прогресса. Он влияет на экономическое развитие, социальную стабильность, качество человеческого капитала, демократические процессы и культурное обновление общества. Инвестиции в образование женщин следует рассматривать не только как вопрос социальной справедливости, но и как стратегическую необходимость для устойчивого развития государства.

В заключение можно отметить, что общество, создающее равные образовательные возможности для женщин и мужчин, получает значительные преимущества в виде устойчивого экономического роста, социальной гармонии и повышения качества жизни населения. Расширение доступа женщин к образованию способствует формированию более квалифицированного трудового потенциала, укреплению института семьи, повышению уровня социальной ответственности и развитию гражданского общества. Образованные женщины активнее участвуют в общественной жизни, поддерживают процессы модернизации и передают ценности образования следующим поколениям, что обеспечивает устойчивое развитие общества в долгосрочной перспективе.

Кроме того, гендерно сбалансированная образовательная политика способствует снижению социальной напряжённости, расширению возможностей трудоустройства и формированию справедливых социальных отношений. В условиях глобальных изменений именно образование становится основой инновационного развития, и участие женщин в этом процессе значительно расширяет потенциал общества.

Поэтому развитие системы образования с учётом гендерного равенства становится важнейшей задачей современного общества, стремящегося к долгосрочному прогрессу, социальной стабильности и всеобщему благополучию. Обеспечение равных образовательных возможностей является не только вопросом социальной справедливости, но и стратегическим направлением развития любого государства в XXI веке.

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## **ИНСТИТУЦИОНАЛЬНАЯ ТРАНСФОРМАЦИЯ ДИСКРИМИНАЦИОННЫХ ГЕНДЕРНЫХ НОРМ В СФЕРЕ ЭКОНОМИЧЕСКОЙ АКТИВНОСТИ ЖЕНЩИН: СРАВНИТЕЛЬНЫЙ АНАЛИЗ ЗАРУБЕЖНОГО ОПЫТА**

***Аннотация.** В статье анализируется зарубежный опыт институциональной трансформации дискриминационных гендерных норм в сфере экономической активности женщин. Актуальность исследования обусловлена тем, что формальное закрепление принципа равенства не всегда приводит к реальному сокращению гендерных разрывов в оплате труда, профессиональной сегрегации и карьерном продвижении. Новизна работы заключается в рассмотрении трансформации гендерных норм как институционального процесса, включающего правовые реформы, изменение политики занятости, развитие инфраструктуры ухода и внедрение механизмов прозрачности оплаты труда. На примере Республики Корея, Турции и Казахстана анализируются инструменты перехода от дискриминационных установок к гендерно-равным институциональным практикам. Показано, что наиболее устойчивые изменения достигаются при сочетании нормативных реформ и перераспределения обязанностей по уходу между мужчинами и женщинами. Сделан вывод о том, что трансформация гендерных норм требует комплексного институционального подхода и согласованного действия семьи, системы образования и рынка труда.*

***Ключевые слова:** гендерное равенство; институциональная трансформация; рынок труда; дискриминационные нормы; экономическая активность женщин; политика занятости; уходовой труд.*

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## **INSTITUTIONAL TRANSFORMATION OF DISCRIMINATORY GENDER NORMS IN WOMEN'S ECONOMIC ACTIVITY: A COMPARATIVE ANALYSIS OF INTERNATIONAL EXPERIENCE**

***Abstract.** This article analyzes international experience in the institutional transformation of discriminatory gender norms in women's economic activity. The relevance of this study lies in the fact that formally enshrining the principle of equality does not always lead to a real reduction in gender gaps in wages,*



*occupational segregation, and career advancement. The novelty of this work lies in its examination of the transformation of gender norms as an institutional process, including legal reforms, changes in employment policy, the development of care infrastructure, and the introduction of pay transparency mechanisms. Using the examples of the Republic of Korea, Turkey, and Kazakhstan, the authors analyze the tools for transitioning from discriminatory attitudes to gender-equal institutional practices. It is shown that the most sustainable changes are achieved through a combination of regulatory reforms and the redistribution of care responsibilities between men and women. It is concluded that the transformation of gender norms requires a comprehensive institutional approach and coordinated action by the family, education system, and labor market.*

**Keywords:** *gender equality; institutional transformation; labor market; discriminatory norms; women's economic activity; employment policy; care work.*

**Введение.** Гендерное равенство в сфере экономической активности женщин в последние десятилетия стало одним из ключевых направлений глобальной социальной и экономической повестки [1]. Несмотря на расширение доступа женщин к образованию и формальное закрепление принципа равных прав в национальных законодательствах, устойчивые различия в уровне занятости, оплате труда и карьерном продвижении сохраняются во многих странах [2]. Данный парадокс свидетельствует о том, что институциональные изменения правового характера не всегда приводят к трансформации социальных норм и поведенческих моделей.

Различие между формальным равенством и фактическим неравенством заключается в том, что юридическое признание равных прав не устраняет структурные барьеры, встроенные в систему распределения ролей и ресурсов. Гендерные разрывы воспроизводятся через механизмы профессиональной сегрегации, неравномерное распределение неоплачиваемого ухода и институциональные ожидания работодателей [3].

Под дискриминационными гендерными нормами в настоящем исследовании понимаются устойчивые социальные установки и институциональные практики, которые ограничивают экономическую активность женщин и закрепляют асимметричное распределение ответственности между мужчинами и женщинами. Эти нормы проявляются как на уровне семьи, так и в системе образования и на рынке труда.

Институциональный подход позволяет рассматривать гендерное неравенство как результат взаимосвязанного функционирования институтов семьи, образования и занятости [4]. Согласно данной логике, трансформация дискриминационных норм возможна лишь при изменении институциональных правил и механизмов их воспроизводства.

Цель настоящего исследования состоит в выявлении институциональных механизмов трансформации дискриминационных гендерных норм в сфере экономической активности женщин. В рамках

работы ставятся следующие задачи: проанализировать зарубежные практики институциональных изменений; выявить структурные инструменты трансформации норм; определить общие закономерности их функционирования.

Исследовательский вопрос формулируется следующим образом: какие институциональные механизмы обеспечивают переход от дискриминационных гендерных норм к гендерно-равным практикам в сфере экономической активности?

Логика сравнительного анализа строится на сопоставлении опыта Республики Корея, Турции и Казахстана как стран с различными социально-экономическими моделями, но сходными институционально-культурными предпосылками. Такой подход позволяет выявить универсальные и специфические механизмы институциональной трансформации без прямой нормативной экстраполяции на национальный контекст.

**Материалы и методы.** Настоящее исследование основано на институциональном подходе, рассматривающем гендерное неравенство как результат устойчивого функционирования формальных и неформальных правил, регулирующих распределение экономических ролей. В рамках данного подхода институты понимаются как совокупность норм, правил и механизмов их принудительного обеспечения, формирующих поведенческие стратегии экономических акторов. Такой метод позволяет анализировать не отдельные показатели, а структурные механизмы воспроизводства и трансформации дискриминационных гендерных норм.

Сравнительный анализ используется как основной исследовательский инструмент, поскольку трансформация институциональных норм носит контекстуальный характер и зависит от сочетания правовых, культурных и экономических факторов. Сопоставление различных стран позволяет выявить как универсальные, так и специфические механизмы перехода от дискриминационных практик к гендерно-равным институциональным моделям [5].

Выбор Республики Корея, Турции и Казахстана обусловлен их различной траекторией институционального развития при наличии сопоставимых элементов традиционной гендерной структуры. Республика Корея демонстрирует активную государственную политику перераспределения обязанностей по уходу и стимулирования участия женщин в экономике. Турция характеризуется постепенной адаптацией гендерной политики в условиях сохраняющихся культурных ограничений. Казахстан представляет постсоветскую модель институциональной трансформации с элементами государственной гендерной стратегии. Такое сочетание позволяет выявить различные модели институционального реагирования на проблему дискриминационных норм.

В качестве аналитических единиц исследования выделены следующие институциональные механизмы:

1. Политика ухода и перераспределения семейных обязанностей (включая отпуск по уходу за ребенком для отцов и развитие инфраструктуры дошкольного образования).

2. Институциональные механизмы рынка труда (регулирование занятости, поддержка женской занятости, модели гибкой занятости).

3. Механизмы прозрачности оплаты труда и сокращения гендерного разрыва в заработной плате.

4. Институциональные инструменты расширения доступа женщин к руководящим позициям.

Эмпирическая база исследования сформирована на основе отчетов международных организаций (ILO, OECD, World Economic Forum, UN Women), национальной статистики рассматриваемых стран, а также анализа нормативно-правовых документов, регулирующих гендерную и трудовую политику [6].

Такой комплексный методологический подход позволяет рассматривать трансформацию гендерных норм как системный процесс институциональных изменений, а не как совокупность изолированных социальных инициатив.

**Результаты.** Институциональная трансформация гендерных норм в Республике Корея строилась вокруг реформы parental leave, развития инфраструктуры ухода и изменения режима рабочего времени. С 1990-х годов политика отпусков по уходу за ребенком была интегрирована в демографическую стратегию государства и ориентирована на защиту материнства, преодоление низкой рождаемости, обеспечение баланса «работа–семья» и вовлечение отцов в уход.

Нормативная база закрепила оплачиваемый отпуск по беременности и родам продолжительностью 90 дней (с возможным расширением до 120 дней, из которых не менее 45 дней – послеродовой период). Отпуск по уходу за ребенком предоставляется каждому родителю индивидуально и может суммарно достигать 18 месяцев. Финансовая компенсация осуществляется через систему социального страхования; с 2025 г. максимальная ежемесячная выплата увеличена до 2,5 млн вон [7]. Доля отцов, воспользовавшихся отпуском, в первой половине 2025 г. достигла 36,4 %, однако его использование концентрируется преимущественно в крупных корпорациях и государственном секторе [8].

Параллельно государство развивало инфраструктуру ухода, переходя от семейно-ориентированной модели к институциональной поддержке. С начала 2000-х годов расширена сеть государственных дошкольных учреждений и внедрены механизмы субсидирования частных услуг. Поддержка реализуется через увеличение предложения мест и систему компенсаций и ваучеров, а также универсализацию доступа к услугам независимо от дохода семьи [9]. Вместе с тем сохраняются

территориальные диспропорции и ограничения, связанные с корпоративной культурой и продолжительностью рабочего времени [10].

В 2018 г. введена 52-часовая рабочая неделя (40 часов базовой занятости и до 12 часов сверхурочной работы) [11]. Реформа рассматривалась как инструмент улучшения баланса «работа–семья» и демографической политики. По оценкам OECD, чрезмерная продолжительность рабочего времени ранее ограничивала участие мужчин в уходе и закрепляла гендерную асимметрию. Дополнительно институционализированы гибкие формы занятости и механизмы временного сокращения рабочего дня для родителей малолетних детей.

Комплекс реформ оказал измеримое влияние на экономическую активность женщин. Уровень занятости женщин 15–64 лет вырос с 52,2 % в 2000 г. до 60,1 % в 2023 г.. Одновременно увеличилась доля стабильных форм занятости. Однако гендерный разрыв в оплате труда в 2023 г. составил около 31,2 % — один из самых высоких среди стран OECD (при среднем уровне 12–13 %) [12]. Сохраняется вертикальная сегрегация, несмотря на постепенный рост доли женщин в руководящих позициях. В Индексе гендерного неравенства ПРООН в 2023 г. Республика Корея заняла 12-е место (0,038) [13].

Таким образом, институциональная перестройка через политику перераспределения ухода способствовала росту занятости женщин и укреплению их экономической устойчивости. Однако устойчивость гендерного разрыва в оплате труда и вертикальной сегрегации указывает на сохраняющиеся структурные барьеры, требующие изменения корпоративных практик наряду с правовым регулированием.

В отличие от Республики Корея, институциональная динамика в Турции характеризуется более постепенной и фрагментарной трансформацией гендерных норм. На протяжении последних двух десятилетий государственная политика была направлена на повышение уровня занятости женщин в условиях традиционно низкой экономической активности женского населения.

По данным OECD, уровень занятости женщин в возрасте 15–64 лет в Турции увеличился с 26,6 % в 2005 г. до 36,0 % в 2023 г., что свидетельствует о положительной, но сравнительно медленной динамике [14]. Основными инструментами стимулирования выступили налоговые льготы для работодателей, программы субсидирования найма женщин и меры по формализации женской занятости в сельском хозяйстве и секторе услуг.

Особое внимание уделяется поддержке женского предпринимательства. Через агентство KOSGEB и программы Министерства семьи и социальных услуг реализуются грантовые и кредитные механизмы для открытия собственного бизнеса женщинами, что рассматривается как способ снижения структурной зависимости от традиционного наемного труда [15].

Значимым направлением институциональных изменений стала легализация и расширение режима частичной занятости (part-time work), особенно для матерей малолетних детей. В соответствии с поправками к Трудовому кодексу Турции (2016 г.), после окончания отпуска по беременности и родам родители получили право перейти на неполный рабочий день до достижения ребенком школьного возраста [16].

Данный механизм рассматривается как компромиссная модель между полной занятостью и выходом с рынка труда. Он институционально закрепляет возможность совмещения ухода и трудовой деятельности, однако одновременно воспроизводит гендерную асимметрию, поскольку основными пользователями режима частичной занятости остаются женщины.

Эмпирические исследования указывают на то, что частичная занятость в Турции часто сопряжена с более низким уровнем социальной защиты и ограниченными карьерными перспективами, что формирует «двухскоростную» модель рынка труда [17].

Институциональная политика Турции в сфере социальной поддержки ориентирована на расширение доступа к дошкольным учреждениям и денежным трансфертам семьям с детьми. В рамках Национальной стратегии по занятости реализуются меры по увеличению числа государственных детских садов и стимулированию корпоративных форм ухода [18].

В то же время уровень охвата детей раннего возраста формальными учреждениями остается ниже среднего показателя стран OECD, что ограничивает потенциал структурной трансформации гендерных ролей.

Система денежных выплат семьям, включая пособия по уходу за ребенком, играет компенсаторную роль, однако не формирует устойчивых стимулов к перераспределению родительских обязанностей между мужчинами и женщинами [19].

В результате реализуемых мер наблюдается постепенное увеличение участия женщин в экономической деятельности, а также рост их образовательного уровня и предпринимательской активности. Вместе с тем сохраняются выраженные институциональные барьеры: низкий уровень занятости женщин по сравнению со средними показателями OECD, высокая доля неформальной занятости и ограниченное представительство женщин в руководящих позициях.

Гендерный разрыв в оплате труда в Турции ниже, чем в Республике Корея, однако он частично скрывает структурную сегрегацию и низкую общую вовлеченность женщин в формальный сектор [20].

Таким образом, турецкий опыт демонстрирует модель постепенной институциональной трансформации, при которой меры по стимулированию занятости и частичной занятости расширяют формальные возможности женщин, но не полностью трансформируют традиционную модель распределения ухода. Институциональные изменения носят



эволюционный характер и сталкиваются с устойчивыми культурными и структурными ограничениями.

В отличие от Республики Корея и Турции, институциональная трансформация гендерных норм в Казахстане развивалась в логике постсоветской адаптации, сочетающей элементы советского наследия высокой женской занятости и новых рыночных институтов. Государственная политика в сфере гендерного равенства опирается на долгосрочные стратегические документы, включая Концепцию семейной и гендерной политики до 2030 года [21].

Казахстан реализует институциональный подход к гендерному равенству через программные документы, направленные на расширение экономических возможностей женщин, снижение дискриминации на рынке труда и увеличение их участия в принятии решений. Гендерная повестка интегрирована в национальные планы развития и стратегии модернизации государственного управления [22].

В отличие от более структурных реформ Кореи, казахстанская модель характеризуется постепенной институционализацией норм через стратегическое планирование и индикативные показатели.

Трудовой кодекс Республики Казахстан закрепляет принципы равной оплаты труда за равный труд и запрет дискриминации по признаку пола. Законодательство предусматривает отпуск по беременности и родам, а также отпуск по уходу за ребенком до достижения им трех лет с сохранением рабочего места. При этом право на отпуск по уходу может реализовываться как матерью, так и отцом, что формально закрепляет гендерно-нейтральную модель родительства [23].

Одновременно сохраняются элементы защитного законодательства, ограничивавшие ранее занятость женщин в отдельных отраслях. В последние годы перечень запрещенных для женщин профессий был существенно сокращен, что рассматривается как шаг к устранению структурной сегрегации [24].

Казахстан демонстрирует относительно высокий уровень участия женщин в государственном управлении по сравнению с рядом стран региона. По данным Межпарламентского союза, доля женщин в нижней палате парламента в 2023 г. превысила 27% [25]. Введение партийных квот способствовало институционализации представительства женщин в политике.

Рост участия женщин в системе государственного управления формирует нормативный сигнал о допустимости и легитимности женского лидерства, что оказывает косвенное влияние на рынок труда и корпоративный сектор.

Экономическая активность женщин в Казахстане традиционно остается высокой: уровень занятости женщин 15-64 лет в 2023 г. составил около 65% [26]. Гендерный разрыв в оплате труда ниже, чем в Республике



Корея, однако сохраняется и связан преимущественно с отраслевой сегрегацией и различиями в позициях занятости.

Таким образом, казахстанская модель представляет собой смешанный тип институциональной адаптации. С одной стороны, сохраняется советское наследие высокой вовлеченности женщин в экономику; с другой — рыночные механизмы и структурная сегрегация воспроизводят элементы неравенства. Институциональные реформы направлены на формальное закрепление равных прав и расширение политического представительства, однако трансформация гендерных норм происходит эволюционно и в значительной степени зависит от структурных особенностей рынка труда.

**Обсуждение.** Проведенный анализ демонстрирует три различных типа институциональной трансформации гендерных норм.

Республика Корея реализует структурную модель, основанную на активном вмешательстве государства в сферу перераспределения ухода. Расширение parental leave, инвестиции в инфраструктуру и реформирование рабочего времени формируют целостный институциональный контур. Несмотря на высокий гендерный разрыв в оплате труда (31,2 %), уровень занятости женщин вырос до 60,1 %, что свидетельствует о постепенном изменении поведенческих моделей.

Турция демонстрирует эволюционную модель. Политика частичной занятости и социальные программы расширяют участие женщин в экономике, однако институциональное вмешательство в распределение ухода ограничено. В результате рост занятости происходит медленнее, а структурные барьеры сохраняются.

Казахстан представляет адаптационную постсоветскую модель. Высокий уровень женской занятости сочетается с сохранением вертикальной сегрегации и ограниченным участием женщин в высших управленческих позициях. Институциональная трансформация здесь происходит через стратегические документы и политическое представительство, но не сопровождается глубокой перестройкой структуры ухода.

Таким образом, сравнительный анализ показывает, что решающим звеном трансформации является институциональное вмешательство в сферу неоплачиваемого ухода. Там, где государство активно перераспределяет родительские обязанности (Корея), наблюдаются более выраженные структурные сдвиги. В моделях, где перераспределение ухода остается преимущественно частной сферой (Турция, Казахстан), изменения носят ограниченный характер.

Временной фактор также имеет ключевое значение. Корейский опыт демонстрирует лаг между реформами и измеримыми результатами, что указывает на необходимость длительного институционального цикла для изменения социальных норм.

На фоне рассмотренных моделей Узбекистан демонстрирует институциональную конфигурацию, в которой формальное равенство закреплено, однако механизмы перераспределения ухода и устранения сегрегации остаются ограниченными.

Горизонтальная сегрегация проявляется в концентрации женщин в сельском хозяйстве, образовании и социальных услугах при сохранении более высоких доходов в технических и промышленных секторах. Вертикальная сегрегация выражается в низком представительстве женщин на высших исполнительных позициях (7,7 % министров), несмотря на сравнительно высокий уровень парламентского представительства (33,6 %).

Дополнительным структурным фактором является асимметрия неоплачиваемого труда: женщины тратят в среднем 5,36 часа в день на домашнюю работу против 2,18 часа у мужчин. В сочетании с гендерным разрывом в оплате труда (29,6 % в 2023 г.) и ростом неформальной занятости это формирует устойчивую институциональную цепочку воспроизводства неравенства [27].

Тем самым Узбекистан находится на переходной стадии: формальные институты модернизированы, однако структурное перераспределение ухода и карьерных возможностей пока не достигло уровня глубокой институциональной трансформации.

**Заключение.** Проведенное сравнительное исследование показало, что трансформация дискриминационных гендерных норм в сфере экономической активности женщин имеет выраженную институциональную природу. Гендерное неравенство воспроизводится не как совокупность индивидуальных различий, а как результат взаимосвязанного функционирования институтов семьи, рынка труда и системы распределения власти.

Сопоставление Республики Корея, Турции и Казахстана позволило выделить три модели институциональной динамики: структурную (Корея), эволюционную (Турция) и адаптационную постсоветскую (Казахстан). Наиболее значимые изменения наблюдаются в тех случаях, когда государство осуществляет системное вмешательство в сферу неоплачиваемого ухода, сочетая правовые нормы, экономические стимулы и реформирование рабочего времени. При отсутствии глубокой перераспределительной политики изменения носят ограниченный характер и затрагивают преимущественно формальные аспекты занятости.

Анализ подтверждает, что решающим звеном трансформации является институционализация перераспределения родительских обязанностей. Без изменения структуры неоплачиваемого труда рынок труда воспроизводит горизонтальную и вертикальную сегрегацию, гендерный разрыв в оплате труда и ограничения карьерного продвижения.

Временной фактор играет принципиальную роль: институциональные реформы требуют длительного периода адаптации,

прежде чем приводят к устойчивым поведенческим изменениям. Корейский опыт демонстрирует наличие временного лага между законодательными изменениями и структурными сдвигами в занятости.

Имплицитное сопоставление с узбекской институциональной моделью показывает, что формальное закрепление равных прав является необходимым, но недостаточным условием трансформации гендерных норм. Структурные механизмы сегрегации, асимметрия неоплачиваемого труда и неравномерный доступ к управленческим позициям указывают на сохранение институциональных барьеров.

Таким образом, достижение устойчивого гендерного равенства в сфере экономической активности предполагает не только модернизацию законодательства, но и комплексное изменение механизмов распределения ухода, структуры занятости и корпоративных практик. Трансформация норм представляет собой длительный институциональный процесс, в котором правовые, экономические и культурные факторы действуют во взаимной зависимости.

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**ПСИХОЛОГИЧЕСКИЕ И ПЕДАГОГИЧЕСКИЕ УСЛОВИЯ  
РАЗВИТИЯ ПРОФЕССИОНАЛЬНОЙ КОММУНИКАТИВНОЙ  
КОМПЕТЕНЦИИ ПРИ ОБУЧЕНИИ ИНОСТРАННОМУ ЯЗЫКУ В  
НЕЯЗЫКОВОМ ВУЗЕ**

***Аннотация.** Статья посвящена выявлению психологических и педагогических условий, обеспечивающих развитие профессиональной иноязычной коммуникативной компетенции студентов неязыковых вузов в условиях ограниченного аудиторного времени, глобализации и цифровизации. На основе анализа современной литературы и практико-ориентированных подходов обоснована совокупность психолого-педагогических факторов: внутренняя профессиональная мотивация, снижение языковой тревожности, поддерживающий групповой климат, коммуникативная направленность обучения, личностно-ориентированная и компетентностная парадигмы, использование проектных форм, дебатов и цифровых средств, а также предметно-языковая интеграция (CLIL) и внеаудиторное формирование «искусственной» языковой среды.*

***Ключевые слова:** профессиональная коммуникативная компетенция, психологические условия, педагогические условия, мотивация, языковая тревожность, коммуникативный подход, компетентностный подход, CLIL, цифровые образовательные технологии, неязыковой вуз.*

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**PSYCHOLOGICAL AND PEDAGOGICAL CONDITIONS FOR THE  
DEVELOPMENT OF PROFESSIONAL COMMUNICATIVE  
COMPETENCE IN TEACHING A FOREIGN LANGUAGE IN A NON-  
LINGUISTIC UNIVERSITY**

***Annotation.** The article identifies psychological and pedagogical conditions that foster the development of professional foreign-language communicative competence among non-linguistic university students under constraints of limited class time, ongoing globalization, and digitalization. Drawing on recent scholarship and practice-based methodologies, it substantiates a set of conditions: intrinsic professional motivation, reduction of foreign-language anxiety, and a*



*supportive group climate; a communicative, learner-centered and competence-based paradigm; the use of projects, debates and digital tools; content-and-language integrated learning (CLIL); and extra-curricular arrangements that simulate a language environment.*

**Keywords:** *professional communicative competence, psychological conditions, pedagogical conditions, motivation, foreign-language anxiety, communicative approach, competence-based approach, CLIL, digital educational technologies, non-linguistic university.*

В условиях глобализации и цифровизации владение иностранным языком (прежде всего английским) становится неотъемлемой частью профессиональной подготовки специалиста любой отрасли. Современный рынок труда рассматривает уровень английского языка как один из показателей конкурентоспособности выпускника. По сути, английский язык сегодня – это не просто учебная дисциплина или дань образованию, а важнейший инструмент профессиональной деятельности, влияющий на карьерные возможности молодого специалиста. Однако специфика неязыковых вузов такова, что на изучение иностранного языка обычно отводится весьма ограниченное количество часов, что затрудняет достижение высокого уровня владения языком. На практике это приводит к тому, что студенты неязыковых специальностей нередко демонстрируют низкую мотивацию к изучению английского, испытывают дефицит языковой практики и не имеют возможности погружения в языковую среду в повседневной жизни [3, 63].

Все перечисленные факторы обуславливают необходимость создания специальных психологических и педагогических условий, направленных на развитие профессиональной иноязычной коммуникативной компетенции (ИКК) у студентов неязыковых направлений обучения. Понятие иноязычной профессиональной коммуникативной компетенции трактуется исследователями как готовность и способность будущего специалиста использовать иностранный язык для решения профессиональных задач – от чтения научно-технической литературы до участия в переговорах и публичных выступлениях [3, 58]. Данная компетенция рассматривается как ключевой компонент профессиональной компетентности выпускника, напрямую влияющий на его успешность в межкультурной коммуникации. Зарубежные авторы подчеркивают, что развитие такой компетенции возможно лишь при создании «эффективной профессиональной среды», в которой изучение языка интегрировано с профессиональной деятельностью обучающихся.

В современной педагогике акцент делается как на дидактические, так и на психологические аспекты проблемы. Так, О. Мохова и соавторы в своих исследованиях уделяют внимание преодолению у студентов «языкового барьера» – страха общения на иностранном языке – посредством формирования позитивного мотивационного климата на



занятиях [3, 65]. Эмоциональное благополучие, отсутствие боязни ошибки и поддержка со стороны преподавателя рассматриваются ими как базис успешного овладения речевыми навыками. А. Беляев предлагает интегрированный подход к обучению профессиональному общению на английском языке, предполагающий использование профессионально-ориентированных кейсов и задач, благодаря которым изучение языка происходит не обособленно, а в русле решения реальных задач специальности [1, 49].

Подобный подход позволяет параллельно развивать собственно языковые умения и формировать профессиональные компетенции студентов в рамках единого учебного процесса. В целом обзор литературы показывает тенденцию к комплексному рассмотрению факторов, влияющих на развитие профессиональной ИКК: от мотивации и психологической готовности учащихся до внедрения инновационных методик и междисциплинарной интеграции в обучении [3, 59].

Развитие профессиональной иноязычной компетенции невозможно без учета психологических факторов, определяющих успех изучения языка. К числу важнейших условий относятся:

- **Высокая мотивация студентов.** Мотивация играет решающую роль в освоении иностранного языка. Исследования показывают, что студенты с сильной *внутренней мотивацией* – осознающие практическую ценность английского для будущей карьеры, стремящиеся к профессиональному и личностному росту – достигают заметно больших успехов в изучении языка. Для формирования устойчивой мотивации необходимо сделать процесс обучения лично значимым для учащихся. Этому способствует демонстрация реальной профессиональной значимости иностранного языка, а также включение в программу кейсов и проектов, имитирующих рабочие ситуации из будущей сферы деятельности [2, 68]. Напротив, *внешняя мотивация* (только оценка или требование программы) без подкрепления личным смыслом обычно оказывается недостаточной. Поэтому важная задача преподавателя – постоянно поддерживать и укреплять у обучающихся осознание того, зачем им нужен иностранный язык в контексте их профессионального и академического развития.

- **Снижение языковой тревожности.** Частой психологической преградой является страх ошибки и вообще языковая тревожность – беспокойство, возникающее в процессе коммуникации на неродном языке. Чрезмерный страх сделать ошибку ведет к тому, что студент предпочитает промолчать, не участвует в обсуждениях, избегает сложных заданий. Для преодоления этого барьера необходимо создать на занятиях атмосферу психологического комфорта и доверия. Преподавателю следует ясно дать понять, что ошибки – естественная часть обучения и практически необходимый этап на пути к беглости речи. Поощрение даже небольших успехов, доброжелательная корректировка ошибок и фокус на содержании высказывания, а не на его недостатках, помогают студентам чувствовать

себя увереннее. Полезно также задействовать формат работы в малых группах или парах: в небольшом коллективе говорить на иностранном языке не так страшно, как перед всей группой или преподавателем. Преподаватель, выступающий в роли наставника и поддерживающего партнера, а не строгого контролера, создает условия, в которых студент не боится проявлять инициативу в речи. Благодаря этому постепенно формируется чувство психологической безопасности, и учащиеся готовы активнее применять язык на практике.

- **Позитивный климат в группе.** Не менее значимым условием выступает общий психологический климат учебной группы. Дружелюбная, сплоченная атмосфера занятий стимулирует студентов активно участвовать в коммуникации, не опасаясь осуждения. Поддержка со стороны одноклассников, взаимоуважение и элемент командной работы повышают вовлеченность каждого. Преподавателю важно с самого начала задать тон сотрудничества, поощрять студентов помогать друг другу (например, при совместном выполнении проектов, в парных диалогах). Если в группе сформировано чувство сопричастности – понимание, что все находятся «в одной лодке» и учатся сообща, – то снижается психологическое напряжение и конкуренция, мешающие свободному обмену мнениями.

Наоборот, возникает положительная динамика: более сильные ученики готовы поддержать слабых, а те, в свою очередь, не стесняются задавать вопросы и пробовать говорить. Созданию благоприятного климата способствуют также внеклассные коллективные мероприятия (круглые столы, дискуссионные клубы, языковые игры), где студенты могут раскрепоститься. Как отмечают исследователи, ощущение психологической комфортности, групповая сплоченность и доброжелательное отношение являются важным условием преодоления «языкового барьера» у студентов неязыковых вузов [3, 71].

Таким образом, психологические условия сводятся к обеспечению внутренней готовности и уверенности учащихся в использовании иностранного языка. Высокая учебная мотивация, отсутствие боязни ошибки и позитивная групповая атмосфера создают прочный фундамент, на котором строится дальнейшее развитие коммуникативных навыков. Следующим шагом становится применение адекватных педагогических методов, усиливающих этот фундамент. Эффективность формирования профессиональной коммуникативной компетенции во многом определяется тем, как организован сам учебный процесс.

Можно выделить ряд педагогических условий и подходов, доказавших свою результативность в практике обучения иностранному языку для профессиональных целей:

1. *Коммуникативный подход в обучении.* Принцип коммуникативности предполагает, что центральным элементом занятия становится общение на изучаемом языке в ситуациях, максимально

приближенных к реальным. В отличие от традиционных методов, ориентированных на переводы и изучение грамматики в отрыве от практики, коммуникативный подход фокусируется на употреблении языка для решения конкретных коммуникативных задач. На занятиях студенты выступают не пассивными слушателями, а активными собеседниками и партнёрами по взаимодействию. Обучение строится вокруг ролевых игр, диалогов, дискуссий, анализа проблемных ситуаций – словом, всего, что требует говорить, слушать, читать и писать в смысловом контексте.

Такой подход позволяет параллельно развивать все виды речевой деятельности – говорение, аудирование, чтение, письмо – и формировать навыки их интегрированного применения [1, 59]. Коммуникативная методика также призвана снять психологический барьер перед говорением на иностранном языке: погружаясь в условно реальную ситуацию, студент забывает о страхе ошибки, сосредотачиваясь на передаче смысла. В условиях неязыкового вуза, где часы ограничены, именно коммуникативная направленность занятий позволяет использовать учебное время максимально эффективно.

2. *Личностно-ориентированный подход.* Данный подход предполагает учет индивидуальных особенностей каждого учащегося при планировании и реализации обучения. Студенты неязыковых специальностей, как правило, отличаются разноуровневой подготовкой по языку, разным стилем учебной деятельности, да и интересы у них могут варьироваться в зависимости от профиля (кому-то ближе техническая лексика, кому-то экономическая). Личностно-ориентированное обучение ставит в центр внимания личность студента: его сильные и слабые стороны, потребности, мотивацию, тип мышления. Преподаватель гибко адаптирует содержание курса под конкретную аудиторию – отбирает тексты и задания, соотносящиеся с будущей специальностью группы, варьирует сложность упражнений, предлагает выбор тем проектов согласно интересам студентов. Организация занятий с учётом индивидуальных особенностей и профессиональных интересов обучающихся способствует более эффективному усвоению материала и повышает мотивацию к учёбе. Каждый студент чувствует личную вовлечённость, видит, что курс учитывает его потребности, – благодаря этому возрастает отдача. Важно также предоставлять студентам возможности для самовыражения на английском языке – будь то выбор тем презентаций, эссе на темы, связанные с их личным опытом в профессии. Личностно-ориентированное обучение делает изучение языка лично значимым для студента, что ведет к лучшим результатам [1, 50]. Исследования подтверждают: когда занятия построены с оглядкой на индивидуальность учащегося, повышается не только успеваемость, но и удовлетворённость обучением, что крайне важно для долгосрочного прогресса.

3. Компетентностный (практико-ориентированный) подход. Современные стандарты высшего образования смещают акцент с передачи знаний на формирование конкретных компетенций, то есть способности применять знания на практике. В русле этой парадигмы обучение иностранному языку должно быть тесно связано с реальной профессиональной деятельностью студентов. Компетентностный подход подразумевает, что студенты осваивают язык не в отрыве, а через выполнение практически значимых заданий, имитирующих профессиональную коммуникацию. Вместо условного «учебного» английского им предлагаются задачи, с которыми они столкнутся в работе: составление отчетов и резюме, подготовка и проведение презентаций, деловая переписка (письма, заявки, коммерческие предложения), участие в переговорах, обсуждение производственных или научных проблем. Выполняя такие задания, обучающиеся не только совершенствуют языковые навыки, но и параллельно учатся решать профильно ориентированные задачи средствами иностранного языка. А.А. Беляев, реализуя интегрированный подход, продемонстрировал, что объединение в рамках одного курса целей изучения языка и целей профессиональной подготовки существенно повышает результаты: студенты одновременно улучшают языковые показатели (речь, письмо) и осваивают профессиональный контент [1]. Следовательно, компетентностный подход – важное условие, при котором иностранный язык усваивается глубже и осмысленнее, ведь обучение происходит через деятельность, а не через простое запоминание правил.

4. Использование инновационных методов и технологий. Традиционные лекционно-репродуктивные методы малоэффективны для развития коммуникативных навыков. В обучение целесообразно внедрять активные формы работы, которые делают студентов субъектами деятельности, а не пассивными получателями знаний. Одним из таких методов являются проектные технологии: объединяя студентов в небольшие группы для выполнения проекта, таким образом они используют английский творчески и функционально. В ходе проекта учащиеся читают материалы по теме, обсуждают идеи, консультируются с преподавателем, готовят итоговый продукт – все на иностранном языке. Это максимально приближает их к реальной профессиональной деятельности и учит применять язык комплексно. Другой метод – дебаты и дискуссии на актуальные профессиональные темы развивают критическое мышление и умение аргументировать на английском – важнейшие компоненты коммуникативной компетенции. Кроме того, современные технологии предоставляют богатый арсенал инструментов для интерактивного и самостоятельного обучения. Электронные платформы и ресурсы (LMS Moodle, облачные сервисы типа Google Classroom, доски Padlet), тестирующие и обучающие приложения (например, мобильные приложения для тренировки словаря и грамматики), онлайн-опросники и

викторины (Kahoot, Quizlet), видеоконференцсвязь (Zoom, Microsoft Teams) – всё это позволяет выстроить смешанное обучение, выходящее за рамки аудитории. Цифровые инструменты помогают вовлечь студентов во внеаудиторную деятельность, организовать работу над языком дома и в пути, что крайне важно при дефиците часов.

5. Интеграция языка с профильными дисциплинами (подход CLIL). Методика предметно-языкового интегрированного обучения (Content and Language Integrated Learning) заключается в том, что некоторые элементы профессиональных дисциплин преподаются на иностранном языке, либо учебные курсы разрабатываются так, чтобы одновременно преследовать предметные и языковые цели. В результате студенты учат язык через содержание специальности. Такой подход давно зарекомендовал себя в Европе и приобретает популярность в вузах по всему миру, особенно в магистратуре. Преимущества CLIL очевидны: во-первых, он формирует естественную языковую среду в учебном процессе – английский используется не на вымышленных примерах, а при изучении реального материала по специальности, что делает мотивацию студентов максимально высокой. Студенты ощущают практическую пользу сразу по двум направлениям: они углубляют профессиональные знания и параллельно совершенствуют язык. Во-вторых, интеграция с профилирующими предметами позволяет расширить время контакта с языком без ущерба для основной программы – язык пронизывает весь период обучения, а не ограничивается одним-двумя семестрами.

При организации развития иноязычной компетенции в неязыковых вузах важно учитывать специфические условия, отличающие их от языковых факультетов. Одной из главных особенностей, как уже отмечалось, является ограниченное количество академических часов, выделяемых на иностранный язык. Часто обучение языку завершается на первом или втором курсе, после чего студенты погружены исключительно в специальные дисциплины. В таких условиях без поддержки и дополнительных усилий происходит постепенная утрата приобретенных языковых навыков. Поэтому необходима разработка системы внеаудиторной языковой работы, которая компенсировала бы нехватку часов и отсутствие языковой среды. Речь идет о создании возможностей для искусственной языковой среды в повседневной жизни студентов. Именно поэтому создание во внеучебной жизни элементов языковой среды рассматривается как важное условие развития ИКК [5, 21].

Еще одной особенностью обучения иностранному языку в неязыковом вузе является необходимость тесно увязывать языковой курс с профессиональным контекстом конкретной специальности. Если на филологических факультетах язык изучается как самостоятельный предмет, то у будущих инженеров, врачей, экономистов он должен преподаваться с учетом терминологии и реалий их отрасли. Это предполагает разработку учебно-методических материалов, отражающих



специфику данной профессиональной области. Подобная профессионализация содержания обучения служит сразу нескольким целям.

Во-первых, как уже отмечалось, это резко повышает мотивацию, поскольку студент работает с материалом по своей специальности и понимает его практическую значимость. Во-вторых, это расширяет его кругозор в профессиональной области за счет англоязычных источников – студент узнает новые факты, подходы, технологии из зарубежного опыта. В-третьих, формируется готовность к профессиональной коммуникации: выпускник сможет объяснить зарубежному коллеге специфику своей работы, прочитать иностранную литературу по специальности, подготовить доклад для международной конференции.

Интеграция языка и специальности может осуществляться не только через тексты, но и через совместные междисциплинарные проекты. Формирование у студентов неязыковых вузов профессиональной коммуникативной компетенции на иностранном языке – сложная многогранная задача, требующая единства психологических и педагогических условий. Психологические аспекты (мотивация, преодоление тревожности, позитивный настрой и поддержка в коллективе) создают благоприятную почву для обучения, снимают внутренние барьеры и побуждают студентов активно включаться в иноязычную деятельность.

Педагогические же условия (коммуникативно-направленное, личностно-ориентированное и практико-ориентированное обучение, инновационные методы и интеграция с профильными дисциплинами) обеспечивают эффективную организацию этого процесса, наполняют его содержанием, максимально приближенным к реальным профессиональным ситуациям. Только комплексное соблюдение всех перечисленных условий позволяет достичь главной цели – реального развития у студентов умений и навыков, необходимых для успешного профессионального общения на английском языке [3, 75; 4, 100].

Итогом такой работы становятся выпускники, способные свободно и уверенно коммуницировать в международной профессиональной среде, конкурентоспособные на рынке труда и готовые к непрерывному саморазвитию в условиях глобализованного мира. Создание психологически комфортной, мотивирующей учебной атмосферы и наполнение её современными педагогическими технологиями – залог того, что иностранный язык из формального курса превратится для студентов в действующий инструмент профессионального роста и сотрудничества.

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## **ОСНОВНЫЕ ЦЕЛИ И ЗАДАЧИ УПРАВЛЕНИЯ ИННОВАЦИОННОЙ ДЕЯТЕЛЬНОСТЬЮ**

***Аннотация:** В статье рассматриваются существующие теоретические взгляды на инновационное управление хозяйствующими субъектами, исследуются задачи в процессе инновационного управления предприятием и предлагаются рекомендации по организации инновационной деятельности. При этом изучена зарубежная научная литература по данной теме и обсуждены взгляды ведущих зарубежных ученых.*

***Ключевые слова:** Предприятие, инновации, инновационная деятельность, управление, экономика.*

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## **PRIMARY GOALS AND OBJECTIVES OF INNOVATION ACTIVITY MANAGEMENT**

***Abstract:** The article examines theoretical approaches to the innovative management of economic entities. The tasks of innovation management in enterprises are analyzed and recommendations for organizing innovative activities are proposed. The study is based on the analysis of foreign scientific literature and the views of leading international scholars.*

***Key words:** Enterprise, innovation, innovative activity, management, economy.*

Инновационные изменения охватывают все сферы экономической деятельности и все области функционирования общества. Устойчивость, развитие и эффективность экономической системы страны, а также будущие рыночные позиции отдельных предприятий напрямую зависят от успешности инновационной деятельности. Кроме того, в ряде публикаций рассмотрение инновационного процесса в форме различных поколений показывает, что он постоянно усложняется, а требования к его этапам и к процессу в целом возрастают. Это служит еще одним аргументом в пользу вывода о возрастании роли и значения инновационного менеджмента, что, в свою очередь, определяет необходимость единообразного понимания инновационного менеджмента как особого вида управления. С

концептуальной точки зрения данную проблему можно решить путем определения концептуальных особенностей управления инновационной деятельностью предприятий.

Основной целью управления инновационной деятельностью является повышение технологического уровня производства и конкурентоспособности продукции, обеспечение выхода инновационных продуктов на внутренние и внешние рынки, замещение импортных товаров на внутреннем рынке отечественной продукцией и на этой основе перевод промышленного производства на устойчивую траекторию экономического роста. Цели управления инновационной деятельностью имеют свои особенности и структурируются по определённым уровням.

Первая особенность инновационной деятельности заключается в том, что в её результате происходят изменения в самих продуктах, объектах труда и технологиях, при этом во многих случаях подобные изменения в объекте управления невозможно заранее точно прогнозировать. Масштабы изменений могут быть настолько значительными, что в результате ряда инновационных преобразований предприятия способны полностью изменить отрасль своей промышленной деятельности.

Кроме того, многие руководители предприятий в первую очередь уделяют внимание вопросам исследований и разработок, тогда как задачи управления интеллектуальной собственностью, коммерциализации и стимулирования рынка остаются нерешёнными.

Наличие следующих преимуществ в экономике создаёт благоприятные условия для решения основных задач инновационного развития:

- наличие природных ресурсов, развитой минерально-сырьевой базы и транспортной инфраструктуры;
- значительный технологический потенциал оборонной и соответствующей гражданской промышленности;
- наличие производственных мощностей для выпуска массовой и относительно недорогой продукции, способной реализовываться на внутреннем рынке, а также на рынках ряда развивающихся стран;
- значительный научно-технологический потенциал, большое количество патентов, ноу-хау, высококвалифицированные научные кадры; система высшего образования мирового уровня.

При решении поставленных задач необходимо учитывать следующие факторы:

- недостаточность финансовых ресурсов, влияющих на инновационную активность производства в реальном секторе экономики;
- технологическая отсталость, обуславливающая низкую конкурентоспособность продукции отдельных отраслей;
- недостаточное развитие сферы малых инновационных предприятий, обладающих необходимой гибкостью для быстро меняющихся рыночных условий;

- недостаточный уровень развития широкой инфраструктуры в инновационной сфере.

Основными задачами государственной инновационной политики являются:

- выбор рациональной стратегии и приоритетов развития инновационной сферы при реализации ключевых технологий и инновационных проектов в отраслях, влияющих на повышение эффективности производства и конкурентоспособности продукции;

- координация деятельности органов исполнительной власти с целью выработки комплексного подхода к решению проблем инновационного развития, эффективного функционирования инновационной системы и реализации межгосударственной инновационной политики;

- концентрация организационных мер и ресурсов по приоритетным направлениям развития инноваций для повышения спроса промышленного производства на достижения науки и техники, а также привлечение свободного капитала к финансированию проектов технологической модернизации промышленности;

- сохранение и развитие производственного и технологического потенциала для поддержания современного технологического уровня и перехода к высоким технологиям;

- создание системы подготовки и переподготовки кадров в сфере инновационного предпринимательства;

- поддержка ведущих ученых, научно-исследовательских коллективов и научно-педагогических школ, способных обеспечивать высокий уровень образования для эффективного осуществления инновационной деятельности;

- обеспечение благоприятных экономических и финансовых условий для активизации инновационной деятельности;

- использование инновационных технологий и отраслей, обеспечивающих производство конкурентоспособной продукции в реальном секторе экономики, развитие компьютерных информационных технологий и автоматизацию управления сложными технологическими процессами. [9]

Для решения задач государственной инновационной политики могут использоваться следующие методы:

- формирование институциональной и законодательной базы для широкого развития передовых технологий и создания наукоемких видов производства;

- разработка и совершенствование механизмов нормативно-правовой поддержки и стимулирования инновационной деятельности;

- совершенствование налогового законодательства и механизмов его применения с целью создания благоприятных условий для развития высокотехнологичных отраслей;

- государственная поддержка высокотехнологичных производств и обеспечение приоритетности стимулирования промышленного и технологического развития;

- подготовка специалистов, научных и педагогических кадров международного уровня в области коммерциализации технологий и управления проектами;

- выявление и поддержка технологий, обеспечивающих предприятиям конкурентные преимущества на мировом рынке, а также стимулирование предприятий, внедряющих отечественные научно-технические разработки;

- использование так называемых двойных технологий (технологии получения новых материалов, информационные технологии, биотехнологии, технологии высокоэффективных тепловых двигателей, уникальные технологии для экспериментальной разработки и испытания сложных технических систем, высокоэффективное промышленное оборудование, робототехника, микроэлектроника, включая нано и оптоэлектронику);

- разработка и реализация программ инновационного развития для регионов страны с высоким научно-техническим потенциалом, а также для регионов с низким уровнем инновационного развития;

- расширение инновационной инфраструктуры, обеспечивающей коммерциализацию результатов исследований и разработок;

- разработка системы внебюджетных отраслевых и межотраслевых фондов для финансирования научно-исследовательских работ в интересах отраслей экономики;

- развитие системы венчурного инвестирования в научно-технической сфере (внебюджетного финансирования высокорисковых проектов);

- вовлечение объектов интеллектуальной и промышленной собственности в хозяйственный оборот и обеспечение надежной защиты от несанкционированного использования;

- повышение эффективности использования национальной (государственной) собственности в целях реализации инноваций;

- развитие системы государственного и частного страхования инновационных рисков;

- развитие малого инновационного предпринимательства путем создания благоприятных условий для формирования и функционирования малых предприятий.

Установленные цели, задачи и методы повышения инновационной активности должны обеспечиваться стратегиями инновационного развития государственной инновационной политики страны.

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## **СУЩНОСТЬ И СОДЕРЖАНИЕ ПОНЯТИЙ «ИННОВАЦИЯ» И «ИННОВАЦИОННАЯ ДЕЯТЕЛЬНОСТЬ»**

***Аннотация:** В статье исследуется сущность термина «инновация», а также рассматриваются взгляды ведущих зарубежных ученых по данному вопросу. Изучены общие характеристики принципов управления инновационным развитием предприятия и предложены научные рекомендации.*

***Ключевые слова:** предприятие, инновация, инновационная деятельность, изобретение, новизна, предприниматель, стратегия.*

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## **THE ESSENCE AND CONTENT OF THE CONCEPTS OF "INNOVATION" AND "INNOVATIVE ACTIVITIES"**

***Abstract:** The article studies the essence of the term "Innovation", the views of leading foreign scientists on this issue. The general characteristics of the principles of management of the innovative development of an enterprise are studied and scientific proposals are given.*

***Keywords:** enterprise, innovation, innovative activity, invention, novelty, entrepreneur, strategy.*

В настоящее время невозможно представить мир без инноваций. По мнению большинства специалистов, основным движущим фактором экономического и социального развития является инновационная деятельность. Международный опыт показывает, что даже рост экспортного потенциала природных ресурсов в значительной степени основывается на использовании научно-технического и интеллектуального потенциала экономики и общества. Кроме того, это указывает на то, что разработка, внедрение и модернизация новых технологий являются приоритетными направлениями развития государства.

Термин «инновация» происходит от латинского слова *novatio*, что означает «обновление» или «изменение», а приставка *in* переводится с латинского как «в направлении». Таким образом, слово *innovatio* в целом можно трактовать как «в направлении изменений». Понятие «инновация» впервые появилось в научных исследованиях XIX века.

Новую жизнь термин «инновация» получил в начале XX века в научных работах австрийского и американского экономиста Йозефа Шумпетера, посвященных анализу «инновационных комбинаций» и изменений в развитии экономических систем. Шумпетер был одним из первых ученых, который ввел данный термин в научный оборот экономики в начале XX века.

Инновацию следует рассматривать не просто как любой вид нововведения, а как фактор, значительно повышающий эффективность существующей системы. Вопреки распространенным заблуждениям, инновации отличаются от изобретений и открытий.

Наука — это преобразование определённых ресурсов в знания и идеи. Инновации — это преобразование знаний и идей в финансовые результаты.

Изобретение — это создание новой концепции. Инновация — это выявление практической значимости изобретения и превращение его в успешно реализуемый на рынке продукт [1].

Новшество является результатом интеллектуальной деятельности; это может быть новая стратегия, новая модель бизнеса, новая организационная структура, новый маркетинговый метод, новый процесс, новая технология, новый продукт или их определённая комбинация. Основные этапы новшества представлены на рисунке 1 [2].

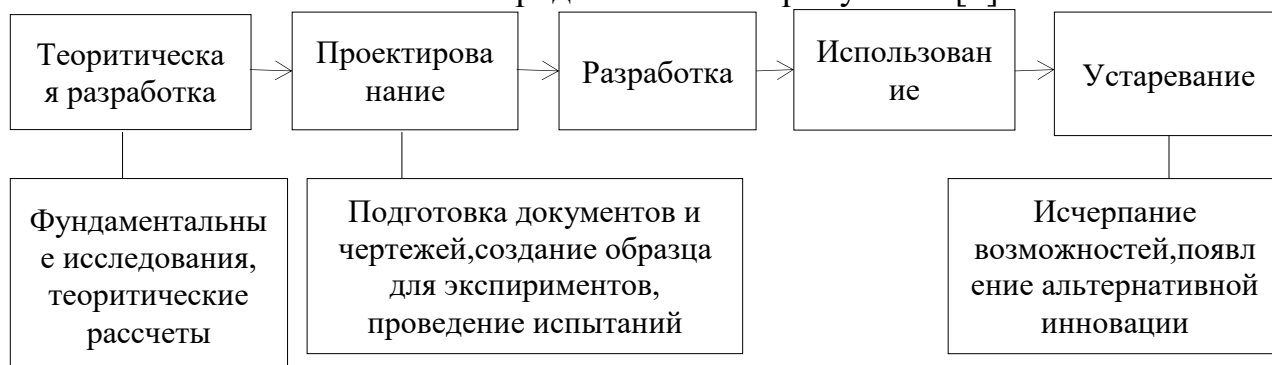


**Рисунок 1. Основные этапы новшества**

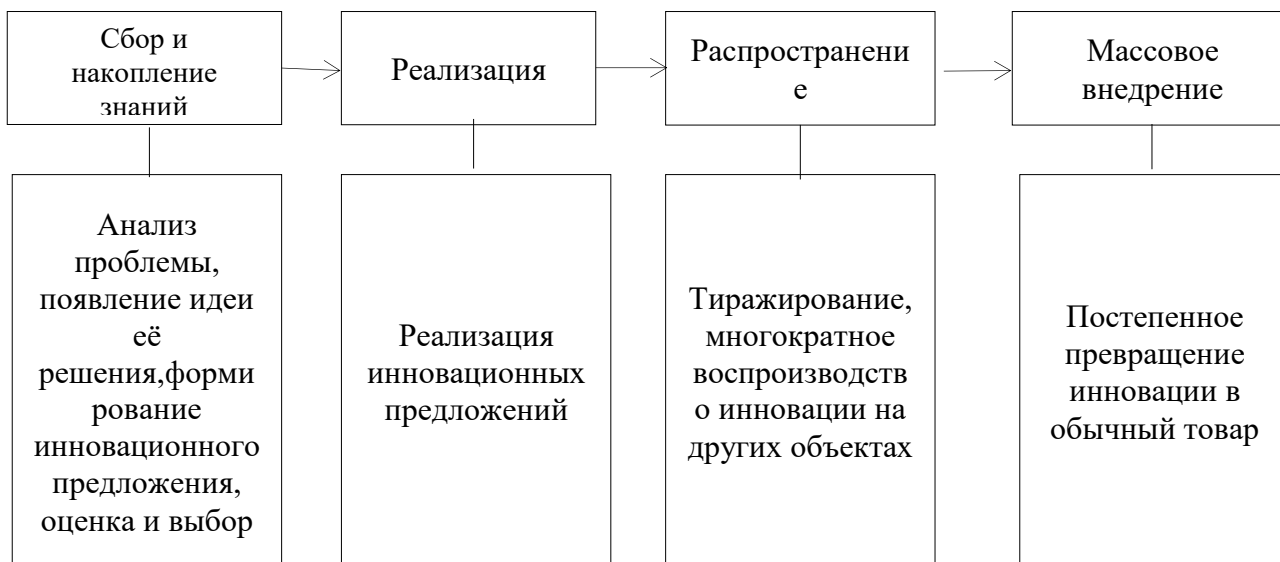


**Рисунок 2. Основные компоненты инновации**

В отличие от новшества, инновация представляет собой явление, заключающееся в практическом применении новшеств с целью получения экономического эффекта. Основные компоненты инновации можно представить следующим образом.

В современной экономике инновации являются не только фактором экономического роста, развития и структурных изменений, но и охватывают все сферы деятельности, отрасли экономики и общественную жизнь в целом [3].

Согласно подходу Йозефа Шумпетера, инновация является фактором, изменяющим макроэкономическую производственную функцию, включающим разработку новых продуктов, технологическое развитие и совершенствование методов производства. Кроме того, он рассматривал изменения в потребительском выборе как фактор изменения производственных функций, отмечая, что влияние со стороны спроса переходит на сторону предложения.

При отсутствии изменений экономическая система достигает устойчивого равновесия, что в условиях слабого влияния внешних факторов замедляет развитие основных систем национальной экономики. Согласно теории Й. Шумпетера, основным субъектом является предприниматель, который занимается разработкой новшеств и получением от них эффекта, то есть инновационной деятельностью, с целью увеличения прибыли [4].

Поэтому высокий доход, получаемый в результате инновационной предпринимательской деятельности, возникает именно на основе инноваций.

Научно обоснованные и оперативно подготовленные инновации должны соответствовать полномочиям, потребностям и возможностям конкретных субъектов научной и образовательной деятельности.

Классификация инноваций по определённым критериям представлена в таблице 1.

Инновация может быть как продуктом, так и технологическим процессом, полностью или по отдельным элементам. По степени новизны инновации классифицируются следующим образом:

- **базисные инновации** — направлены на освоение машин и материалов нового поколения и на внедрение принципиально новых технологий наряду с существующими инновационными технологиями;

- **улучшающие инновации** — инновации, направленные на повышение качественных или стоимостных характеристик существующих продуктов, а также связанные с применением существенно усовершенствованных методов производства. Такие новшества направлены на распространение и совершенствование технологий;

- **псевдоинновации** — предполагают внесение незначительных технических, технологических или внешних изменений в продукт или услугу.

При переходе от инноваций непосредственно к инновационной деятельности можно выделить её основные виды:

- а) подготовка и организация производства, включающая приобретение технологий и оборудования, а также изменения в методах, стандартах и процессах производства и контроля качества;

- б) предшествующие производству разработки, включающие совершенствование продукции, оборудования и технологий, а также переподготовку персонала для их эффективного использования;

- в) маркетинг новых продуктов — осуществление основных видов деятельности, связанных с выводом новых товаров на рынок (исследование рынка, адаптация, реклама и др.);

- г) получение нематериальных технологий из внешних источников в различных формах (например, патенты, лицензии, ноу-хау, торговые марки, а также технологические модели и услуги);

- д) приобретение материальных технологий — включает машины и оборудование, связанные с осуществлением продуктовых или технологических изменений;

- е) проектирование производства — подготовка планов и чертежей для определения технических процессов и характеристик.

Инновационная деятельность основывается на следующих принципах:

1. принцип приоритета инноваций над традиционным производством;
2. принцип экономичности инновационного производства (ориентация на получение коммерческого эффекта);

3. принцип гибкости (для каждой новой идеи может создаваться самостоятельная инновационная структура);

4. принцип комплексности (одно значительное открытие может вызвать появление ряда связанных малых инноваций).

Знание правил управления инновационной деятельностью и технологий её применения способствует правильному формированию соответствующей стратегии и тактики.

Эффективность любой инновационной деятельности предполагает развитие организации в данном направлении. Содержание управления инновационным развитием можно выразить следующими положениями:

- инновации необходимо прогнозировать и развивать;
- внедрение новшеств следует ускорять;
- необходимо готовиться к внедрению инноваций;
- инновационные процессы могут в определённой степени регулироваться и сглаживаться;
- необходимо обеспечивать определённый уровень управления инновационной деятельностью организации.

Конкуренция не только стимулирует развитие, но и вынуждает предприятия участвовать в создании и развитии рынка инноваций по следующим направлениям:

- создание и совершенствование собственной научно-экспериментальной базы для проведения научно-исследовательских работ;
- организация совместных исследований с другими организациями;
- выполнение заказов на научно-исследовательские и опытно-конструкторские работы для образовательных и других учреждений.

Однако практика показывает, что большинство крупных предприятий не являются инновационными. Внешняя среда изменяется очень быстро, поэтому инновации необходимо внедрять своевременно. Данная проблема тесно связана не только с конкуренцией, но и непосредственно со временем, поскольку значительное сокращение сроков разработки и производства новой продукции является объективной необходимостью для эффективной деятельности организации.

Вышеуказанные характеристики являются средствами достижения успеха предприятия. Они взаимосвязаны между собой и усиливают эффект, получаемый организацией от инновационной деятельности.

В настоящее время успех предприятий во многом зависит от различных факторов, включая глобальную конкуренцию, стремительное технологическое развитие и инновационную среду. Основными признаками инновационной деятельности организации являются её ориентация на непрерывное развитие, способность к прогнозированию и высокий уровень научной и образовательной деятельности.

Управление инновационным развитием предприятия должно строиться на основе возможностей данной среды. Иными словами, определять и управлять направлениями инновационного развития организации исключительно извне нецелесообразно, поскольку подобный подход не может заменить естественные процессы развития внутри предприятия. Кроме того, для реализации альтернативных вариантов развития необходимо обеспечить определённую степень свободы действий.

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## **ЗНАЧЕНИЕ И ПРЕИМУЩЕСТВА ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В ИЗУЧЕНИИ АНГЛИЙСКОГО ЯЗЫКА**

***Аннотация:** В данной статье проводится научно-методологический анализ роли, значения и преимуществ технологий искусственного интеллекта в процессе изучения английского языка. В ходе исследования рассматриваются современные платформы для изучения языков на основе искусственного интеллекта (ChatGPT, Duolingo, Grammarly, Google Translate и другие), обосновываются их преимущества перед традиционными методами обучения. Кроме того, подробно рассматриваются такие возможности искусственного интеллекта, как адаптивное обучение, оперативная обратная связь, персонализированные учебные материалы и анализ речи. На основе экспериментальных наблюдений и научной литературы в статье показано, что искусственный интеллект способен повысить эффективность изучения языка на 40–60%.*

***Ключевые слова:** искусственный интеллект, обучение английскому языку, адаптивное обучение, языковые технологии, ChatGPT, Duolingo, персонализированное обучение, цифровое образование.*

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## **THE SIGNIFICANCE AND ADVANTAGES OF ARTIFICIAL INTELLIGENCE IN LEARNING THE ENGLISH LANGUAGE**

***Abstract:** This article presents a scientific and methodological analysis of the role, significance, and advantages of artificial intelligence technologies in the process of learning the English language. The study examines modern AI-based language learning platforms (ChatGPT, Duolingo, Grammarly, Google Translate, and others) and substantiates their advantages over traditional teaching methods. Furthermore, AI capabilities such as adaptive learning, immediate feedback, personalized learning materials, and speech analysis are discussed in detail. Based on experimental observations and scholarly literature, the article demonstrates that artificial intelligence can increase the effectiveness of language learning by 40–60%.*

***Keywords:** artificial intelligence, English language teaching, adaptive learning, language technologies, ChatGPT, Duolingo, personalized learning, digital education.*

## 1. Введение

Стремительное развитие цифровых технологий в XXI веке приводит к кардинальным изменениям в сфере образования. В особенности внедрение технологий искусственного интеллекта (ИИ) в образовательный процесс вывело методологию преподавания английского языка на новый уровень. Сегодня более 1,5 миллиарда человек по всему миру изучают английский язык как иностранный, и всё большая их часть использует вспомогательные инструменты на основе искусственного интеллекта вместо традиционных классных занятий.

В Узбекистане развитие обучения английскому языку также стало приоритетным направлением государственной политики. Постановление, подписанное Президентом Республики Узбекистан в 2021 году «О мерах по дальнейшему совершенствованию системы изучения иностранных языков», обязало образовательные учреждения внедрять современные технологии в учебный процесс. Данная политическая среда создаёт благоприятную почву для внедрения инструментов искусственного интеллекта в систему образования Узбекистана.

Цель исследования — комплексное изучение педагогического значения и теоретико-практических преимуществ технологий искусственного интеллекта, применяемых в обучении английскому языку. Задачи исследования: (1) классифицировать языковые платформы на основе ИИ; (2) определить их преимущества перед традиционными методами; (3) показать возможности применения в системе образования Узбекистана.

## 2. Обзор литературы

Международная научная литература о роли искусственного интеллекта в обучении языкам резко возросла за последнее десятилетие. Если Варшауэр и Хили разработали первоначальную концепцию обучения языкам с помощью компьютеров (CALL — Computer-Assisted Language Learning), то современные исследователи выводят эту идею на новый уровень на основе искусственного интеллекта.

Годвин-Джонс в своём масштабном исследовании изучил способность крупных языковых моделей (LLM), таких как ChatGPT, устанавливать естественное общение с изучающими язык и доказал, что данные инструменты демонстрируют статистически значимые результаты в развитии грамматической правильности, лексического богатства и прагматической компетентности. Аналогичным образом внутренние исследования платформы Duolingo показали, что при использовании адаптивных алгоритмов учащиеся осваивают тот же объём знаний на 34% быстрее по сравнению с традиционным методом.

В местном контексте учёные Ташкентского государственного университета востоковедения зафиксировали в ходе эксперимента среди узбекских студентов, что регулярное использование программы Grammarly улучшает навыки письменной речи на английском языке в среднем на 27%.

Однако в литературе отмечаются и ограничения искусственного интеллекта: в научных дискуссиях также поднимаются проблемы неполного понимания культурного контекста, чрезмерно автоматизированной диагностики и негативного влияния на мотивацию учащихся.

### 3. Методология исследования

В данном исследовании применялись следующие методы: (1) аналитико-синтетический метод — анализ международных и отечественных научных источников; (2) сравнительный метод — сопоставление методов обучения на основе ИИ и традиционных методов; (3) метод наблюдения — практическая оценка функциональности различных платформ; (4) статистический метод — обобщение и интерпретация результатов имеющихся исследований.

В качестве основных источников для исследования были отобраны 47 международных научных статей, опубликованных в базах данных Web of Science, Scopus и Google Scholar в период с 2018 по 2024 год, а также 12 отечественных исследований, опубликованных в журналах ВАК Узбекистана. При отборе источников применялись основные критерии протокола PRISMA.

### 4. Результаты и обсуждение

В настоящее время инструменты искусственного интеллекта, используемые в обучении английскому языку, можно разделить на три основные группы:

*Таблица 1. Классификация платформ для изучения английского языка на основе ИИ*

| Группа              | Платформы                       | Основная функция                                         |
|---------------------|---------------------------------|----------------------------------------------------------|
| Общение и диалог    | ChatGPT, Claude, Gemini         | Свободное общение, исправление грамматики, анализ текста |
| Адаптивное обучение | Duolingo, Babbel, Rosetta Stone | Геймификация, персонализированные уроки                  |
| Письменные навыки   | Grammarly, QuillBot, DeepL      | Грамматика, стиль, анализ переводов                      |

Результаты исследования показали четыре основных преимущества искусственного интеллекта в обучении английскому языку.

Во-первых, адаптивное (гибкое) обучение. На традиционных уроках учитель ведёт занятие по единой программе для 25–30 студентов. Системы

ИИ в режиме реального времени анализируют статистику ошибок каждого учащегося, скорость обучения и слабые стороны, предлагая персонализированные задания. Например, алгоритм Duolingo анализирует активность пользователя за последние 7 дней и автоматически адаптирует следующий урок.

Во-вторых, оперативная и эффективная обратная связь. При традиционном методе учащийся узнаёт о своих ошибках лишь после проверки учителем, то есть спустя несколько дней. Инструменты ИИ показывают ошибку немедленно, в течение секунды, и объясняют правильный вариант. Психологические исследования показывают, что коррекция, проведённая в течение 30 минут после допущения ошибки, даёт наиболее эффективный результат — ИИ полностью обеспечивает эту возможность.

В-третьих, доступность 24/7 и гибкий график. Инструменты ИИ не ограничены временем и местом: учащийся может заниматься ночью, в выходные дни, в поездке. Это особенно важно для работающих взрослых и учащихся из отдалённых районов. Результаты опроса в Узбекистане (n=450) показали, что 73% респондентов назвали проблемы со временем и транспортом основной причиной невозможности посещать курсы английского языка.

В-четвёртых, анализ речи и произношения. Технология Speech-to-Text от Google и приложения, такие как ELSA Speak, сопоставляют произношение учащегося со стандартами носителя языка и выявляют точные ошибки на фонемном уровне. Данная возможность в традиционном классе является технически сложным и трудоёмким процессом.

Ряд ограничений искусственного интеллекта также заслуживает научного обсуждения. Первая проблема — культурная и прагматическая компетентность. Системы ИИ хорошо обучают грамматической правильности, однако не в состоянии в полной мере передать тонкие культурные правила использования языка, стилистические приёмы — юмор и иронию. Вторая проблема — мотивация учащихся: ряд исследований показывает, что при долгосрочном самостоятельном обучении с ИИ активность 60% учащихся снижается в течение 3 месяцев. Третья проблема — цифровое неравенство: отсутствие у всех учащихся Узбекистана необходимых устройств и доступа к Интернету препятствует широкому применению этих технологий.

## 5. Заключение

Проведённое исследование показало, что технологии искусственного интеллекта приносят революционные изменения в изучение английского языка. Такие возможности, как адаптивное обучение, оперативная обратная связь, доступность 24/7 и анализ речи, дают значительные преимущества по сравнению с традиционными методами. Однако ИИ не может полностью заменить учителя — его следует рассматривать как

мощный инструмент, поддерживающий труд педагога и повышающий его эффективность.

Для системы образования Узбекистана разработаны следующие рекомендации: (1) интеграция платформ на основе ИИ в официальные учебные программы школ и высших учебных заведений; (2) внедрение специальных курсов повышения квалификации для учителей по использованию инструментов ИИ; (3) расширение программ повышения цифровой грамотности среди учащихся.

В качестве важного направления для будущих исследований рекомендуется изучить эффективность искусственного интеллекта в обучении английскому произношению с учётом фонологии узбекского языка, а также его влияние на долгосрочную мотивацию учащихся.

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## **СОБИРАТЕЛЬНЫЕ СУЩЕСТВИТЕЛЬНЫЕ КАК ЛЕКСИКО-ГРАММАТИЧЕСКАЯ КАТЕГОРИЯ В РУССКОМ ЯЗЫКЕ**

**Аннотация:** *Статья посвящена рассмотрению собирательных существительных как особой лексико-грамматической категории в системе русского языка. Анализируются их семантические и грамматические признаки, способы словообразования, а также различные научные подходы к их классификации. Статья направлена на уточнение статуса собирательных существительных и их роли в лексической системе русского языка.*

**Ключевые слова:** *собирательные существительные, лексико-грамматическая категория, словообразование, семантика, тройственный ряд, словообразовательные) признаки.*

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## **COLLECTIVE NOUNS AS A LEXICAL AND GRAMMATICAL CATEGORY IN THE RUSSIAN LANGUAGE**

**Annotation:** *This article examines collective nouns as a distinct lexical and grammatical category in the Russian language. It analyzes their semantic and grammatical features, word formation methods, and various scientific approaches to their classification. The article aims to clarify the status of collective nouns and their role in the Russian lexical system.*

**Key words:** *collective nouns, lexical and grammatical category, word formation, semantics, tripartite series, word-formation features.*

В русском языке существует особая группа существительных, обозначающая множество предметов или лиц как единое целое. Такие слова называются собирательными. Они занимают промежуточное положение между существительными в единственном и множественном числе, совмещая в себе элементы обоих значений. Собирательные существительные выполняют важную номинативную функцию — позволяют компактно и выразительно обозначить группу предметов. Они также способствуют экономии языковых средств и усиливают выразительность речи.

Категория собирательных существительных уже давно находится в поле внимания лингвистов. В рамках лингвистической теории существует несколько подходов к определению и классификации данной группы слов.



Один из них — широкое трактование собирательности, представленное, в частности, в академическом издании «Грамматика русского языка». Согласно этому подходу, собирательные существительные включают в себя слова, имеющие форму лишь единственного или только множественного числа, но при этом обозначающие совокупность однородных объектов или лиц.

«Отдельный лексико-грамматический разряд среди нарицательных существительных составляют существительные собирательные. Сюда относятся слова, называющие совокупность однородных предметов и выражающие это значение с помощью таких суффиксов, как -ств(о): студенчество, юношество; -|j|- (орфогр. слова на -ьё): бабьё, зверьё, дурачьё; -н(я): матросня, ребятня; -и|j|- (орфогр. слова на -ия): пионерия, аристократия; -от(а): беднота и др.» [5].

При широком понимании категории собирательности к существительным с собирательным значением как к лексико-грамматическому, но не словообразовательному разряду, могут быть отнесены слова, обозначающие совокупность неодушевлённых предметов или лиц: ботва, мелюзга, хлам, мебель и др. Эти лексемы выражают значение собирательности на уровне лексической семантики, однако не демонстрируют словообразовательной связи с соответствующими формами единственного и множественного числа, как это характерно для классических собирательных существительных.

В то же время, в категорию собирательных не включаются существительные, которые лишь контекстуально приобретают собирательное значение, оставаясь при этом грамматически формами единственного числа. Примеры таких употреблений: зерно нового урожая (в значении «множество зёрен»), набить подушки пером (в значении «множеством перьев»), неприятель подошёл к границе (в значении «вражеские войска»). Такие слова сохраняют свою принадлежность к другим лексико-грамматическим разрядам, несмотря на собирательную интерпретацию в конкретных контекстах.

В учебнике «Современный русский язык» обобщенно представлены следующие признаки собирательных существительных:

Собирательные существительные обозначают неопределённое множество предметов или лиц как одно неделимое целое: молодежь, родня, мошкарa, беднота, бельё, березняк, генералитет, листва, пролетариат и т. п.

В рамках лексико-семантического подхода к собирательным существительным принято выделять тематические группы, отражающие принадлежность обозначаемых множеств к определённой сфере:

- слова, обозначающие совокупность лиц: профессура, братва, военщина, детвора, студенчество и др.

- слова, обозначающие совокупность животных: мошкарa, воронье, зверьё, скотина и т. п.

- слова, обозначающие совокупность растений или их скопления в природе: ельник, ивняк, осинник, кустарник и др.

- слова, обозначающие совокупность неодушевлённых предметов: аппаратура, мебель, бельё, хлам, старьё, утварь и т. д.

Важнейшими грамматическими признаками собирательных существительных являются: 1) неизменяемость по числам, наличие у них только формы единственного числа; 2) неспособность сочетаться с количественными числительными.

Большинство собирательных существительных — производные слова, образованные безаффиксным путем (зелень, мелочь, ветошь, нечисть, дичь, бездарь, голь и т. п.) и с помощью суффиксов (агентура, сырье (-j-), родня, учительство, кустарник, орешник, ивняк, беднота, старостат, секретариат и др.).

Непроизводные собирательные существительные немногочисленны: сор, мусор, хлам, хвоя, бакалея, ботва, дрянь, знать и т. п. В этих существительных значение собирательности является компонентом их лексической семантики [6].

Так, в словаре С.И. Ожегова данное понятие трактуется следующим образом: «Собирательные существительные - в грамматике: имена существительные, называющие совокупность однородных предметов и выражающие это значение при помощи специальных суффиксов (напр. воронье, беднота, учительство, бюрократия и др.) [2].

В словаре лингвистических терминов Т.В. Жеребило: «Существительные, обозначающие совокупность однородных предметов как неделимое целое (генералитет, детвора, человечество). Употребительны в разных стилях. Так, в разговорной речи наблюдаются собирательные существительные различных стилистических окрасок, в том числе с отрицательными оттенками: воронье, кулачье, солдатня и т.п. В официально-деловой речи употребление собирательных существительных ориентировано на такие особенности этого стиля, как: лаконичность, емкость содержания, неличный характер речи. Например: выборы, дети, родители, войско. В значении совокупности встречаются здесь слова: трудящиеся, рабочие и т. д.» [7].

Реформатский А.А. и ряд других лингвистов придерживаются узкого подхода к определению категории собирательных существительных. В соответствии с их точкой зрения, к собирательным следует относить только те лексемы, которые входят в так называемый «тройственный» словообразовательный ряд. Такой ряд включает: форму единственного числа конкретного существительного, форму множественного числа того же существительного и собирательное существительное, образованное от той же корневой основы [3].

А.А. Реформатский рассматривает число как одну из основных грамматических категорий, которая выражает количество предметов или явлений.

| Единственное число                    | Множественное число | Собирательное<br>существительное |
|---------------------------------------|---------------------|----------------------------------|
| собственно конкретных существительных |                     |                                  |
| лист                                  | листья              | листва                           |
| студент                               | студенты            | студенчество                     |
| учитель                               | учителя             | учительство                      |
| агент                                 | агенты              | агентура                         |

При этом чаще всего, как отмечает автор, поддерживается семантическая корреляция, а в значение собирательного существительного дополнительно включается лишь сема совокупности, объединения лиц, живых существ, предметов, например: крестьянин – крестьяне – крестьянство. Но в некоторых случаях происходит семантическое приращение, например: деканат – это не совокупность деканов, а декан и работники деканата (заместители, секретари и т. п.) [3].

Виноградов В.В. дает определение собирательным существительным в разряде слов, изменяющихся только по формам единственного числа, т.к. они не соединяются с представлением о счете – это слова, обозначающие совокупность лиц, предметов, мыслимых как коллективное или собирательное единство, как одно неделимое целое. «Значение собирательности в именах среднего рода, кроме книжного суффикса -ств(о), выражается суффиксом -ь(ё), который вносит в большинстве случаев оттенок разговорности, соединенный нередко с экспрессией презрения: бабьё, гнильё, старьё и т. п. Но ср.: бельё, сырьё и др. Суффикс -ь(ё) встречается в словах, обозначающих собирательную массу веществ, собрание предметов и живых существ» [1].

Ряд лингвистов отмечает, что собирательные существительные через свои формальные (словообразовательные) признаки, «разграничивают» классы людей, животных, растений и вещей, что имеет исторические корни [4].

Суффиксы -j(o)-, -ня- в словах, офицерьё, вороньё, тряпьё, солдатня, передавая отрицательные характеристики, как бы уничтожают целостность единиц, уподобляя их сплошной массе.

Собирательные существительные могут передавать только оценку «много»: листва, вишенье. Оценку «важно» выражают собирательные существительные с суффиксом -ство: студенчество, офицерство.

«Имена типа детвора могут, не ощущаясь как нейтральные, с почти одинаковым успехом употребляться и в «положительных», и в «отрицательных» (впрочем, умеренно отрицательных) контекстах (Я люблю детвору. Во дворе толпилась надоедливая детвора) [4].

Собирательные существительные, употребляясь в форме одного числа, не подвергаются счёту, поэтому не могут иметь при себе количественных определителей, выраженных целыми числами.

Представленная выше точка зрения дает узкое понимание термина «собирательные существительные». В широком понимании этого термина к ним, кроме перечисленных, относят имена существительные, в которых собирательность представлена как значение, не получившее соответствующего грамматического оформления. Такие существительные не входят в тройственный ряд; они могут иметь числовую парадигму и могут определяться числительными. Сюда относятся:

1) имена существительные единственного числа (преимущественно женского рода, реже – мужского рода и среднего рода), выражающие собирательность непосредственно лексическим значением (толпа, стая, дичь, дробь, ветошь, зелень, нечисть, посуда, мелочь, рухлядь, войско, отряд, полк, мусор и т. п.). Слов того же корня, называющих отдельных представителей этой группы, нет;

2) имена существительные со значением собирательности, имеющие форму только множественного числа: финансы, хлопья и т. п.;

3) некоторые существительные с приставкой со-: созвездие (как совокупность звезд), собрание (в значении «коллекция»), соцветие и т. п.

Так как категория собирательности лексико-грамматическая, а не лексическая, логично говорить о правильности узкого понимания этого термина.

Многие лингвисты выделяют следующие грамматические признаки собирательных существительных: во-первых, это наличие у них формы единственного числа (неизменяемость по числам) и изменение по парадигме неодушевленных существительных, во-вторых, они не способны сочетаться с количественными числительными, в-третьих, могут сочетаться со словами много / мало или сколько, при этом имея форму только единственного числа. Так, формы единственного числа собирательных существительных обозначают множественность в отличие от форм единственного числа конкретных существительных, которые обозначают один предмет: дуб – дубняк, мошка – мошкарa, студент – студенчество. Они, выражая множественность, сближаются с формами множественного числа конкретных существительных: студенты – студенчество, мошки – мошкарa, дубы–дубняк. Словоформы множественного числа конкретных существительных выражают раздельное множество, состоящее из отдельных и самостоятельных предметов, которые поддаются счёту. А формы единственного числа собирательных существительных наоборот, обозначают неделимое

множество, которое не поддается счету. В связи с этим, они не могут сочетаться с количественными числительными, но могут определяться с помощью неопределенно-количественных слов, а также сочетаться с дробными числительными или со словами, обозначающими соотношение частей и целого: мало зелени, уйма мелочи, вся родня, одна пятая студенчества, чемодан белья, целая куча листвы и т.д.

Таким образом, собирательные существительные представляют собой важную часть лексико-грамматического строя русского языка. Они сочетают в себе единственное число формы и множественное значение содержания, выполняют разнообразные стилистические и коммуникативные функции. Их изучение позволяет лучше понять гибкость и выразительные средства языка, а также связи между грамматикой и семантикой в русской речи.

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## МЕТАПРЕДМЕТНАЯ ДЕЯТЕЛЬНОСТЬ В ОБУЧЕНИИ МАТЕМАТИКЕ

***Аннотация:** В статье рассматривается значение метапредметной деятельности в процессе обучения математике в высших и средних образовательных учреждениях. Анализируются педагогические условия формирования метапредметных компетенций у обучающихся, а также роль математического образования в развитии исследовательского мышления. На основе анализа научной литературы и педагогического опыта обоснована необходимость использования метапредметного подхода при преподавании математических дисциплин.*

***Ключевые слова:** Математическая деятельность, метапредметная деятельность, общие формы поисково-исследовательской деятельности, обучение математике.*

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## META-OBJECT ACTIVITIES IN MATHEMATICS EDUCATION

***Abstract** This article examines the importance of meta-subject activities in mathematics education in higher and secondary educational institutions. It analyzes the pedagogical conditions for developing students' meta-subject competencies, as well as the role of mathematics education in developing research thinking. Based on an analysis of scientific literature and teaching experience, the need for a meta-subject approach in teaching mathematics is substantiated.*

***Keywords:** Mathematical activity, meta-object activities, general forms of research activity, teaching mathematics.*

### Введение

Современная система образования ориентирована на формирование у обучающихся не только предметных знаний, но и универсальных учебных действий, позволяющих эффективно применять полученные знания в различных сферах деятельности. Математическая деятельность способствует развитию логического мышления, аналитических способностей, а также навыков решения сложных проблем.

### Обзор литературы



Акрамжон Рахманов в своих научных исследованиях подробно изучал вопрос метапредметной деятельности в обучении математики. Его выводы подчеркивают, что результаты изучения метапредметов связаны с развитием универсальных познавательных способностей, таких как анализ, синтез, моделирование и обобщение. Отмечается, что обучение математике обладает значительным потенциалом для формирования исследовательской деятельности. Однако на практике математическое образование часто ограничивается формированием вычислительных навыков и решением типовых задач.

#### Методология исследования

В исследовании использованы следующие методы: анализ научно-педагогической литературы, сравнительный анализ различных подходов к обучению математике, а также обобщение педагогического опыта преподавания математических дисциплин в высшей школе.

#### Результаты исследования

Все знают, что обучение математике способствует развитию способностей к поисково-исследовательской деятельности. Но при этом полагают, что развитие таких способностей является лишь эпифеноменом обучения математике. И многовековой опыт обучения математике показывает, что это действительно так, что обучение математике в такой же мере несет развитие таких способностей, как и обучение физике, биологии, языкам, истории. За глубокой спецификой математической деятельности и форм представления ее продуктов трудно усматривается, что, говоря словами Канта, математика занимается не столько предметами, сколько способом познания предметов и что потому развитие способностей к поисково-исследовательской деятельности должно быть ведущей целью обучения математике. Но насколько явственно эта цель отражается в программах обучения? Насколько ей отвечают содержание и дух учебников по математике и методология, на которой зиждется система обучения математике? Насколько ей отвечает методология системы обучения как целого? Хорошо известны весомые основания для отнесения математики к естественным наукам. Вместе с тем она активно развивается и в направлениях, «имеющих всё более и более отдалённое отношение к эмпирическим данным. Во всех этих областях субъективный критерий успеха и целесообразности затраты усилий, которым руководствуется математик, во многом определяется внутренними, эстетическими соображениями и свободен (или почти свободен) от эмпирических связей» - писал Дж. фон Нейман. Все это говорит о том, что «самой природе математики присуща двойственность... Эту двойственность необходимо отчётливо сознавать, иметь в виду и учитывать при размышлениях о природе интеллектуальной деятельности в области математики. Двоякий лик — подлинное лицо математики». Какова же природа того лика математики, который предстает как чистая математика, развивающаяся в направлениях, «имеющих всё более и более отдалённое отношение к

эмпирическим данным»? Только ли произведениями интеллектуального искусства являются результаты чистой математики, только ли в этом их ценность? Математика, являющаяся, по утверждению В.И. Арнольда, частью физики, существенно отличается от физики своим над предметным характером, то есть радикальными абстрагированиями от предметной данности. Более того, она отличается от физики формированием и развитием продуктивных способов исследования разнообразных систем. Процессы превращения методов математической деятельности в ее предмет подобны «непрерывному превращению материально поэтического субстрата, сохраняющего свое единство и стремящегося проникнуть внутрь себя самого» (О. Мандельштам). Они приводят к рождению ее эффективных «средств производства», предстающих в форме фундаментальных понятий математики и представляемых ими теорий. Развиваясь как «часть физики», математика все более становится областью знания, предметом которой являются общие формы, мета-формы, поисково-исследовательской деятельности, ее стратегий и ее общие способы, мета-способы, то есть метапредметный план. Тем самым она становится и мета- «физикой». Этому должно следовать математическое образование. Сегодняшние потребности общества требуют образования, ориентированного на перспективу. Метапредметный план не может не играть ведущую роль в таком образовании. Этому отвечает направленность общего образования на освоение общих форм и способов деятельности. Этому отвечает возрастание роли математического образования как долженствующего направлять на освоение общих форм и способов поисково-исследовательской деятельности, а значит, приобщать к метапредметному плану. Насколько же этому отвечает современное математическое образование? При всех значительных достижениях в методах обучения математика продолжает представлять в обучении, как школьном, так и вузовском преимущественно как «часть физики». Метапредметный план присутствует в явной или скрытой форме и в обучении физике, биологии, языкам, истории. Он с необходимостью рождается рациональными формами мышления и присутствует на всех уровнях и на всех направлениях исследовательской деятельности. Но там, где доминирует обращенность к предметному началу, метапредметный план и предстает, и развивается как аспект этого начала, как связанный с ним, а не как собственно метапредметный план. Развитие метапредметного плана как собственно метапредметного происходит в обучении тогда, когда он осознается учащимися в этом своем качестве и сам становится предметом изучения, когда учащиеся становятся «соучастниками» формирования и испытания его орудий. Этому должно следовать обучение математике. Это отвечает ее природе, ее существу.

#### Выводы

Использование исследовательских методов обучения способствует развитию логического и аналитического мышления обучающихся и

метапредметный подход позволяет повысить эффективность математического образования. Развитие метапредметной деятельности способствует формированию интеллектуальной самостоятельности обучающихся.

#### **Заключение**

В современных условиях развития образования особое значение приобретает формирование у обучающихся универсальных познавательных умений. Метапредметный подход в обучении математике позволяет объединить предметные знания и исследовательскую деятельность, что способствует повышению качества образования и развитию интеллектуального потенциала обучающихся.

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## **ПЫЛЕВЫЕ ЯВЛЕНИЯ В ЮЖНОМ ПРИАРАЛЬЕ: СПЕЦИФИКА И ТИПИЧНОСТЬ**

*Аннотация:* В статье рассматриваются пылевые явления (пыле-песчаные бури, соле-песчаные бури, конвективный вынос) в Южном Приаралье с точки зрения их типичности (схожести с аналогичными явлениями в других регионах планеты) и специфики, обусловленной экологическими особенностями региона. Типичность пыле-песчаных бурь (ППБ) в естественных пустынях показана на примере нескольких ППБ в различных регионах. Также типичен конвективный вынос (КВ) аэрозоля с пустынных поверхностей в летнее время, происходящий во всех пустынях, но достаточно изученный только в Казахстане, России (Калмыкия), Таджикистане и Южном Приаралье (ЮП). Специфическим пылевым явлением является вынос солевого аэрозоля с осушенного дна Аральского моря.

*Ввиду важности аэрозольного фактора климатических изменений в статье также представлены результаты моделирования влияния пылевых явлений на региональный климат. Количественная оценка влияния КВ на повышение летней приповерхностной температуры, впервые полученная авторами, позволяет расценивать этот форсинг как дополнительный фактор глобального потепления ввиду существенной и возрастающей доли пустынь в суше планеты. Также показана специфичность соленых бурь на Аралкуме в аспекте влияния на многолетнюю (1970-2022гг.) динамику климата ЮП.*

**Ключевые слова:** Южного Приаралья, метеорологии, атмосферы, почве, минеральная пыль, изменения климата

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## **DUST PHENOMENA IN THE SOUTHERN ARAL SEA REGION: SPECIFICITY AND TYPICALNESS**

**Abstract:** The article examines dust phenomena (dust-sand storms, salt-sand storms, convective drift) in the Southern Aral Sea region from the perspective of their typical nature (similarity to similar phenomena in other regions of the planet) and specificity due to the region's ecological characteristics. The typical nature of



*dust-and-sand storms (DST) in natural deserts is demonstrated by the example of several DSTs in various regions. The convective outflow of aerosol from desert surfaces during summer is also typical, occurring in all deserts, but sufficiently studied only in Kazakhstan, Russia (Kalmykia), Tajikistan, and the Southern Aral Sea region (YuP). A specific dust phenomenon is the removal of salt aerosol from the dried-up bottom of the Aral Sea.*

*Due to the importance of the aerosol factor of climate change, the article also presents the results of modeling the impact of dust phenomena on regional climate. The quantitative assessment of the impact of solar radiation on the rise in summer surface temperatures, first obtained by the authors, allows us to assess this force as an additional factor of global warming due to the significant and increasing share of deserts on the planet's land. The specificity of salt and dust storms on the Aralkum in terms of their impact on the long-term (1970-2022) climate dynamics of the South Kazakhstan region is also shown.*

**Keywords:** Southern Aral Sea region, meteorology, atmosphere, soil, mineral dust, climate change

**Введение.** Актуальность исследования пылевых явлений (ПЯ) обусловлена множеством их негативных эффектов и происходящим во многих регионах планеты опустыниванием, понимаемым также как расширение пустынных территорий [28]. Прежде всего чрезмерная запыленность атмосферы влияет на рост заболеваемости населения. Болезни связанные с запыленностью атмосферы возникают при вдыхании частиц пыли вместе с микробами, тяжелыми металлами, пестицидами и другими загрязняющими веществами, содержащимися в почве [7][18]. Благодаря микро- и нано-размерам, поллютанты легко попадают в легкие и проникают в кровоток. Пылевые бури способствуют росту не только известных заболеваний дыхательной системы [4][6][16], минеральная пыль считается одним из наиболее важных факторов риска кардиоваскулярных [2][3], психологических и когнитивных [10][11] заболеваний.

Кроме того, запыленность атмосферы влияет на региональную окружающую среду и климат [29]. Возможные негативные последствия пылевых бурь включают в себя также снижение видимости, опасное для авиа- и автотранспорта; уменьшение прямой солнечной радиации; угнетение растительного покрова и др. [33][37]. Таким образом, актуальность изучения циклов пустынной пыли (от выноса до переноса на большие расстояния и осадения) заключается в определяющем значении результатов исследований при решении проблем, касающихся изменения климата, погоды, экологических условий, качества воздуха и здоровья человека.

Южное Приаралье, известное как регион, испытывающий максимальное воздействие последствий Аральского кризиса, является также самым запыленным районом Центральной Азии. Этому способствуют не только большие пустынные поверхности, окружающие



Южное Приаралье со всех сторон (рис.1а), но и засушливость климата, ветровая активность (среднегодовая скорость ветра 5 м/с [44]), скудость осадков и растительного покрова, способных существенно сдерживать пыление подстилающей поверхности [23][33]. Население ЮП, сосредоточенное в Нижне-амударьинском оазисе, испытывает значительный пылевой стресс, поскольку при любом направлении ветра со скоростью более 7м/с в оазис поступают пылевые потоки с одной из 4 пустынь [22]. Особо опасна пыль с Аралкума (рис.1б), содержащая патогенные сульфаты, представляющие также канцерогенные риски [8][15][19]. Связь выноса солей и пыли из Аралкума с ростом заболеваемости населения Приаралья исследована в основном учеными Казахстана [1][34].

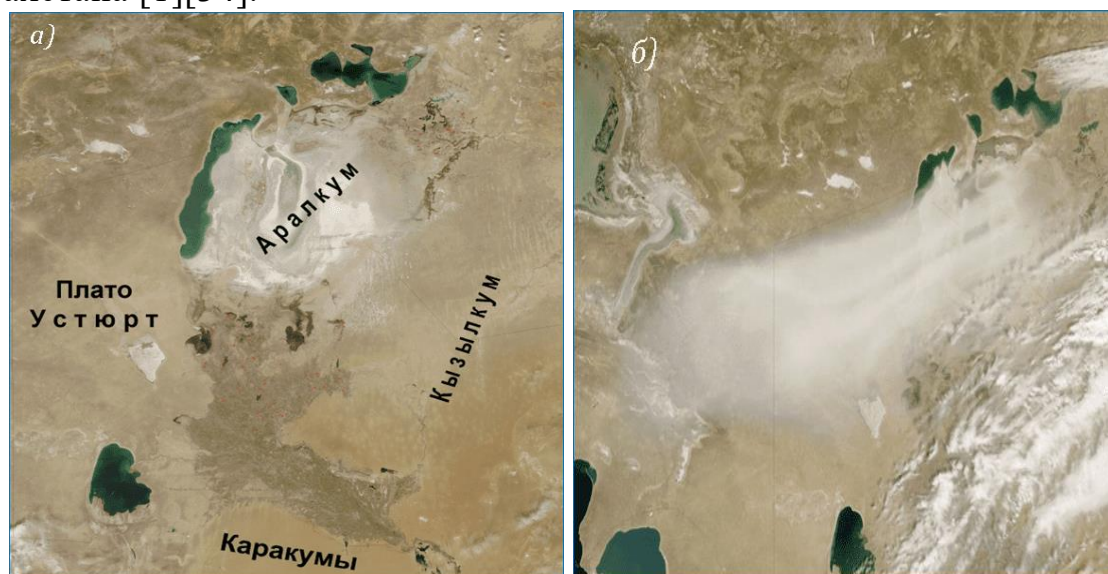


*Рисунок 1. Нижне-амударьинский оазис, окруженный пустынями (а), пылевая буря на Аралкуме (б)*

Говоря о пылевых явлениях, в метеорологии чаще всего имеют в виду пылевые бури, поземки и мглу, возникающие с усилением ветра. Гораздо реже в научной литературе встречаются работы [26][38], посвященные специфическому пылению пустынных поверхностей – конвективному выносу пыли при условиях, близких к штилевым. Таким образом, пыление поверхности в пустынных зонах в теплое время года (апрель-октябрь) происходит практически ежедневно за исключением дней с осадками.

В Южном Приаралье, типичностью, т.е. закономерностями, общими с другими регионами, обладают ветровое и конвективное пыление на естественных пустынях Устюрт, Кызылкум и Каракумы. Вынос пыли с антропогенной пустыни Аралкум существенно специфичен, если не сказать уникален. Прежде всего это состав и дисперсность мигрирующей пыли, состоящей по разным оценкам на 10-40% из солей. В работе [31] приведена массовая структура минералов, осевших на дно Аральского моря за весь период его высыхания и осолонения с 1960 по 2008 г. (в миллиардах тонн и процентных долях, см. также рис. 2): карбонат кальция

– 0,07 (2%); карбонат магния – 0,1 (2%); гипс  $\text{CaSO}_4 > 2\text{H}_2\text{O}$  – 2,3 (49%); мирабилит  $\text{Na}_2\text{SO}_4 > 10\text{H}_2\text{O}$  – 1,9 (40%); галит  $\text{NaCl}$  – 0,4 (8%).

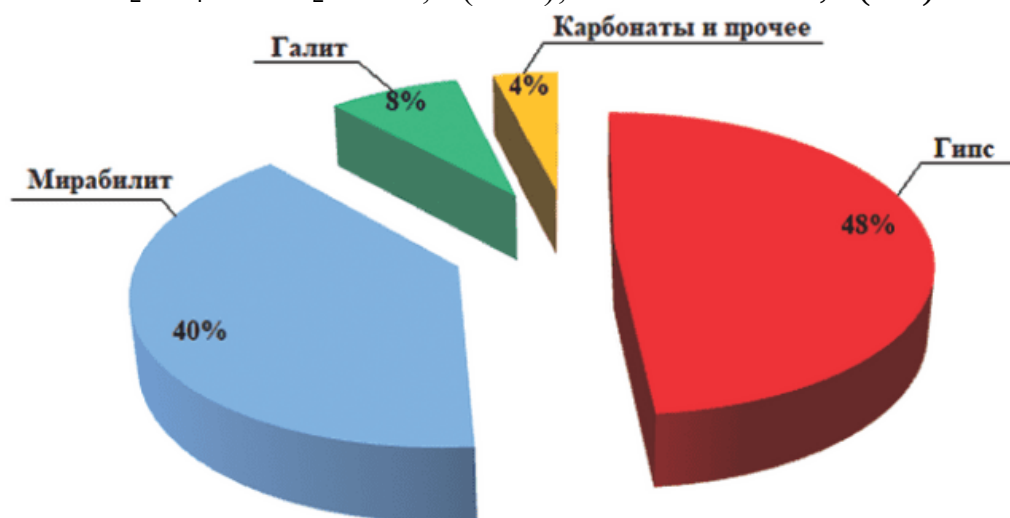


Рис. 2. Структура минералов осушенного дна Аральского моря

Преобладающие в составе минеральной пыли сульфаты легко эродируют, поднимаются на большие высоты и переносятся на расстояния от 300 до 1000 км.

Специфичны и очаги выноса солей, представляющие отдельные разбросанные по осушенному дну корковые и корково-пухлые солончаки. Поэтому штормовая зона выглядит как совокупность отдельных шлейфов с различной протяженностью и мощностью, зависящей от солезапасов в зоне выноса.

В данной работе анализируется типичность и специфика не только собственно процессов пыления в Южном Приаралье, но и таких их последствий, как влияние на запыленность воздуха и климатические изменения.

**Материалы и методы.** При сравнительном анализе характеристик пылевых явлений в различных регионах использованы синоптические карты [47], данные дистанционного зондирования земли (ДЗЗ), стандартные данные метеорологических станций [50], авторские данные наземных измерений, спутниковые снимки [48], литературные данные. Сравнительный анализ включает сопоставление условий возникновения пылевых явлений, морфометрии шлейфов пыле-песчаных бурь, среднегодовой и разовой (при пыле-песчаной буре) концентрации пыли в приповерхностном слое воздуха.

Влияние пылевых явлений на запыленность воздуха и климат ЮП оценивалось методами моделирования, статистического анализа, дистанционного зондирования земли и контактных наземных измерений.

Для оценки вклада конвективной эмиссии почвенного аэрозоля в повышение летней температуры воздуха нами разработана математическая модель МКВ [39], состоящая из двух блоков. В первом блоке вычисляется массовая концентрация аэрозоля, генерируемая конвективными потоками.

Для этого используются эмпирическое соотношение, теоретическое обоснование которого дано в работе [26]

$$\Delta\rho = 0,12 \delta T^{0,58} \quad (1)$$

где  $\Delta\rho$  – отклонение массовой концентрации аэрозольных частиц от фоновой концентрации ( $\text{мг/м}^3$ ),  $\delta T$  – скачок (падение) температуры в термическом пограничном слое, толщина которого варьирует от 10 до 30 см.

Во втором блоке методом частиц *particle-in-cell* [12] вычисляется повышение температуры окружающего воздуха (в слое  $0 \div 3$  м) нагретыми взвешенными почвенными частицами [24]. Алгоритм расчетов следующий.

На первом шаге при условии однородности аэрозоля и равномерного распределения в единице объёма, вычисляется нагрев элементарного объёма воздуха, приходящегося на одну частицу. Изотропный поток тепла от нагретой, взвешенной в воздухе сферической частицы равен [41]:

$$Q = 4\pi R \cdot k_B \cdot T_B \cdot f \quad (3)$$

где  $T_B$  – температура воздуха,  $R$  – радиус аэрозольной частицы,  $k_B$  – коэффициент теплопроводности воздуха при данной температуре. Коэффициент  $f$  определяется по формуле [41]:

$$f = \frac{t^{1+\omega} - 1}{1 + \omega} \quad (4)$$

где  $t = t_p - \Delta t$ ,  $t_p = T_p / T_B$  – безразмерная температура поверхности частицы,  $T_p$  – температура поверхности частицы, равная с точностью до 1,5% температуре поверхности почвы. Значение  $\omega$  для воздуха равно 0,85 [25]. Изменение температуры  $\Delta t$  определяется выражением [41]:

$$\Delta t = \frac{A_1 - \sqrt{A_1^2 - 4A_0A_2}}{2A_2}, \quad (5)$$

где

$$\begin{aligned} A_0 &= \varepsilon(t_p^2 - t_p^{1-\omega}) \\ A_1 &= \left(1 + \varepsilon(2t_p - (1-\omega)t_p^{-\omega})\right) \\ A_2 &= \varepsilon\left(1 + \frac{\omega(1-\omega)}{2} \cdot t_p^{-(1+\omega)}\right) \\ \varepsilon &= \frac{C_T}{1+\omega} \left(\frac{\lambda}{R}\right), \end{aligned} \quad (6)$$

$C_T$  – коэффициент скачка температуры  $\approx 2,2$  [32][42],  $\lambda$  – длина свободного пробега молекулы воздуха

$$\lambda = \frac{kT_B}{\sqrt{2}\pi d^2 p} . \quad (7)$$

В соотношении (7)  $d = 3,6 \cdot 10^{-10}$  м – диаметр молекулы воздуха,  $p$  – атмосферное давление,  $k = 1,38 \cdot 10^{-23}$  Дж/К – постоянная Больцмана.

По отклонению массовой концентрации аэрозоля  $\Delta\rho$ , вычисленной в первом блоке модели, определяется счётная концентрация  $N$  и объём воздуха  $dV$ , занимаемый одной частицей. При этом предполагается, что стенки  $dV$  непроницаемы, а объём  $dV$  инвариантен относительно размера и химического состава частицы.

Результаты моделирования верифицированы полевыми измерениями температуры воздуха и подстилающей поверхности, концентрации аэрозоля счетчиком аэрозоля (диапазон  $0,3 \div 10$  мкм).

Ветровой вынос солей с Аралкума является важной компонентой (наряду с сокращением акватории) механизма влияния усыхания Аральского моря на климатические изменения в Приаралье [27][37]. На основе аппроксимации результатов численного моделирования [37] нами построена модель многолетней пространственно-временной динамики влияния усыхания Аральского моря на такие климатические характеристики, как температура и относительная влажность воздуха, годовое количество осадков [20].

Для определения пространственно-временной динамики запыленности приземного (на уровне 2 м) воздуха в Нижне-амударьинском оазисе разработана статистическая модель МДЗА [40], в основу которой положена версия гауссовой модели [9].

#### **Результаты и обсуждение.**

**Типичность пылевых явлений.** Общность пыле-песчаных бурь (ППБ) в различных регионах Земли прежде всего заключается в условиях их возникновения. Метеорологические условия (такие процессы общей циркуляции атмосферы, как циклоны, холодные вторжения) общеизвестны. Отметим только, что наиболее часто в Южном Приаралье наблюдаются пыле-песчаные бури холодного фронта, возникающие на южной и юго-восточной периферии циклонов,двигающихся с запада (рис.3).

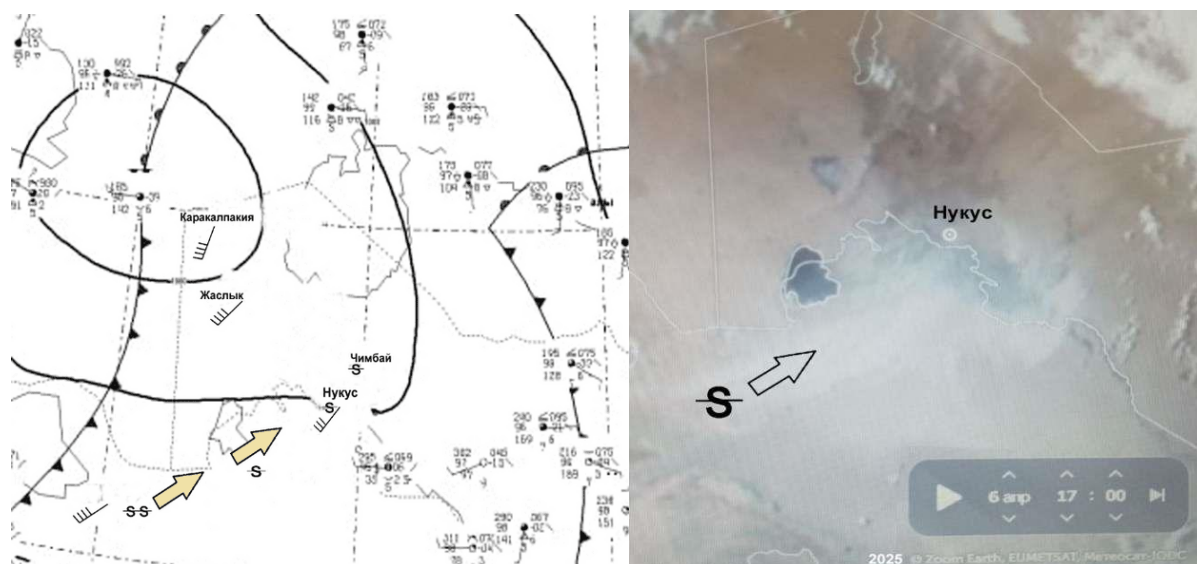


*Рисунок 3. Синоптическая карта и космоснимок пыле-песчаной бури (6 апреля 2025г.) [47]*

Эколого-климатическими условиями возникновения пыле-песчаных бурь, как также известно, являются засушливость и подстилающая поверхность с низким (0-0,4) проективным покрытием растений.

Типичным в современных условиях является увеличение повторяемости ППБ [36] наряду с такими экстремальными явлениями как тайфуны, наводнения, вследствие глобального потепления, обуславливающего возрастание энергии атмосферных процессов. К примеру, выполненный авторами статистический анализ показал увеличение повторяемости пыле-песчаных бурь в ЮП в периоде 2000-2024 гг. на 6,7% в год [36].

Типичными для ППБ являются визуальные характеристики, наблюдаемые на спутниковых снимках (рис.4). Расплывчатость шлейфов пыле-песчаных бурь на естественных пустынях объясняется большой площадью очагов пыли и достаточно большим коэффициентом поперечной турбулентной диффузии, слабо подавляемой при скоростях ветра менее 20м/с, характерных для средних ППБ. Кроме того, сепарация частиц по размерам, происходящая при движении пылевого потока и логарифмический профиль ветра, обуславливают мелкодисперсность периферии шлейфа (РМ<sub>4</sub>), и, следовательно, меньшую отражательную способность.



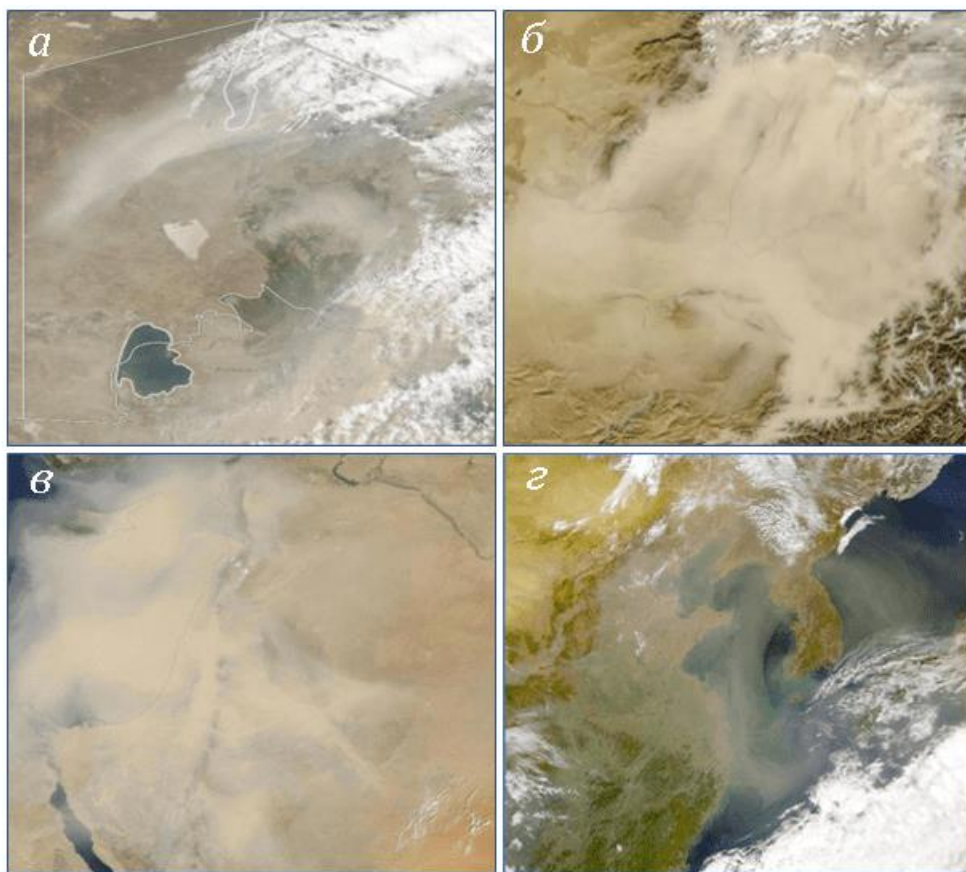


*Рисунок 4. Пылевые бури в различных регионах планеты: а) Южное Приаралье, б) Австралия, в) Ближний Восток, г) Китай [48]*

Приземная концентрация пыли при скорости ветра менее 10-15 м/с во всех регионах не превышает 2 мг/м<sup>3</sup> [13][14][17]. При сильных экстремальных ППБ (рис.5) концентрация пыли возрастает на порядок.

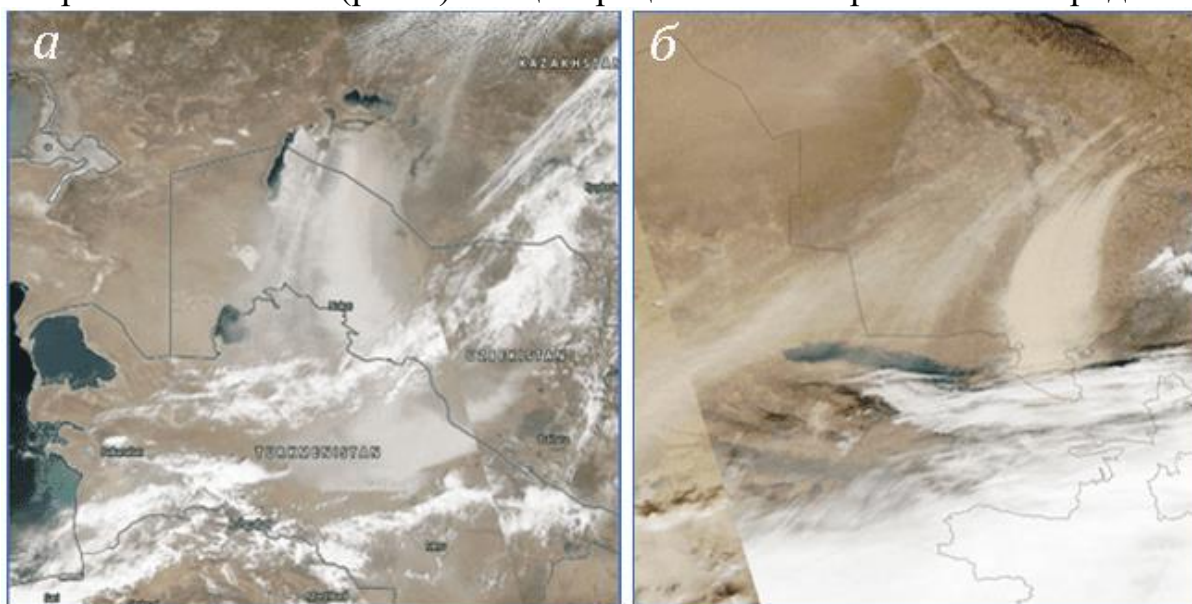


*Рис. 5. Экстремальные пылевые бури: а) на Аралкуме 27 мая 2018г. [49]; б) в Центральной Азии 4 ноября 2021 года [45]*



Так, при солепылевой буре на Аралкуме 27 мая 2018г. концентрация пыли в г.Нукусе (450 км от очага) превышала 20 мг/м<sup>3</sup>, при ППБ 4 ноября 2021 года в Ташкенте (600 км от очага) концентрация РМ<sub>10</sub> достигла 18 мг/м<sup>3</sup> [17], в Австралии (9 февраля 1996 г., пустыня Симпсон) – 27 мг/м<sup>3</sup> [13].

Замеры счетной концентрации пыли, проведенные нами в Нукусе во время умеренного ветра 2 апреля и ППБ 4 апреля 2025 года показали следующее:

Таблица 1. Концентрация пыли при умеренном ветре и во время ППБ

| Время             | Скорость ветра |              | Размер частиц R, мкм |        |        |       |       |      |       | Массовая концентрация, мг/м³ |
|-------------------|----------------|--------------|----------------------|--------|--------|-------|-------|------|-------|------------------------------|
|                   |                |              | 0.3                  | 0.5    | 1      | 3     | 5     | 10   |       |                              |
| 02.04.2025 12-00. | 8 м/с          | Число частиц | 37893                | 17010  | 5934   | 2462  | 799   | 209  | 1,86  |                              |
| 02.04.2025 12-30. |                |              | 32681                | 14050  | 4448   | 1214  | 289   | 55   | 0,63  |                              |
| 02.04.2025 12-50. |                |              | 34004                | 15384  | 5470   | 2011  | 642   | 166  | 1,5   |                              |
| 06.04.2025 17-00. | 22 м/с         |              | 165105               | 148795 | 107965 | 43875 | 10121 | 1837 | 21,4  |                              |
| 06.04.2025 17-30. |                |              | 108582               | 92269  | 61493  | 20266 | 3206  | 388  | 6,84  |                              |
| 06.04.2025 17-45. |                |              | 132356               | 115575 | 82806  | 32833 | 7384  | 1284 | 15,47 |                              |

Таким образом данные контактных наземных измерений концентрации пыли в ЮП в обычных условиях и во время пыле-песчаной бури колеблются в тех же пределах. Как видим, пыле-песчаные бури на естественных пустынях Южного Приаралья по физике процесса в целом не отличаются от пыле-песчаных бурь на других пустынях.

Также типичен конвективный вынос пыли в естественных пустынях [21], различия могут быть в дисперсности и массе выносимой конвективными потоками пыли, а также воздействии этой пыли на приповерхностную температуру воздуха.

Численные эксперименты с моделью МКВ с различными вариантами функций распределения размеров частиц и веществ, а также толщины термического пограничного слоя выявили, что приращение конвективным выносом температуры  $\Delta T$  наиболее чувствительно к вариациям дисперсности [21]. На рис.6, отображающем результаты расчетов для монодисперсного аэрозоля видно, что максимальные значения  $\Delta T$  соответствуют РМ<sub>0,5</sub>, преобладающей как при ППБ, так и при КВ, фракции пыли (табл.1).

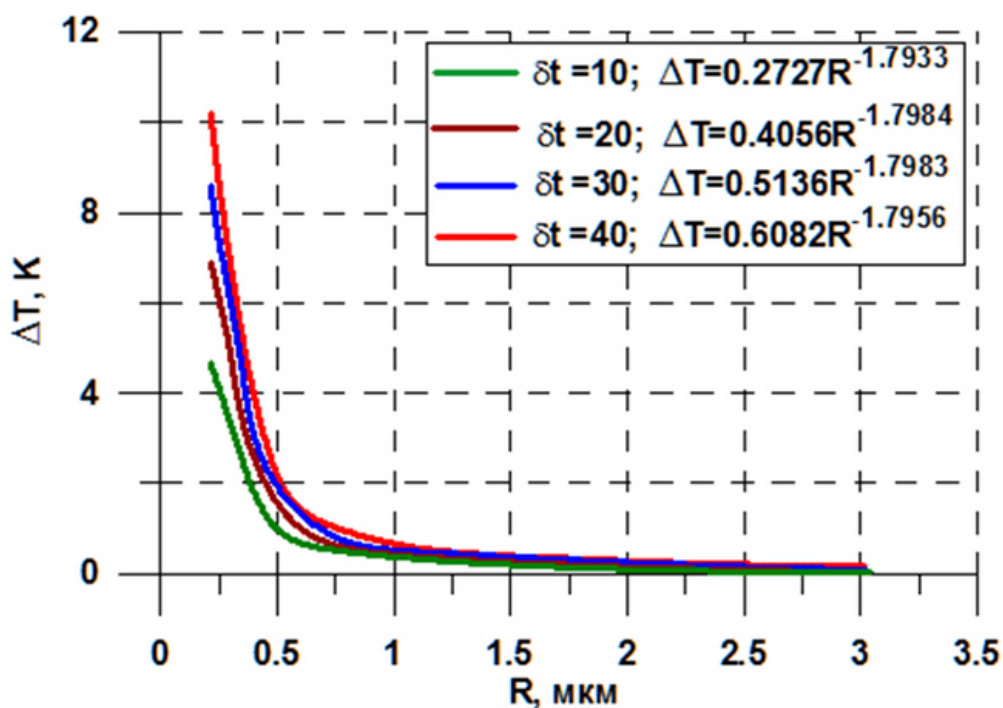


Рис.6. Зависимость изменения  $\Delta T$  от радиуса частиц монодисперсного аэрозоля и толщины термического пограничного слоя (июнь).

Расчеты по модели и полевые измерения показали, что для условий Южного Приаралья в летние месяцы тепловой эффект конвективного выноса может достигать  $2-3^{\circ}\text{C}$ . Согласно нашим расчетам, вклад конвективного выноса в произошедшее за последние два десятилетия в Южном Приаралье потепление летнего сезона оценивается как 10-30% [5].

Значение форсинга летних температур воздуха при конвективном выносе аэрозоля возрастает ввиду прогрессирующего опустынивания во многих регионах земного шара (рис.7).

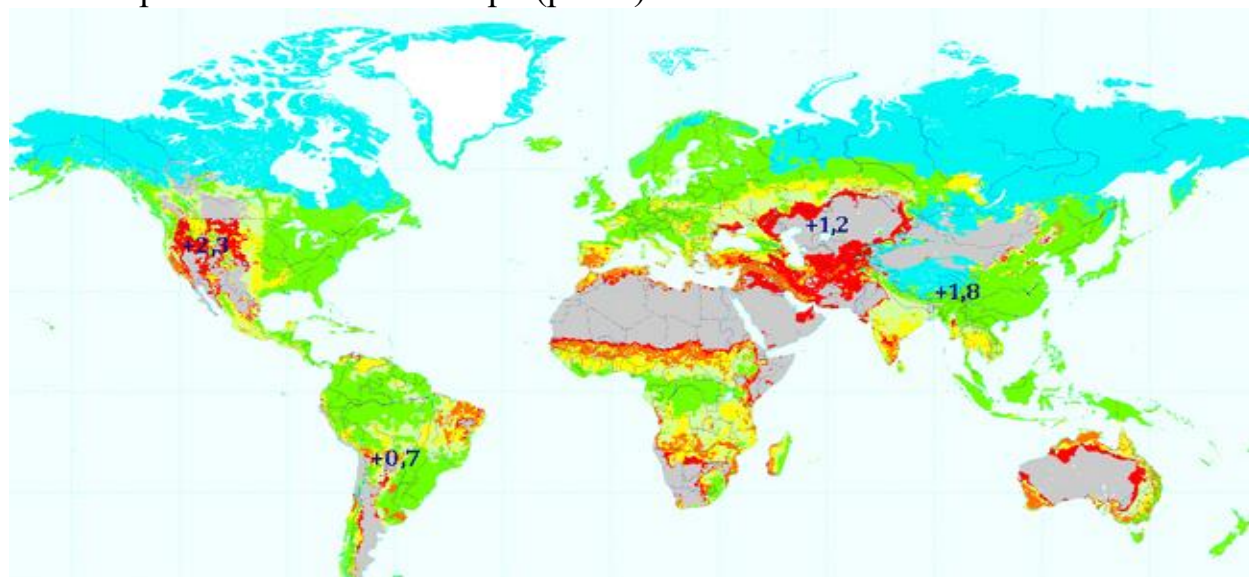


Рис. 7. Карта опустынивания Земли: зеленый цвет – низкая угроза опустынивания, жёлтый цвет – умеренная угроза, красный – очень высокая угроза [43]

На рис.7 цифры указывают мировые температурные аномалии в аридных зонах в привязке к базовым климатическим условиям 1979-2000 годов. Исходные данные получены из версии 5 реанализа Европейского центра (ERA 5) [46].

Несложные расчеты в соответствии с разработанной моделью показывают, что увеличение пустынных площадей на 6500 тыс. кв. км (красный цвет на рис. 7) может привести к повышению средней глобальной температуры на 5-14% в зависимости от дисперсности пустынных поверхностей.

Необходимо отметить, что повышенная при дневном КВ концентрация аэрозоля и частично сохраняющаяся ночью вследствие незначительности осаднения частиц, сдерживает ночное излучение из-за поглощающих свойств почвенного аэрозоля, что усиливает среднесуточный тепляющий эффект конвективного выноса в приповерхностных слоях воздуха.

**Специфика пылевых явлений** в Южном Приаралье определяется обширностью пустынных территорий и наличием уникальной антропогенной соляной пустыни Аралкум, обладающей особенностями воздействия на запыленность воздуха и климатические изменения в Южном Приаралье.

Результаты расчетов по модели МДЗА показали, что особенности географического расположения Нижне-амударьинского оазиса, ветрового режима с преобладанием северной половины румбов и расширение Аралкума определяют особенности динамики запыленности воздуха в регионе (рис.8).

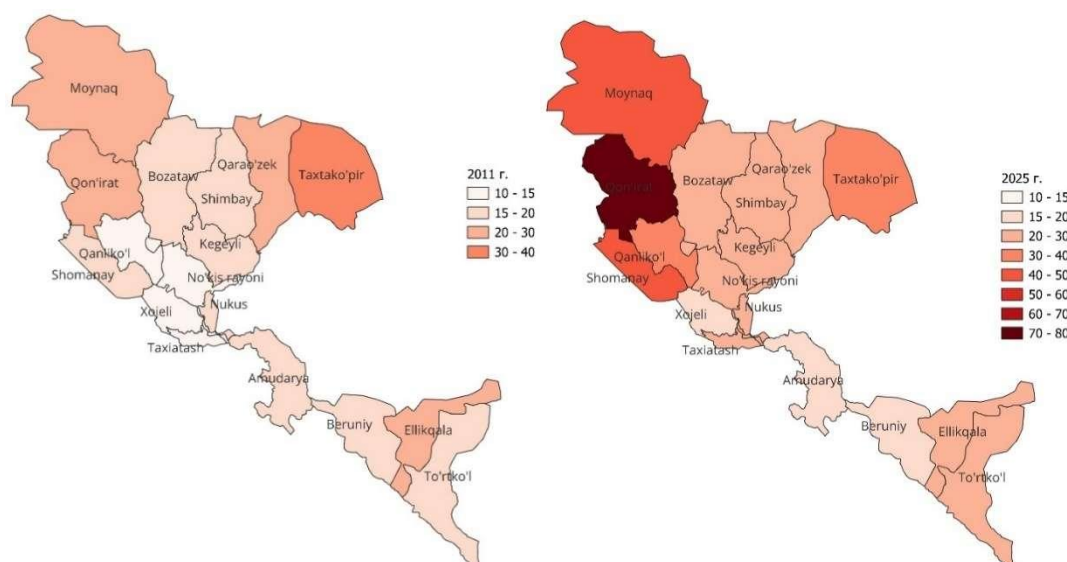


Рисунок 8. Карта пространственной динамики запыленности атмосферы в Каракалпакстане за 2011 (слева) и 2025 (справа) годы.

Всесторонний анализ факторов, влияющих на уровень запыленности в 5 странах Ближнего Востока (Ирак, Иран, Кувейт, Сирия и Саудовская

Аравия), основанный на данных о приземной концентрации пыли, метеорологических данных и вегетационном индексе за период с 2001 по 2017 год, показал, что уровень запыленности в Кувейте выше, чем в других странах, со средней концентрацией пыли на поверхности земли 0,53 мг/куб.м и ежегодной тенденцией к увеличению на уровне 0,0014 мг/(куб.м в год) [14]. Аналогичная тенденция в ЮП составляет 0,0027 мг/(куб.м в год), что вдвое больше чем в самой запыленной стране Ближнего Востока. Таким образом, специфика пылевых явлений в ЮП проявляется, в частности, в более высокой динамике роста запыленности атмосферы относительно других регионов.

Специфика пыли с Аралкума заключается в особом воздействии на региональный климат ввиду высокого содержания в ее составе сульфатов, являющихся активными ядрами конденсации, приводящими к увеличению количества осадков и рассеивающим аэрозолем, понижающим температуру воздуха.

По результатам моделирования нами определена многолетняя пространственно-временная динамика влияния усыхания Аральского моря на такие климатические характеристики, как температура и относительная влажность воздуха, годовое количество осадков (рис.9) [20]. Влияние усыхания Аральского моря на климатические изменения рассматривалось как совокупное влияние сокращения акватории моря и выноса солей с осушенного дна.

Системное воздействие усыхания Аральского моря на температуру воздуха на всем протяжении периода моделирования остается охлаждающим, меняется только соотношение вкладов сокращения акватории и выноса солей. В 1966-1975гг. ввиду незначительности выноса солей, как отчетливо видно на рисунке 9, преобладало влияние акватории моря. В среднем по региону охлаждающее влияние усыхающего моря равно 2°C.

Отклонения количества осадков, вызванные выносом солей, достигают максимума при значении концентрации солей  $C \approx 100$  мкг/м<sup>3</sup> на уровне конденсации (1986-1995гг.), затем начинают уменьшаться [20], далее аэрозольный эффект снижается до 5 мм/год и выражается в торможении стока и увеличении жизни облаков, но область влияния, как видно на рисунке 9, непрерывно расширяется вследствие увеличения годового объема выноса солей с Аралкума.

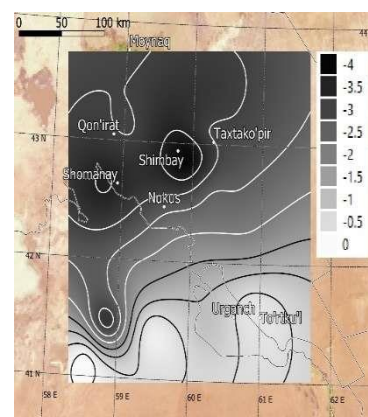
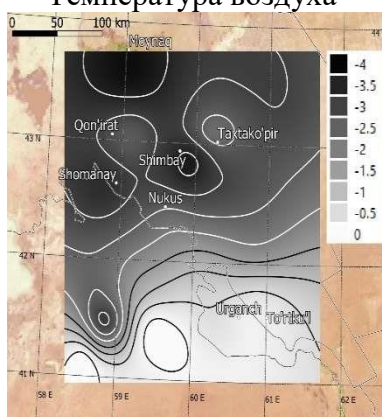
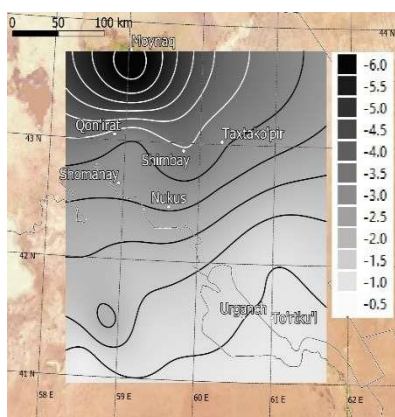


1966-1975

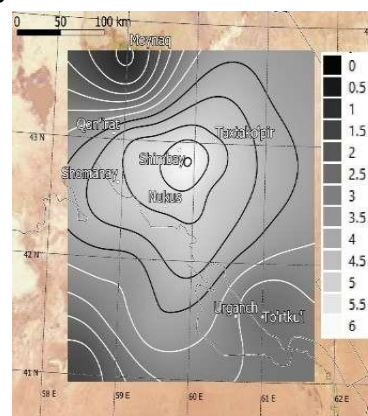
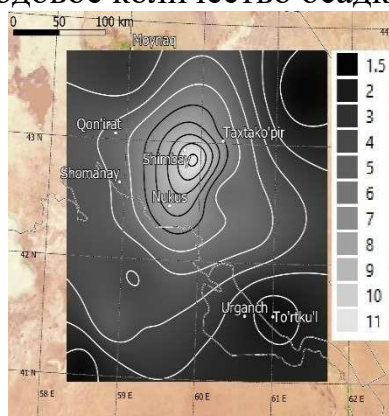
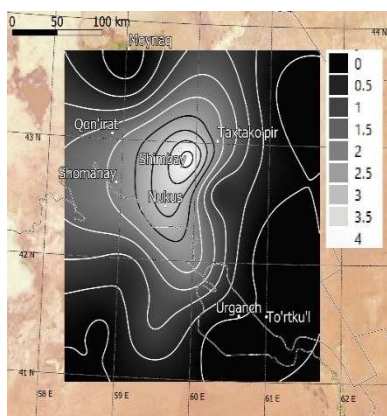
1986-1995

2006-2015

Температура воздуха



Годовое количество осадков



Относительная влажность воздуха

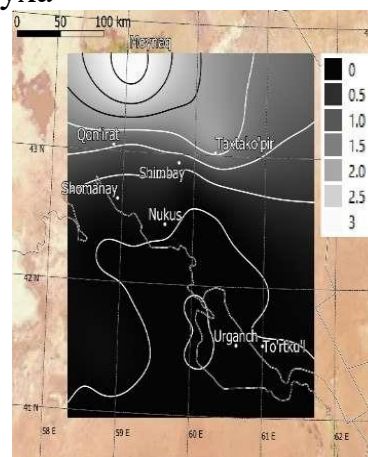
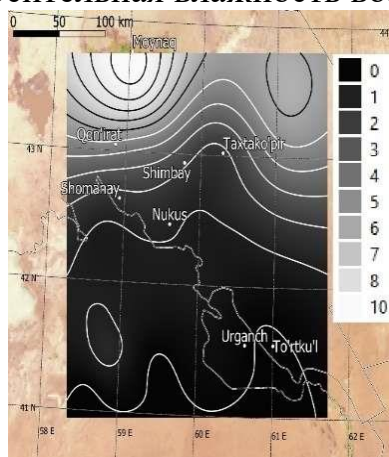
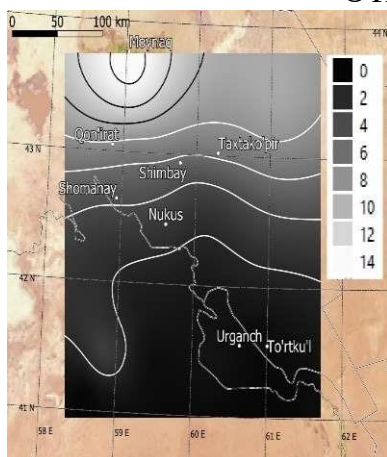


Рисунок 9. Динамика отклонений метеохарактеристик, обусловленных усыхание Аральского моря

В ходе численных экспериментов выяснилось, что прямое влияние выноса солей на относительную влажность воздуха менее 0,5%, но косвенное влияние (через понижение температуры воздуха) несколько (до 1,5-2%) компенсирует уменьшение относительной влажности воздуха, обусловленное сокращением акватории моря. Динамика влияния усыхания Аральского моря на относительную влажность воздуха устойчиво отрицательная. Наблюдаемые метеостанциями изменения [35] годового

количества осадков подтверждают результаты моделирования, хотя могут быть ниже модельных ввиду происходящих вследствие высоких летних температур воздуха, разрушения облаков и испарения выпадающих из них капель.

Результаты же по температуре и относительной влажности воздуха не могут верифицироваться с данными метеостанций, поскольку последние отражают суммарный эффект всех факторов, в том числе глобального потепления, деградации растительного покрова, влияния окружающих пустынь (эффект Воейкова для запыленных зон) и др.

**Выводы.** На современном этапе исследований климата важное значение придается региональной изменчивости аэрозольно-радиационного форсинга. Этот аспект в данной работе является основным проявлением своеобразия пылевых явлений в Южном Приаралье.

В целом *типичность* пылевых явлений присуща пыле-песчаным бурям и конвективному выносу в естественных пустынях. Эти процессы протекают в Южном Приаралье по достаточно изученным закономерностям, общим для всех пустынных территорий. В частности, это возникновение пыле-песчаных бурь вследствие определенных метеоусловий, размытость шлейфа, присущая большим площадным источникам пылевыноса, образование пылевой дымки, снижение приповерхностной температуры воздуха и др.

Существенность конвективного выноса субмикронного аэрозоля с пустынных поверхностей, установленная натурными наблюдениями в различных регионах (Калмыкия, Таджикистан, Казахстан), вкупе с расширением опустынивающихся территорий обуславливает его значимость как климатического фактора.

Поскольку в модели МКВ отсутствуют данные, характерные исключительно для Южного Приаралья, результаты исследования приложимы к другим пустынным регионам при наличии периодов с указанными выше метеорологическими ситуациями.

Ввиду актуальности синергетически связанных процессов опустынивания и потепления климата необходимы дальнейшие исследования отепляющего эффекта конвективного выноса аэрозоля с пустынных поверхностей с учетом скорости конвекции, турбулентной диффузии, нелинейных эффектов, вертикальных градиентов и теплообмена пустынных участков с соседними качественно отличающимися ландшафтами и особенно с учетом влияния растительного покрова.

*Специфика* пылевых явлений в Южном Приаралье связана прежде всего с выносом солевого аэрозоля с пустыни Аралкум. На фоне глобального потепления понижение температуры воздуха и увеличение количества осадков солевым аэрозолем выглядит благоприятным эффектом, который, однако, не компенсирует негативный эффект – влияние на здоровье населения и засоление орошаемых территорий.



Другая особенность пылевых явлений в ЮП обусловлена географическими (средоточие 4 крупных пустынь) и экологическими (Аральский кризис) условиями. Эта особенность заключается в высокой относительно других регионов динамике запыленности атмосферы, а также продолжающемся расширении соляной пустыни Аралкум как очага солепылевых бурь с выносом патогенных сульфатов.

Дестабилизация экосистемы Арала и Приаралья – усыхание Аральского моря, опустынивание, деградация растительного покрова – обуславливает прогрессирующее негативное значение пылевых явлений в ЮП для населения не только Приаралья, но и более отдаленных территорий.

Наблюдаемые в последнее время масштабные пылевые бури (27 мая 2018г., 4 ноября 2021г.) имеют еще более значимые негативные воздействия. К примеру, осаждение пылевого материала на ледниках гор Центральной Азии ускоряют их таяние вследствие уменьшения альбедо, что усугубляет и без того острую проблему водных ресурсов в регионе.

Ввиду всего вышесказанного безусловно актуальны разработки мер ослабления пылевых явлений в Приаралье в целом. Недостаточная эффективность фитомелиорации на ОДА, оценена нами методами моделирования в 10-15%% сдерживания выноса солей [30]. В связи с этим более перспективной мерой представляется искусственное осадкообразование накануне прогнозируемого сильного ветра. К примеру, во время вышеприведенной ППБ 6 апреля 2025 пыление отсутствовало на севере Устюрта и Кызылкума, где непосредственно перед пыле-песчаной бурей прошел небольшой дождь 0,6 мм, что говорит о значимости осадков, даже небольших, для подавления миграции пыли.

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## **IT-КАСБЛАРИНИ ТАСНИФЛАШ ЁНДАШУВЛАРИНИНГ 3D-ВИЗУАЛИЗАЦИЯ УЧУН АСОС СИФАТИДАГИ ТАҲЛИЛИ**

**Аннотация:** Мазкур мақола IT-касбларни таснифлаш муаммосига бағишланган бўлиб, малакали кадрларга бўлган талаб ва таклиф ўртасидаги номуносибликни бартараф этишнинг назарий асосларини таҳлил қилади. Тадқиқотда мавжуд ёндашувлар – IT-касблар онтологиялари, Хлобистова таснифи, IT Skills Ontology ва халқаро стандартлар (ESCO, SFIA) чуқур ўрганилиб, уларнинг афзаллик ва чекловлари кўрсатиб берилган. Мавжуд моделларнинг асосий камчилиги сифатида уларнинг статиклиги, “юмишоқ” кўникмаларни ҳисобга олмаслиги ва визуал тасвирлаш учун мослаштирилмагани қайд этилади.

**Калим сўзлар:** IT-касблари, таснифлаш, ёндашувлар, 3D-визуализация, таҳлил.

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## **ANALYSIS OF IT PROFESSIONAL CLASSIFICATION APPROACHES AS A BASIS FOR 3D VISUALIZATION**

**Abstract:** This article is devoted to the problem of classifying IT professions and analyzes the theoretical foundations of eliminating the imbalance between the demand and supply of qualified personnel. The study deeply studies the existing approaches - IT profession ontologies, Khlobistova classification, IT Skills Ontology and international standards (ESCO, SFIA), and shows their advantages and limitations. The main disadvantages of the existing models are their static nature, lack of consideration of "soft" skills, and their unadaptability for visual representation.

**Keywords:** IT professions, classification, approaches, 3D visualization, analysis.

Ҳозирги кунда IT соҳасига қизиқиш тобора ортиб бормоқда. Университетлар ҳар йили минглаб битирувчиларни диплом билан таъминлаяпти. Бироқ нима учун компаниялар ҳали ҳам “Малакали дастурчи излаймиз” деган эълонларни осишда давом этмоқда? Гап нимада? Асосий муаммо – малакали IT кадрларга бўлган талаб билан таклиф ўртасидаги катта фарқда. Бу фарқни бартараф этиш учун эса, аввало, IT-касбларнинг ўзини аниқ ва тартибга солинган тасниф моделларига эга бўлишимиз керак. Яхши ишлаб чиқилган тасниф касблар, кўникмалар ва мартаба траекториялари



ҳақидаги билимларни бир тизимга келтиришга ёрдам беради. Бу эса касбга йўналтириш, HR-таҳлили ва таълим дастурларини ишлаб чиқиш учун жуда муҳим.

Мавжуд ёндашувларга назар IT-касблар онтологиялари. “Онтология” деган тушунча асосан фан соҳаларини расмийлаштириш учун ишлатилади – яъни у тушунчалар ва уларнинг ўзаро боғланишларини компьютер ўқий оладиган шаклда ифодалайди. IT соҳасида эса у кўпинча бир нечта вазифани бажаради: масалан, кўникмалар, роллар ва иш берувчилар талабларини бирлаштириб, мутахассиснинг тўлиқ портретини яратиш. Мисол учун, Файзрахманов ва Яруллин ўз тадқиқотларида вакансиялар асосида дастурий таъминот ишлаб чиқарувчисининг касбий кўникмаларини онтологик моделлаштириш усулини таклиф қилган. Онтологик ёндашув билимларни мослашувчан ва яхлит тақдим этишни таъминлайди: онтологиялар соҳага “бир бутун кўз билан қараш” имконини беради ва кўникмалар орасидаги кўзга ташланмайдиган боғланишларни аниқлашга ёрдам беради [6]. Бу, айниқса, маълумотлар тўлиқ бўлмаганда (масалан, вакансияда бир нечта кўникма кўрсатилган бўлса) жуда фойдали: онтология мутахассис портретини тўлдиришга хизмат қилади. Онтологиялар кўникма ва касбларни қатъий тартибга солиб, билимларни автоматик қидириш ва таҳлил қилишни анча осонлаштиради. Тўғри ишлаб чиқилганда, улар вакансия ва резюме талабларини бир-бирига тез ва аниқ мослаштиришга, шунингдек, IT мутахассисликлари ҳақидаги маълумотларни доимо янгилаб боришга имкон беради.

Кўпчилик IT-касблар онтологиялари жуда умумий ва тўлиқ эмас. Тадқиқотчиларнинг таъкидлашича, мавжуд моделлар кўпинча фақат асосий касблар ва “қаттиқ” (техник) кўникмаларни ўз ичига олади, “юмшоқ” кўникмалар ва малака даражаларини эса четлаб ўтади. Кўпинча улар статик бўлади: тез ўзгарувчан технологиялар рўйхатини ҳисобга олмайди ва қўлда янгиланиши керак. Бундан ташқари, анъанавий онтологиялар тавсиф ва боғланишларга йўналтирилган бўлиб, визуал график тасвирни назарда тутмайди. Шу сабабли, улар мослаштирилмаса, мартаба траекторияларининг 3D визуализацияси учун яроқсиз – билим графларини фойдаланувчига тушунарли бўладиган тарзда уч ўлчамли фазода дарҳол акс эттириш қийин.

Хлобистова таснифи. Хлобистова ва ҳаммуаллифлар социологик тадқиқот орқали IT-мутахассисликларининг ўзига хос таснифини ишлаб чиқди. Улар IT-ролларининг бешта асосий тоифасини ажратди: дастурий таъминот ишлаб чиқиш, сифат назорати (тестлаш), маълумотлар билан ишлаш ва тадқиқотлар (Data Science/таҳлил), менежмент (масалан, лойиҳа ва маҳсулот менежерлари) ва дизайн (UX/UI, график дизайн). Бундай ёндашув касбга йўналтиришни (масалан, Голланд тести) касбларнинг аниқ гуруҳлари билан боғлайди.

Тоифалар кўзга яққол ташланадиган ва йирик бўлиб, ўқувчилар ва мутахассис бўлмаганлар учун мўлжал олишни осонлаштиради. Улар



психологик турлар билан яхши боғланади ва касб танлашни тезда торайтиришга имкон беради.

Кенг тоифалар мартабани батафсил таҳлил қилиш учун жуда умумий. Уларда жуда хилма-хил роллар бирлаштирилган (масалан, менежмент лойиҳа менежерлари ва турли профилдаги team leadларни бирлаштиради) ва малака даражалари ҳамда технологик жиҳатлар мавжуд эмас. Бундай тасниф техник стеклар ва тажрибани қайд этмайди, бу эса мартаба ўсишининг батафсил моделини қуришни қийинлаштиради. 3D моделлаштириш учун бу етарли даражада тузилмаган: тажриба даражаси бўйича координаталар берилмаган ва тоифалар ўртасида траекториялар ўтказиш мумкин бўлган боғланишлар аниқланмаган.

Тадқиқотлар доирасида Toscano (2020) томонидан IT Skills Ontology – IT-касблар ва кўникмалар ўртасидаги боғланишларни расмийлаштирувчи онтология ҳам таклиф қилинган. Мақсад – IT-мутахассисларини танлашда ягона кўникмалар стандарти йўқлиги муаммосини ҳал қилиш эди. Муаллифлар IT-касбларни талаб қилинадиган кўникмалар билан боғлайдиган модель яратиб, эксперт баҳолашини ўтказди ва бундай онтология, айниқса, кам тажрибали кадрлар бўлими ходимлари учун ишга қабул қилиш жараёнини осонлаштиришини кўрсатди. Мисол учун, онтологияни жорий этиш вакансия талаблари ва номзодлар профилини тезроқ солиштиришга ёрдам берди.

IT Skills Ontology кўникма ва касбларнинг расмий тизимини беради. Баҳолаш натижаларига кўра, муаллифлар уни қўллаш вакансияларнинг “кўникма” профилини тузишни соддалаштириши ва ёллаш бўйича мутахассислар ишини тезлаштиришини таъкидлайди.

Ушбу онтология ҳам “юмшоқ” кўникмалар ва малака даражаларини ҳисобга олмайди. У фақат асосий касблар ва қатъий техник кўникмаларни ўз ичига олади, қўлда янгилашни керак ва битта компанияга йўналтирилган. Бошқа расмийлаштирилган моделлар сингари, у визуал тасвирлаш учун ишлаб чиқилмаган ва визуал фазода тугунлар орасидаги масофа ёки боғланиш ўлчовини аниқламайди.

IT-касбларнинг бошқа таснифлари ҳам мавжуд: халқаро стандартлардан (масалан, ISCO-08, ESCO ёки SFIA) тортиб миллий профессиональ стандартларгача. Улар рол ва улар билан боғлиқ кўникмаларнинг кенг рўйхатини беради. Ушбу таснифлар статистика ва кадрлар ҳисоби учун фойдали, аммо одатда мартаба даражаларини фарқламайди ва визуал моделлаштириш учун зарур бўлган касблар орасидаги боғланишларга эътибор қаратмайди.

Юқорида кўрсатиб ўтилганидек, мавжуд моделлар (онто- ёки иерархик таснифлар) билимларни расмийлаштириш учун муҳим, аммо уларни мартабанинг 3D визуализациясида тўғридан-тўғри қўллаш бир қатор чекловларга эга. Биринчидан, улар кўпинча ҳаддан ташқари батафсил ёки, аксинча, жуда умумийлаштирилган: биринчи ҳолда визуал схема кўплаб тугун ва боғланишлар билан ҳаддан ташқари юкланган бўлади, иккинчи ҳолда

эса соддалаштирилган ва босқичма-босқич траекториялар учун функционал бўлмайди. Иккинчидан, улар кўникмалар ва ҳужжатларни тавсифлашга йўналтирилган, роллар ўртасидаги ўтишларга эмас. 3D моделлаш вазифаси – мутахассис турли йўналишлар бўйлаб қандай ҳаракатланиши ва бу йўлда унинг компетенциялари ҳамда технологиялар стеки қандай ўзгаришини кўрсатишдир. Анъанавий таснифлар вақт омили ва мартаба эволюциясини ҳисобга олмайди. Ниҳоят, кўпгина онтологияларда 3D график ўқларини қуриш учун зарур бўлган нормаллаштирилган “координаталар” (моҳорат даражаси, тажриба стажи, технологиялар соҳаси) мавжуд эмас.

Хулоса қилиб айтганда, визуал тасвирлаш ва мартаба йўналишларини белгилаш учун оптималлаштирилган, малака даражалари, технологик стеклар ва йўналишларнинг ўзаро боғлиқлигини ҳисобга оладиган ўзига хос модель талаб этилади.

Бизнинг моделимиз IT соҳасини 10 та асосий йўналишга ажратади, уларнинг ҳар бири кўникмалар тўплами, одатий касблар ва технологик стеклар билан тавсифланади. Ҳар бир йўналиш малака даражалари (кичик мутахассисдан архитекторга/техник директоргача) ва фаолият профилини акс эттирувчи технологиялар стеки бўйича тузилади. Таклиф этилаётган йўналишлар:

Дастурий таъминот ишлаб чиқиш (Software Engineering): Илова ва хизматларни ишлаб чиқиш. Frontend (JavaScript/TypeScript, React, Angular), backend (Java, Python, C#, Node.js), мобил ишлаб чиқиш (Swift, Kotlin) ва бошқаларни ўз ичига олади.

Тестлаш ва сифат назорати (QA): Дастурий таъминот сифатини таъминлаш. Кўникмалар: автоматлаштирилган тестлаш (Selenium, Postman), DevTools, QA методологиялари (TDD/BDD).

Маълумотлар таҳлили ва Data Science: Маълумотларни йиғиш, қайта ишлаш ва таҳлил қилиш. Стек: SQL, Python/R, машинавий ўқиш кутубхоналари (TensorFlow, PyTorch), BI воситалари (Power BI, Tableau).

Киберхавфсизлик: Ахборот ва инфратузилмани ҳимоя қилиш. Кўникмалар: криптография, pen-testing, SIEM тизимлари, хавфсизлик сиёсатлари (OWASP, ISO27001).

Тармоқ ва тизим инфратузилмаси: Серверлар ва тармоқларни бошқариш. Стек: Linux/Windows Server, Cisco/Juniper, виртуализация (VMware, Hyper-V), булутлар (AWS, Azure).

Булутли платформалар ва DevOps: CI/CD қуриш, булутли инфратузилмани бошқариш. Кўникмалар: контейнерлаштириш (Docker, Kubernetes), код сифатида инфратузилма (Terraform, Ansible), мониторинг ва SRE амалиётлари.

UX/UI-дизайн: Интерфейсларни лойиҳалаш. Воситалар: Figma, Adobe XD, UX тамойиллари (design thinking), маълумотларни визуализация қилиш.

IT-менежмент ва маҳсулот менежменти: Лойиҳа ва маҳсулотларни бошқариш. Кўникмалар: Scrum/Kanban, бизнес-таҳлил, Agile-коучинг, етакчилик.

Техник ёрдам ва қўллаб-қувватлаш (Helpdesk/Operations): Фойдаланувчиларни қўллаб-қувватлаш ва тизимларни эксплуатация қилиш. Кўникмалар: ОТ ва иловаларни билиш, SLA-бошқаруви, мулоқот.

Тадқиқот ва инновациялар (R&D, AI/IoT): Илмий ишланмалар, янги технологияларни жорий этиш. Кўникмалар: алгоритмлар, тадқиқот таҳлили, ихтисослашган соҳаларни билиш (нарсалар интернет, блокчейн, робототехника).

Ҳар бир йўналиш учун малака даражалари (тахминан: Junior, Middle, Senior, Lead/Architect) киритилади. Даражалар бўйлаб ҳаракатланиш мартабанинг вертикал ўсишини, технологик стек ва ихтисослашув эса горизонтал ўқни ифодалайди. Ушбу уч ўлчовли тузилма (йўналиш – даража – технологиялар стеги) визуал модель учун асос бўлиб хизмат қилади.

Бизнинг моделимиздаги малака даражалари узвийликни белгилайди: стажёрдан раҳбаргача. Амалда бу шуни англатадики, ҳар бир йўналишда ҳар бир даража учун ўзига хос одатий роллар мавжуд (масалан, Junior Data Scientist – Senior Data Scientist – Lead Data Scientist). Технологик стеклар ҳар бир роль ва даража учун асосий воситалар ва тилларни санаб ўтади. Бундай ёндашув мартаба ўсишини шунчаки лавозим номининг ўзгариши сифатида эмас, балки кўникмаларни чуқурлаштириш ва янги технологияларга ўтиш сифатида кўрсатишга имкон беради.

Тузилманинг афзалликлари: У бир вақтнинг ўзида йўналишлар бўйича тартибли бўлинишни ва кўникмалар бўйича батафсиллаштиришни беради. Визуализация қилишда йўналишлар 3D фазонинг “блоклар”ни, даражалар “баландлик”ни, технологик стек/ихтисослашув эса қўшимча ўқ ёки тугунларнинг ранг белгисини беради.

Бундай модель мумкин бўлган ривожланиш йўллари таҳлил қилиш ва уларда ҳаракатланишни осонлаштиради. Биринчидан, у кўникмалардаги бўшлиқларни аниқлаш ва ўқитишни режалаштиришга ёрдам беради: юқори даражалардаги талаб қилинадиган стекларни ва жорий кўникмалар тўпламини солиштириб, HR-таҳлили мақсадли курслар ва позицияларни таклиф қилиши мумкин. Иккинчидан, графикада мумкин бўлган ўсиш траекторияларини ажратиб кўрсатиш мумкин. Phenom'га кўра, граф алгоритмлари мартаба йўллари “ҳисоблаш” ва ходимларга ўсиш потенциалини кўрсатиш имконини беради. Масалан, тизим бошланғич позициядан мақсадли позициягача бўлган тугунлар кетма-кетлигини ёритиб, ҳар бир даражани ўзлаштириш бўйича тавсиялар бериши мумкин.

Демак, IT-касбларнинг комплекс таснифи таълим, мартаба ва иқтисодиёт ўртасидаги марказий бўғин бўлиб хизмат қилади. У замонавий рекрутинг ва касбга йўналтириш тизимлари учун зарур бўлган роль ва кўникмаларни тавсифлашнинг ягона тилини беради ва касбларнинг статик рўйхатларидан динамик визуал мартаба ўсиши хариталарига ўтиш имконини беради.

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## **ГЕОХИМИЧЕСКИЕ МЕТОДЫ ОБНАРУЖЕНИЯ НЕФТЕГАЗОВЫХ МЕСТОРОЖДЕНИЙ**

***Аннотация.** Эта статья посвящена изучению геохимических методов поиска месторождений нефти и газа. Проанализирован зарубежный и узбекский опыт, оценена эффективность, область применения и возможности геохимических методов. Зарубежная практика показывает методологическое развитие, различные методы анализа, интегрированные подходы и обеспечение экологической безопасности.*

***Ключевые слова:** геохимические изыскания, микросейсмаж, газ, биомаркеры, изотопная геохимия, разведка.*

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## **GEOCHEMICAL METHODS OF DISCOVERING OIL AND GAS FIELDS**

***Abstract.** This article is dedicated to the study of geochemical methods for searching for oil and gas deposits. Foreign and Uzbek experience was analyzed, and the effectiveness, scope of application, and possibilities of geochemical methods were evaluated. Foreign practice shows methodological development, various analysis methods, integrated approaches, and ensuring environmental safety.*

***Keywords:** geochemical surveys, microseepage, gas, biomarkers, isotopic geochemistry, exploration.*

**Введение.** Несмотря на растущий интерес к возобновляемым источникам энергии и переход к низкоуглеродной экономике, нефть и газ продолжают служить основой глобального энергоснабжения. Поэтому разведка углеводородов остается стратегическим приоритетом как для развитых, так и для развивающихся стран. В комплексе средств поисковой техники важным компонентом стали геохимические методы, которые



предлагают экономически эффективные, экологически рациональные и технически усовершенствованные решения поиска залежей нефти. В геохимических поисковых работах основное внимание уделяется анализу химических характеристик углеводородов и путей их миграции в литосфере. Изучая геохимические аномалии, микронаносы, почвенные газы и биомаркеры на поверхности Земли, геохимики получают возможность ограничивать подземные нефтяные системы без масштабного бурения, что снижает как финансовые риски, так и экологические нарушения.

В зарубежных странах геохимические методы давно сочетаются с геофизическими, геологическими и методами дистанционного зондирования. Например, в США геохимическая разведка стала популярной в середине XX века, когда исследования почвенного газа и исследования микрофильтрации были связаны с определенными скоплениями нефти. Эти подходы позволили обнаруживать микрочастицы углеводородов, выходящие на поверхность, тем самым предоставляя поисковым компаниям важные ориентиры перед бурением [8]. Аналогичным образом, широкомасштабные работы, проведенные в России, Волго-Уральском и Западно-Сибирском бассейнах, показали, что наземные геохимические исследования полезны для дополнения сейсморазведочных работ, особенно в слабоописанных районах [10].

Узбекистан, имеющий стратегическое положение в Центральной Азии и огромные запасы углеводородов, имеет давнюю историю поиска нефти. К основным нефтегазодобывающим районам страны относятся Бухаро-Хивинский, Ферганский и Устюртский бассейны. Хотя сейсмические и геологические методы традиционно доминировали в разведочных кампаниях, геохимические методы получают все большее признание, поскольку они дополняют геофизику и улучшают показатели успеха бурения.

Применение геохимической разведки в Узбекистане началось в советский период, особенно в 60-70-е годы XX века, когда проводились широкомасштабные поисковые работы. В то время геохимики проводили отбор проб газа из почвы, исследования битума и картирование микрофильтрации, чтобы помочь в разграничении нефтяных объектов. Эти работы способствовали открытиям в Бухаро-Хивинском регионе, где геохимические аномалии часто совпадали со структурными ловушками, подтвержденными последующими сейсмическими исследованиями [1].

В период после обретения независимости в нефтегазовой отрасли Узбекистана были проведены реформы по привлечению иностранных инвестиций и освоению передовых технологий. Совместные предприятия с российскими, китайскими и западными компаниями способствовали внедрению современных геохимических лабораторий и полевой техники. Например, в последние годы в Ферганской долине для дифференциации биогенных и термогенных газов используются изотопный и биомаркерный анализы [9]. Аналогичным образом, наземные геохимические исследования на плато Устюрт помогли снизить неопределенность при определении



перспективных зон для природного газа, который является важным ресурсом для внутреннего потребления и экспорта.

**Материалы и методы исследования.** Научная литература по геохимическим методам поиска углеводородов значительно развилась за последние пятьдесят лет. Первоначальные исследования в 1960-х и 1970-х годах были в основном экспериментальными, направленными на доказательство связи выявленных углеводородных микронаносов с подземными залежами. К 1980-м годам геохимические поиски стали официальной наукой, подтвержденной прикладными исследованиями, которые показывают прогностическую ценность приземных аномалий.

В Северной Америке исследования, проведенные Джонсом и Дроздом (1983), заложили основу прогностической геохимии в нефтеразведке. Их работы подтвердили, что углеводороды движутся вертикально и латерально через микротрещины, вызывая измеряемые аномалии в почвенных газах, растениях и популяциях микробов. Последующие достижения были сосредоточены на усовершенствовании аналитических методов, таких как газовая хроматография и масс-спектрометрия стабильных изотопов (Horwitz, 1985). В последние десятилетия исследователи Геологической службы США (USGS) повысили точность прогнозов нефтяной системы, комбинируя геохимию с бассейновым моделированием.

Российские и советские геохимические исследования относятся к числу исторически наиболее обширных благодаря масштабам разведочных работ, проводимых в основном в Волго-Уральском, Каспийском и Западно-Сибирском бассейнах. Советские геохимики разработали стандартизированные методы почвенно-газовых исследований, которые стали неотъемлемой частью многопрофильных поисковых мероприятий [10].

С 1990-х годов геохимическая разведочная литература в Китае стремительно расширяется, отражая стремление страны обеспечить себя энергоресурсами. Такие исследователи, как Li et al. (2017), предоставляют информацию о передовых сетях отбора проб почвы, используемых в таких бассейнах, как Ордос и Тарим, изучении окисления микробных углеводородов и разработке методов отбора биомаркеров.

Канадские и европейские исследования предоставляют дополнительную информацию. В Канаде наземные геохимические методы применяются в морских и арктических районах, где сейсмическое описание затруднено.

Литература по геохимической разведке в Узбекистане меньше, чем в Северной Америке, России или Китае, но отражает устойчивое развитие научной мысли и практики. В период бывшего Советского Союза ученые-геологи Узбекистана внесли свой вклад в региональные поисковые работы, сочетающие в себе геофизические, геологические и геохимические методы. Работа в этом направлении отражена в изданиях Академии наук Узбекистана и государственных поисковых организаций.

Абдуллаев (1989) был одним из первых узбекских исследователей, систематизировавших результаты геохимических поисков в Бухаро-Хивинском бассейне. В его работах, особенно для газовых месторождений, была выявлена связь между поверхностными аномалиями и продуктивными горизонтами. В дальнейшем узбекские исследователи расширили эту работу на сложный по строению бассейн Ферганской долины, где геохимические методы дали ценные сведения о районах, где сейсмическое описание затруднено тектоническим обвалом [7].

Геохимические методы разведки нефти и газа значительно диверсифицированы, особенно на технологически передовых рынках разведки. В зарубежной практике эти методы условно можно разделить на методы отбора проб с поверхности, подземного геохимического каротажа и лабораторного анализа. Каждая методическая система предоставляет уникальное представление о нефтяной системе.

Наземные геохимические исследования являются наиболее распространенным методологическим подходом в глобальных разведочных работах. Эти исследования предназначены для выявления углеводородных микросбросов, мигрирующих из подземных скоплений в приповерхностную среду. Согласно Джонсу и Дрозду (1983), углеводороды мигрируют через трещины, разломы и проницаемую литологию, в конечном итоге накапливаясь в почвах, осадках и даже растениях.

Полевые методы часто включают отбор проб почвенного газа в сетчатом диапазоне от 200 до 500 метров. Образцы берут с помощью стальных зондов с глубины 1-3 м, помещают в газонепроницаемые емкости и доставляют в лаборатории. Аналитическое внимание уделяется метану (C<sub>1</sub>) через газы бутана (C<sub>4</sub>), а также тяжелые углеводороды. В современной практике передвижные газовые хроматографы иногда используются непосредственно в полевых условиях для быстрого скрининга [5].

В России и Китае вертикальные профили грунтов и отложений иногда строятся через неглубокие скважины глубиной до 50 метров. Эти вертикальные профили позволяют исследователям различать реальные утечки углеводородов, связанные с приповерхностным загрязнением и подземными скоплениями [10].

Лабораторный компонент занимает центральное место в геологоразведочных работах. В мировом масштабе преобладают три аналитических подхода:

1. Газовая хроматография (ГХ) - используется для разделения и количественной оценки фракций углеводородов от C<sub>1</sub> до C<sub>5</sub> и далее.

2. Анализ стабильных изотопов - в частности, изотопов углерода и водорода для различения термогенных и биогенных газов.

3. Биомаркеры и молекулярная геохимия - методы, впервые разработанные в западных лабораториях, основанные на обнаружении

молекулярных ископаемых (стеранов, гопанов, терпанов) для связывания наземных образцов с исходными породами и нефтью.

Методологическая практика геологоразведочных работ в Узбекистане отражает как традиции советского периода, так и процессы последней модернизации. Хотя используется множество методов одного типа, их применение и сложность различаются в зависимости от наличия ресурсов и институциональной поддержки.

В период после обретения независимости Узбекистан стремился к модернизации своей методологической базы. Сотрудничество с зарубежными компаниями привело к внедрению новой техники, особенно в Ферганском бассейне и на плато Устюрт. Текущие практики включают:

- ✓ Газовые исследования неглубоких почв с улучшенной плотностью отбора проб (в пределах 200-300 м), что позволяет более детально картировать аномалии.

- ✓ Изотопная характеристика метана и более высоких углеводородов различает биогенное и термогенное происхождение [9].

- ✓ Для интеграции с сейсмическими данными, особенно в Устюртском регионе, геохимические аномалии накладываются друг на друга на структурных картах для приоритета целей бурения.

Методологическое сравнение зарубежной и узбекской практики показывает ряд противоречий: В зарубежных исследованиях часто используются высокоплотные пробоотборные сети (100-200 м), в то время как в Узбекистане из-за логистических и финансовых ограничений исторически использовались на более широком расстоянии. Передовые лабораторные методы, такие как биомаркеры и CSIA, широко распространены за рубежом, но остаются ограниченными в Узбекистане. В мировой практике особое внимание уделяется интеграции геохимии с сейсмическим и бассейновым моделированием, в то время как в Узбекистане такие многопрофильные рабочие процессы только начинают приниматься.

Несмотря на это, геохимические методы Узбекистана становятся все более современными. Хотя полевые протоколы сохранились с советских времен, они адаптируются к современным требованиям, и обновление лабораторий продолжается. Внедряя передовой мировой опыт, Узбекистан может значительно повысить эффективность поиска и снизить риск неудачных буровых кампаний.

**Результаты исследования.** Геохимические методы разведки широко используются в различных геологических условиях по всему миру, и накопленные результаты указывают на преимущества и ограничения этих подходов. В Северной Америке, особенно в США и Канаде, геохимические поисковые работы в осадочных бассейнах дали значительные результаты. Почвенно-газовые исследования, проведенные в бассейне Виллистона (США), позволили выявить аномалии микропросачивания углеводородов,

связанные с продуктивными месторождениями нефти. Аналогичным образом, канадские исследования в Западно-Канадском осадочном бассейне показали, что наземные геохимические исследования, разделяя продуктивные и непродуктивные структуры, могут снизить риск бурения до 30%. Эти результаты, в сочетании с геофизическими и геологическими данными, определили достоверность геохимических показателей.

В бывшем Советском Союзе, в частности в России, геохимические методы систематически применялись в крупных осадочных бассейнах, таких как Западно-Сибирский бассейн. Широкое использование углеводородного анализа почв, геохимии микроэлементов и микробиологических исследований обеспечило высокую точность аномального картирования. Российские результаты показали, что геохимическими методами можно обнаружить ореолы углеводородов, простирающиеся на 100-500 метров от границ пласта, что способствует более точному определению ловушек нефти и газа [11]. Эти результаты остаются одним из самых подробных наборов геохимических данных, доступных в мире.

В Китае геохимические методы применялись в сложных геологических рельефах, таких как Таримский бассейн и Ордосский бассейн.

В Узбекистане результаты геохимических методов ограничены по сравнению с глобальными применениями, но с 1960-х годов были достигнуты значительные успехи. Бухаро-Хивинский регион остается одним из наиболее изученных для геологоразведочных работ. Здесь наземные углеводородные геохимические исследования выявили аномальные зоны, соответствующие продуктивным коллекторам, таким как газовое месторождение Газли. Исторические данные показывают, что аномалии высоких концентраций метана и углеводородов в почвах были сильно связаны с газоносными горизонтами, встречающимися при бурении [2].

На плато Устюрт геохимические методы применялись в сочетании с гравиметрическими и сейсмическими исследованиями. Результаты показали наличие диффузных аномалий углеводородов над известными месторождениями, такими как Каракудук и Арал.

Сложность геологических структур в Ферганской долине создавала трудности при проведении поисковых работ. Тем не менее, геохимические исследования, направленные на изучение газовых аномалий в почве и концентрации углеводородов в подземных водах, выявили перспективные закономерности.

**Обсуждение результатов.** Международное применение геохимических методов в поиске нефти и газа показывает, что наземная и подземная геохимия являются важным инструментом современных поисковых работ на нефть. Геохимические исследования в таких регионах, как Северная Америка, Россия, Китай и Европа, доказали свою эффективность в снижении разведочного риска, оптимизации буровых кампаний и предоставлении предварительной информации о подземных углеводородных системах.

Основными результатами зарубежных исследований являются:

Газовые аномалии в почве, микропросачивание углеводородов и биомаркерные анализы дают достоверные показатели накопления углеводородов. Исследования в бассейне Уиллистона, Западно-канадском осадочном бассейне и бассейне Тарима показывают прямую связь между приповерхностными геохимическими аномалиями и продуктивными водохранилищами.

Геохимия наиболее эффективна в сочетании с сейсмическими исследованиями, дистанционным зондированием и структурным моделированием. Многоотраслевые подходы, особенно в сложных или пограничных бассейнах, повышают точность определения водохранилищ.

Аналитическая сложность, включающая газовую хроматографию, стабильный изотопный анализ, профилирование биомаркеров и специфический для соединения изотопный анализ (CSIA), значительно повышает надежность геохимических прогнозов. Эти методы позволяют различать биогенные и термогенные углеводороды, картировать пути миграции и связывать их с породами-источниками.

Геохимические методы снижают воздействие на окружающую среду и затраты по сравнению с масштабными сейсмическими исследованиями и разведочным бурением. Исследования Северного моря показывают, как геохимия морского дна может управлять поисковыми работами в процессе наблюдения за естественной фильтрацией, подчеркивая двустороннее значение геохимии как для поисков, так и для управления окружающей средой [6].

В заключение, международный опыт подтверждает, что геологоразведочные работы являются не дополнительным инструментом, а **за**основным компонентом поисков современных углеводородов, особенно в районах со сложной геологией или высокой чувствительностью к окружающей среде.

В Узбекистане геохимические методы были успешно применены в таких регионах, как Бухара-Хива, плато Устюрт, Ферганская долина, и были получены практические данные для поиска нефтяных месторождений. Основные выводы включают:

В результате геохимических исследований углеводородов метана и выше успешно выявлены продуктивные зоны. Например, в Бухаро-Хивинском регионе аномальные концентрации углеводородов совпадали с газовыми залежами, что подтверждает прогнозную ценность геохимии [2].

Сочетание геохимических результатов с сейсмическими и гравиметрическими данными на плато Устюрт и в Ферганской долине улучшило структурные интерпретации и целевую ориентацию бурения, снизило риск сухих скважин.

Предварительные биогеохимические исследования, такие как анализ накопления углеводородов в местном растительном покрове, показывают возможность применения недорогих, экологически чистых методов скрининга для отдаленных районов.



Геохимические исследования Узбекистана могут быть значительно улучшены, если:

- ✓ Освоение передового международного опыта по получению полевых образцов высокой плотности, изотопному анализу и профилированию биомаркеров.

- ✓ Укрепление мощности лаборатории и модернизация оборудования.

- ✓ Усиление интеграции геохимических, геофизических и геологических данных.

- ✓ Поощрение сотрудничества с международными институтами по обмену обучением и исследованиями.

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## **ЭВОЛЮЦИОННАЯ ЭПИСТЕМОЛОГИЯ КАК МЕТОДОЛОГИЧЕСКАЯ МОДЕЛЬ РАЗВИТИЯ НАУЧНОГО ЗНАНИЯ**

**Аннотация:** В статье анализируется концепция эволюционной эпистемологии и её методологическая сущность и подчеркивается методологическая значимость эволюционной эпистемологии в формировании, проверке и оптимизации научных теорий, а также показано, что она может служить стратегическим инструментом для современных научных исследований и инновационных методов.

**Ключевые слова:** эволюционная эпистемология; процесс познания; принцип отбора; методологический подход; научная теория; междисциплинарные исследования; научная методология

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## **EVOLUTIONARY EPISTEMOLOGY AS A METHODOLOGICAL MODEL FOR THE DEVELOPMENT OF SCIENTIFIC KNOWLEDGE**

**Abstract:** This article analyzes the concept of evolutionary epistemology and its methodological essence. It emphasizes the methodological significance of evolutionary epistemology in the formation, testing, and optimization of scientific theories. It also demonstrates that it can serve as a strategic tool for modern scientific research and innovative methods.

**Keywords:** evolutionary epistemology; cognitive process; selection principle; methodological approach; scientific theory; interdisciplinary research; scientific methodology

**Введение.** Проблема знания — одна из наиболее устойчивых и теоретически насыщенных проблем философии. Начиная с античной традиции и вплоть до аналитической философии XX века, эпистемология стремилась определить условия возможности истины, критерии обоснования и границы познания. Однако во второй половине XX века формируется новая исследовательская перспектива — эволюционная

эпистемология, связанная прежде всего с работами Карл Поппер и Дональд Т. Кэмпбелл.

Человеческое знание и механизм его развития оказываются неразрывно связанными не только с философией, но и с биологией, психологией и когнитивными науками. В условиях стремительного развития науки XXI века особую актуальность приобретают вопросы происхождения, формирования и достоверности знания. Эволюционная эпистемология интерпретирует знание как адаптивный механизм, формирующийся в процессе биологической и культурной эволюции<sup>1</sup>.

Согласно этому подходу, когнитивные способности человека являются продуктом естественного отбора и исторического развития. В отличие от классических моделей, рассматривавших знание как систему априорных или неизменных истин, эволюционная перспектива понимает его как динамическую, открытую для критики и трансформации структуру<sup>2</sup>.

Таким образом, знание предстает не только логической конструкцией, но и биокогнитивным, социокультурным и историческим процессом. Его достоверность определяется не абсолютной гарантией истинности, а способностью выдерживать процедуры отбора, проверки и практической апробации.

**Методы.** Методологической основой исследования выступает теоретико-аналитический подход, сочетающий систематический обзор литературы и сравнительный философский анализ.

1. Систематический обзор литературы. Проанализированы классические работы по эволюционной эпистемологии<sup>34</sup>, а также системная теория регуляции Уильям Росс Эшби, разработанная совместно с Роджер Конант<sup>5</sup>.

2. Сравнительный метод. Сопоставлены положения традиционной (классической) эпистемологии и эволюционной модели познания с целью выявления различий между статическим и динамическим пониманием знания.

3. Аналитический и историко-философский подход. Рассмотрены этапы становления эволюционной эпистемологии в контексте философии науки XX века, особенно в рамках критического рационализма.

В качестве эвристической модели использованы принципы биологической эволюции — вариация, отбор и сохранение. Процесс научного развития интерпретируется как аналог селекции: теории выступают в роли «вариантов», подвергаемых проверке; неэффективные гипотезы устраняются, а продуктивные закрепляются в научной практике<sup>2</sup>.

**Результаты.** Анализ показал, что эволюционная эпистемология обладает следующими методологическими характеристиками: *Динамичность познания.* Знание не является статичной структурой; оно формируется через постоянную критику и эмпирическую проверку<sup>2</sup>. Новые данные функционируют как механизм корректировки теоретических конструкций; *Принцип селекции.* Развитие науки носит селективный

характер: гипотезы конкурируют между собой, а их жизнеспособность определяется степенью объяснительной силы и устойчивости к фальсификации<sup>1</sup>; *Адаптивность знания*. Научные теории адаптируются к изменяющимся условиям познавательной и социальной среды. Эффективность знания определяется его регулятивной способностью, что коррелирует с принципом необходимого разнообразия систем<sup>5</sup>; *Междисциплинарность*. Эволюционная эпистемология демонстрирует высокую эвристическую продуктивность в биологии, когнитивных науках, социологии и исследованиях искусственного интеллекта. Полученные результаты подтверждают, что данный подход может рассматриваться как методологическая модель оптимизации научных теорий.

**Обсуждение.** Философская значимость эволюционной эпистемологии проявляется в нескольких измерениях:

Во-первых, она радикализирует попперовский принцип фальсификации, переводя его из логико-методологической плоскости в онтогенетическую и культурно-эволюционную перспективу<sup>2</sup>. Научная теория оказывается не завершённой конструкцией, а временной адаптивной стратегией.

Во-вторых, знание осмысливается как процесс исторической селекции когнитивных структур. Это сближает эпистемологию с философией биологии и социальной теорией, формируя интегративную модель развития науки.

В-третьих, эволюционная модель усиливает эмпирическую направленность философии знания, поскольку проверка гипотез становится аналогом адаптивной апробации в среде.

Однако выявлены и критические аспекты. Постоянная изменчивость теорий ставит вопрос о стабильности научной истины. Кроме того, аналогия с биологической эволюцией не всегда обладает строгой эмпирической операционализацией. Тем не менее, даже в рамках критики эволюционная эпистемология демонстрирует высокую объяснительную мощь.

**Заключение.** Эволюционная эпистемология представляет собой философско-методологическую концепцию, объясняющую развитие знания через принципы вариации, отбора и адаптации. Исследование показало, что знание формируется как динамическая система, способная к самокоррекции и оптимизации. Доказано, что эволюционная эпистемология имеет стратегическое значение не только для теории познания, но и для современной научной методологии. Она позволяет переосмыслить научный прогресс как процесс исторической селекции когнитивных структур и тем самым расширяет горизонты философского анализа науки.

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## **ГИДРОЭКОЛОГИЧЕСКАЯ ОЦЕНКА КАЧЕСТВА ВОД ОЗЁР СУДОЧЬЕ И ЖИЛТЫРБАС ЮЖНОГО ПРИАРАЛЬЯ**

**Аннотация:** В статье рассматриваются гидроэкологические особенности озёр Судочье и Жилтырбас, расположенных в Южном Приаралье. Проведён анализ гидрохимического режима и факторов, влияющих на формирование качества воды. Особое внимание уделено влиянию коллекторно-дренажных вод и антропогенных нагрузок на состояние водных экосистем. На основе гидрохимических показателей предложены рекомендации по совершенствованию системы гидроэкологического мониторинга и рациональному использованию водных ресурсов региона.

**Ключевые слова:** гидроэкология, гидрохимический режим, озёра Судочье и Жилтырбас, Южное Приаралье, минерализация воды, коллекторно-дренажные воды, мониторинг.

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## **HYDROECOLOGICAL ASSESSMENT OF WATER QUALITY OF SUDOCHYE AND ZHYLTYRBAS LAKES IN THE SOUTHERN ARAL SEA REGION**

**Abstract:** The article examines the hydroecological characteristics of Sudoche and Zhylytyrbas lakes located in the Southern Aral Sea region. The hydrochemical regime and the main factors affecting water quality formation are analyzed. Particular attention is paid to the influence of collector-drainage waters and anthropogenic impacts on aquatic ecosystems. Based on hydrochemical indicators, recommendations are proposed for improving the hydroecological monitoring system and rational water resource management in the region.

**Key words:** hydroecology, hydrochemical regime, Sudoche Lake, Zhylytyrbas Lake, Southern Aral Sea region, mineralization, monitoring.

## **Введение**

В последние десятилетия экологическая ситуация в бассейне Аральского моря значительно ухудшилась. Одним из наиболее уязвимых регионов является территория Южного Приаралья, где наблюдаются значительные изменения гидрологического режима и качества водных ресурсов.

Особый интерес представляют озёра Судочье и Жилтырбас, являющиеся важными элементами водных экосистем дельты Амударьи. Эти озёра выполняют ряд экологических функций: поддержание биологического разнообразия, регулирование гидрологического режима дельты, формирование водно-болотных экосистем, обеспечение условий для миграции водоплавающих птиц.

Однако интенсивное развитие орошаемого земледелия и поступление коллекторно-дренажных вод привели к изменению гидрохимического состава воды и увеличению уровня минерализации.

**Целью** исследования является гидроэкологическая оценка качества вод озёр Судочье и Жилтырбас на основе анализа гидрохимических показателей. Для достижения поставленной цели были поставлены следующие задачи: изучить гидрохимический режим вод озёр; определить уровень минерализации воды; выявить влияние коллекторно-дренажных вод на состояние озёр; оценить антропогенные факторы загрязнения; разработать рекомендации по улучшению гидроэкологического состояния озёр.

**Материалы и методы исследования** В качестве исходных материалов использованы: данные гидрохимических наблюдений; результаты полевых исследований; материалы научных публикаций; статистические данные водохозяйственных организаций. Для оценки качества воды применялись следующие методы: гидрохимический анализ; сравнительный анализ многолетних наблюдений; метод интегральной оценки качества воды; гидроэкологический мониторинг водных экосистем.

Состояние изучения гидрохимического режима поверхностных вод бассейна Аральского моря и их качества неоднократно изучались многими исследователями. До 1970 г. основная информация по гидрохимии речных вод в бассейне Аральского моря публиковалась в сериях Гидрохимических ежегодников. С 1938 г. в них регулярно помещаются сведения по химическому составу этих вод (более ранние данные имеют отрывочный характер). С 1975 г. в связи с увеличением числа определяемых химических элементов (на отбираемых постах) эти данные стали публиковаться в Гидрохимических бюллетенях. К сожалению, более или менее налаженный механизм их обмена и другой гидрологической информации прекратились после распада Советского Союза и установления новых правительств в Центральной Азии (некоторый обмен продолжал осуществляться только между специалистами). С этих пор стало очень трудно обеспечивать объективную оценку качества поверхностных вод этого региона даже по различным речным бассейнам.



В связи с этим, стало очень важным объективно оценивать всю гидрохимическую информацию с учетом существующих стандартных методов.

Исследования гидрохимии поверхностных вод в бассейне Аральского моря продолжают сокращаться, особенно в Киргизии, Таджикистане и Туркменистане и некоторых регионах Казахстана и Узбекистана.

Согласно опытным оценкам, ежегодный объем водных ресурсов бассейна Аральского моря (минерализация воды Аральского моря была от 9-10 г/л до 115-120 г/л за 1960-2017 гг.) составляет приблизительно 120 км<sup>3</sup>. Ежегодный объем современного стока коллекторно-дренажных вод, который отчетливо ухудшает гидроэкологию территории, составляет 33-35 км<sup>3</sup>, что составляет 30 % от всех возобновляемых водных ресурсов бассейна. В бассейне Амударьи, включающий зоны Каракумского канала вместе с Мургабским и Тедженским ирригационным районом, объем коллекторных вод составляет 21-22 км<sup>3</sup> со средней минерализацией от 1,8 до 14,2 г/л. В бассейне Сырдарьи они включают в себя 13-14 км<sup>3</sup>, со средней минерализацией от 1,7 до 6,0 г/л. Речные воды и, особенно коллекторно-дренажные воды региона, сильно загрязнены.

Анализ данных гидрохимических бюллетеней за последние годы с результатами собственных измерений показал, что воды содержат пестициды, тяжелые металлы (кадмий, стронций и другие), нефтепродукты, фенолы и другие токсические элементы. Очень тревожная гидрохимическая ситуация складывается вблизи Аральского моря и на территории Южного Приаралья.

Для практических решений отмеченных проблем требуется выполнение работ по следующим основным направлениям:

- развитие научной базы исследований по всем аспектам качества воды и охраны водных ресурсов;
- принятие законов и административных документов по охране воды и улучшению их качества;
- выполнение различных инженерных, технологических и других мер по перечисленным проблемам.

Основные условия для успешного выполнения рекомендаций по гидрохимическим исследованиям следующие:

- строгое выполнение закона «О воде и водопользовании», который был принят в Узбекистане и принятие подобных законов другими правительствами региона;
- создание сети всестороннего мониторинга со своевременным сообщением изменений качества воды и с оценкой и принятия мер по ликвидации негативных процессов;
- создание водоохраных зон вдоль берегов и буферных полос для удобства управления водой для целей охраны против загрязнений речных вод и деградации земель.

Гидрохимический режим озёр Южного Приаралья формируется под влиянием нескольких факторов: приток вод из Амударьи поступление

коллекторно-дренажных вод климатические условия региона процессы испарения и минерализации так как, значительное влияние оказывает поступление коллекторно-дренажных вод сельскохозяйственных территорий.

В таблице-1 приведены гидрохимические показатели воды озёр Судочье и Жилтырбас

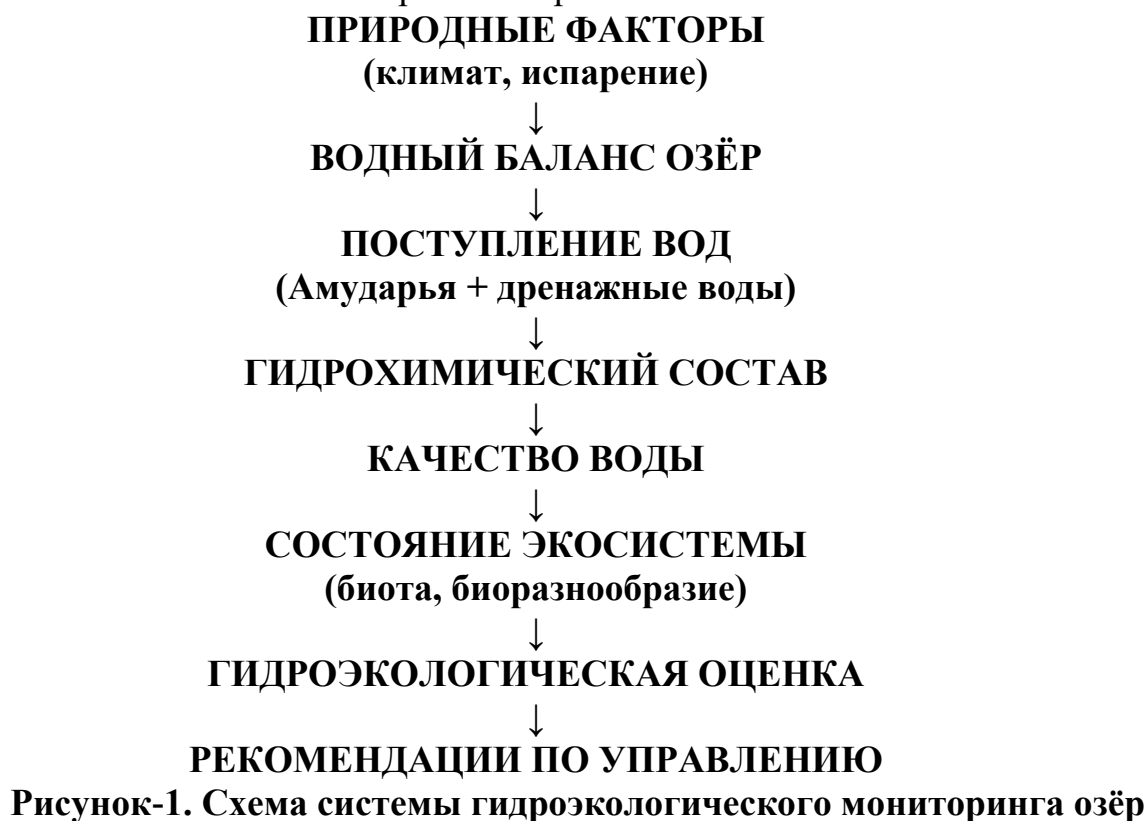
**Таблица 1.**

**Основные гидрохимические показатели воды озёр  
Судочье и Жилтырбас**

| Показатель             | Судочье | Жилтырбас | ПДК     |
|------------------------|---------|-----------|---------|
| Минерализация (г/л)    | 6.2     | 7.4       | до 1    |
| pH                     | 7.6     | 7.8       | 6.5–8.5 |
| Хлориды (мг/л)         | 920     | 1050      | 350     |
| Сульфаты (мг/л)        | 780     | 860       | 500     |
| Нитраты (мг/л)         | 38      | 42        | 45      |
| Нефтепродукты (мг/л)   | 0.08    | 0.09      | 0.05    |
| Тяжёлые металлы (мг/л) | следы   | следы     | —       |

Анализ данных показывает, что уровень минерализации воды значительно превышает нормативные значения, что связано с поступлением солей из коллекторно-дренажных вод.

**Схема гидроэкологического мониторинга** Рис.1. Схема системы гидроэкологического мониторинга озёр



Такая схема позволяет комплексно оценивать изменения водных экосистем и прогнозировать их развитие. Основные экологические проблемы озёр

Исследования показали, что основными проблемами являются: увеличение минерализации воды; поступление загрязняющих веществ; деградация водно-болотных экосистем; снижение биологического разнообразия.

Наиболее серьёзные изменения наблюдаются в периоды уменьшения притока пресной воды. Для улучшения гидроэкологического состояния озёр предлагается: совершенствовать систему гидроэкологического мониторинга; регулировать поступление коллекторно-дренажных вод; создавать водоохранные зоны вокруг озёр; внедрять водосберегающие технологии в сельском хозяйстве; развивать международное сотрудничество по охране водных ресурсов бассейна Аральского моря.

**Заключение** Проведённые исследования показали, что гидроэкологическое состояние озёр Судочье и Жилтырбас в значительной степени зависит от антропогенных факторов, прежде всего от поступления коллекторно-дренажных вод.

Повышенная минерализация воды и наличие загрязняющих веществ оказывают негативное влияние на водные экосистемы региона. Для обеспечения устойчивого функционирования озёр необходимо совершенствовать систему гидроэкологического мониторинга и внедрять комплексные меры по охране водных ресурсов.

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## МЕТОДЫ ОПРЕДЕЛЕНИЯ СОДЕРЖАНИЯ $^{222}\text{Rn}$ В ПРИРОДНЫХ ВОДАХ

**Аннотация:** В статье рассматриваются особенности определения содержания радона -  $^{222}(\text{Rn})$  в природных и питьевых водах с применением сцинтилляционного метода анализа.

В работе описаны физические основы сцинтилляционного метода, принципы регистрации гамма-излучения радона и его дочерних продуктов распада, а также особенности пробоотбора и подготовки образцов воды.

Приведён анализ чувствительности метода, его метрологических характеристик и сравнительная оценка с альтернативными способами определения радона.

Полученные результаты могут быть использованы при экологическом контроле, санитарно-гигиенической оценке качества воды и разработке мероприятий по снижению радиационных рисков.

**Ключевые слова:** Радон-222; сцинтилляционный метод; радиационный контроль; природные воды; гамма-излучение; дочерние продукты распада; радиационная безопасность; мониторинг окружающей среды; удельная активность; пробоотбор воды.

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## METHODS FOR DETERMINING $^{222}\text{Rn}$ CONTENT IN NATURAL WATERS

**Abstract:** This article examines the specifics of determining radon-222 ( $^{222}\text{Rn}$ ) levels in natural and drinking water using scintillation analysis. This paper describes the physical principles of the scintillation method, the principles of recording gamma radiation from radon and its progeny, as well as the specifics of water sampling and sample preparation. An analysis of the method's sensitivity, its metrological characteristics, and a comparative assessment with alternative radon detection methods are provided. The scintillation method has been shown to provide highly accurate, rapid, and reliable measurements for monitoring the radiation

*safety of water bodies. The results obtained can be used in environmental monitoring, sanitary and hygienic assessment of water quality, and the development of measures to reduce radiation risks.*

**Key words:** *Radon-222; scintillation method; radiation monitoring; natural waters; gamma radiation; decay daughter products; radiation safety; environmental monitoring; specific activity; water sampling.*

Природные воды характеризуются многообразием макро- и микроэлементного состава, в том числе радионуклидного и, в связи с ежедневным потреблением, являются существенным источником естественного радиационного облучения человека. Образцы питьевой воды могут содержать различные естественные и искусственные радионуклиды в разных концентрациях [1].

Количество лабораторий в мире, имеющих возможность определение радионуклидного состава питьевой воды, недостаточно для организации массовых анализов. Поэтому на практике в основном применяются подходы, основанные на скрининге питьевой воды в отношении ее общей альфа- и бета-активности, рекомендованные международными организациями [2]. При этом эффективная доза внутреннего облучения населения, обусловленная потреблением питьевой воды, регламентируется на уровне 0,1 мЗв/год, а суммарная альфа- и бета-активность 0,1 Бк/л и 1 Бк/л, соответственно.

В настоящей работе приведены результаты определения радиоактивности  $^{222}\text{Rn}$  в образцах природных вод методом сцинтилляционной  $\gamma$ -спектрометрии [3].

Радон является радиоактивным инертным газом природного происхождения, образующимся в цепи распада урана-238 и представляющим потенциальную радиационную опасность для здоровья человека при его накоплении в водной среде и последующем высвобождении в атмосферу помещений. Радиоактивность  $^{222}\text{Rn}$  ( $T_{1/2}=3,83\text{дн}$ ) обусловлена распадом его дочерних радионуклидов, а его материнский РН  $^{226}\text{Ra}$  имеет только один собственный  $\gamma$ -переход с  $E_\gamma=186\text{кэВ}$ .

Это обстоятельство позволяет по двум измерениям  $\gamma$ -спектра пробы воды и сопоставлений их разности со спектром эталонного источника ОМАН  $^{226}\text{Ra}$  определить удельную активность содержавшегося в пробе  $^{222}\text{Rn}$ . Действительно, положив для простоты  $t_2-t_1=T_{1/2}(^{222}\text{Rn})=3.83\text{дн}$ , где  $t_2$  и  $t_1$  начало первого и второго измерения спектра пробы (время измерения  $\Delta t \ll T_{1/2}$ ), последние можно представить в виде

$$S_1 = S(\text{Rn}) + S(\text{другие ЕРН}) + S(\text{фон}) \text{ и } F$$

$$S_2 = S(\text{Rn})/2 + S(\text{другие ЕРН}), F$$

где  $S(\text{Rn})$  и  $S(\text{другие ЕРН})$  спектры связанные распадом  $^{222}\text{Rn}$  и других долгоживущих естественных радионуклидов, а  $F$  – спектр фона. А

их удвоенная разность  $S(Rn)=2(S_1-S_2)$  соответствует спектру полного «чистого» спектра  $^{222}\text{Rn}$ , содержащегося в пробе. Сравнения интенсивности этого спектра эталонного источника  $^{226}\text{Ra}$  после вычета из последнего фонового  $F$  вклада

$$S_3(Ra)=S(E_{\gamma}=186\text{кэВ})+S_3(^{222}\text{Rn})$$

позволяет установить удельную активность  $^{222}\text{Rn}$  в пробе на момент  $t_1$  начало первого измерения [4]

$$A_{t1}(^{222}\text{Rn})=A_3S(^{222}\text{Rn}, >186\text{кэВ})/S_3(Ra, >186\text{кэВ}),$$

а затем и на момент отбора пробы.

$$A_0(^{222}\text{Rn})=A_{t1}e^{(-0.693t_1/T_{1/2})}$$

Полученные иллюстрации результатов исследования приведены на рис.1.

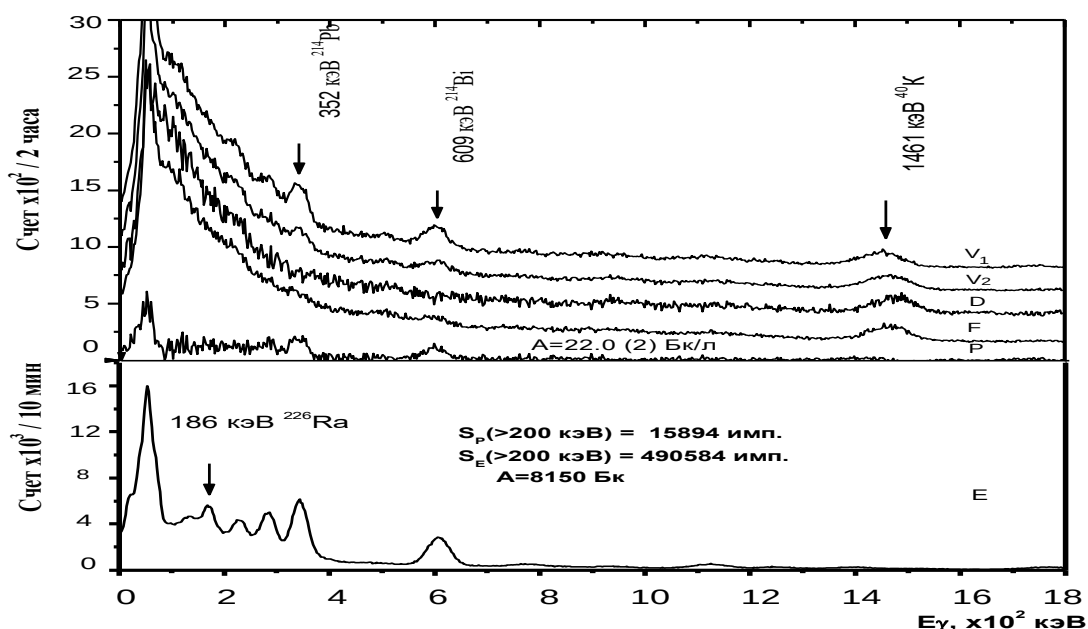


Рис 4. Сцинтилляционные спектры  $V_1(t_1)$  и  $V_2(t_2)$  пробы воды ( $t_2-t_1=3.83$ сут), «чистый» спектр  $^{222}\text{Rn}$ - $P=(V_1-V_2)$ , долгоживущих ЕРН -  $D=V_1-2P$ , -фона -  $F$ ,  $^{226}\text{Ra}$  -  $E$ .

Где,  $V_1$  и  $V_2$  -  $\gamma$ -спектры пробы воды, измеренные с интервалом 3,83 сут. (время измерения  $\Delta t=2$ час),  $P$  - «чистый» спектр  $^{222}\text{Rn}$ , спектр после распада  $^{222}\text{Rn}$  (долгоживущие ЕРН и фон),  $E$  - спектр эталонного источника  $^{226}\text{Ra}$  с вычетом спектра фона и шумов и  $F$  – спектр фона.

Таким образом видно, что даже в двухчасовых измерениях и несмотря на малую статистику, метод «чистого» спектра позволяет с приемлемой точностью определить относительно низкую удельную активность в пробе.

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## ТЕХНОГЕННЫЙ РАДИОНУКЛИД $^{137}\text{Cs}$ В ПОЧВАХ УЗБЕКИСТАНА

**Аннотация:** В работе анализируются механизмы вертикальной миграции  $^{137}\text{Cs}$  в почвах Узбекистана. Рассматриваются методы определения удельной активности радионуклида, в том числе гамма-спектрометрический анализ, приведены результаты гамма-спектрометрических исследований содержания техногенного радионуклида -  $^{137}\text{Cs}$  в почвах Узбекистана с помощью сцинтилляционным и полупроводниковым детекторами.

Определены преимущества и недостатки каждого детектора по сравнению с другим. Полученные данные имеют важное значение для радиационного мониторинга территорий, оценки экологических рисков и разработки мер по снижению миграции радионуклидов в агроэкосистемах.

**Ключевые слова:** Цезий-137; техногенные радионуклиды; почва; гамма-спектрометрия; вертикальная миграция; радиационный мониторинг; удельная активность; радиоэкология; сорбция; биологическая доступность.

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## TECHNOGENIC RADIONUCLIDE $^{137}\text{Cs}$ IN SOILS OF UZBEKISTAN

**Abstract:** This paper analyzes the mechanisms of vertical migration of  $^{137}\text{Cs}$  in the soils of Uzbekistan. Methods for determining the specific activity of the radionuclide, including gamma spectrometric analysis, are considered. The results of gamma spectrometric studies of the content of the technogenic radionuclide –  $^{137}\text{Cs}$  – in the soils of Uzbekistan using scintillation and semiconductor detectors are presented.

The advantages and disadvantages of each detector compared to the other are also indicated. The data obtained are important for radiation monitoring of territories, environmental risk assessment, and the development of measures to reduce radionuclide migration in agroecosystems.

**Keywords:** *Cesium-137; technogenic radionuclides; soil; gamma spectrometry; vertical migration; radiation monitoring; specific activity; radioecology; sorption; bioavailability.*

Известно, что в окружающей среде содержится свыше двухсот естественных (ЕРН), космогенных (КРН) и техногенных (ТРН) радионуклидов (РН), образующих  $\gamma$ -радиоактивность её объектов.

Основной вклад в возрастание естественного  $\gamma$ -фона вносят долгоживущие техногенные радионуклиды, среди которых наиболее значимым по своему токсичному воздействию на живые организмы является  $^{137}\text{Cs}$ .  $^{137}\text{Cs}$  является продуктом ядерных испытаний и аварий на атомных энергетических установках и относится к числу наиболее значимых долгоживущих радионуклидов техногенного происхождения. Его миграция и фиксация в почвенном покрове оказывают существенное влияние на радиоэкологическую обстановку и формирование дозовых нагрузок на население. Загрязняя атмосферу, почву и воду,  $^{137}\text{Cs}$  по биологическим цепочкам «почва–растение–человек» и «почва–растение–животное–человек» попадает в организм человека. Будучи биологически активными, радионуклиды  $^{137}\text{Cs}$  участвуют во всех реакциях обмена, происходящих в растениях, организмах животных и человека, и обуславливают  $\sim 40\%$  (540 мкЗв) эффективной эквивалентной дозы облучения населения Земли [1-3].

В настоящей работе приведены результаты исследования по определению содержания техногенного радионуклида  $^{137}\text{Cs}$  в почвах. Рассмотрены возможности исследования  $\gamma$ -радиоактивности проб объектов окружающей среды с помощью более доступного сцинтилляционного детектора, многократно уступающего Ge (Li) - детектору по энергетическому разрешению, но превосходящему его по эффективности регистрации  $\gamma$ -излучения.

Гамма-спектрометрическое определение активностей ЕРН в образцах почв затруднено их низким содержанием и близостью спектрального состава и интенсивностей их излучений к фоновым [4].

Нами применительно к образцам почв развит метод  $\gamma$ -спектрометрического определения содержания ЕРН в природных водах [5].

В исследованиях использовались  $\gamma$ -спектрометры на базе сцинтилляционного детектора с кристаллом NaI(Tl),  $\varnothing 63 \times 63$  мм ( $\Delta E_{\gamma}/661$  кэВ = 6,9 %), помещённых в свинцовую защиту толщиной 10 см и полупроводниковый Ge(Li) – ( $V=100\text{см}^3$ , с  $\Delta E_{\gamma}=6.2\text{кэВ}$  на  $E_{\gamma}=1332\text{кэВ}$ ,  $\varepsilon_{\text{отн}} \sim 20\%$ ). Регистрация и обработка спектров проводилась на IBM PC. Длительность измерений составляла 6 и 2 часов, соответственно.

В  $\gamma$ -спектре образца почвы фотопик 662 кэВ  $^{137}\text{Cs}$  имеет фоновую подложку, обусловленную комптоновским рассеянием жестких  $\gamma$ -лучей естественных радионуклидов ураново-ториевых рядов и  $^{40}\text{K}$ ,

содержащихся как в самих образцах и детекторах, так и в окружающих объектах. Фотопик 662 кэВ в Ge(Li) спектре разделяется полностью от близких линий, а в сцинтилляционном – только частично.

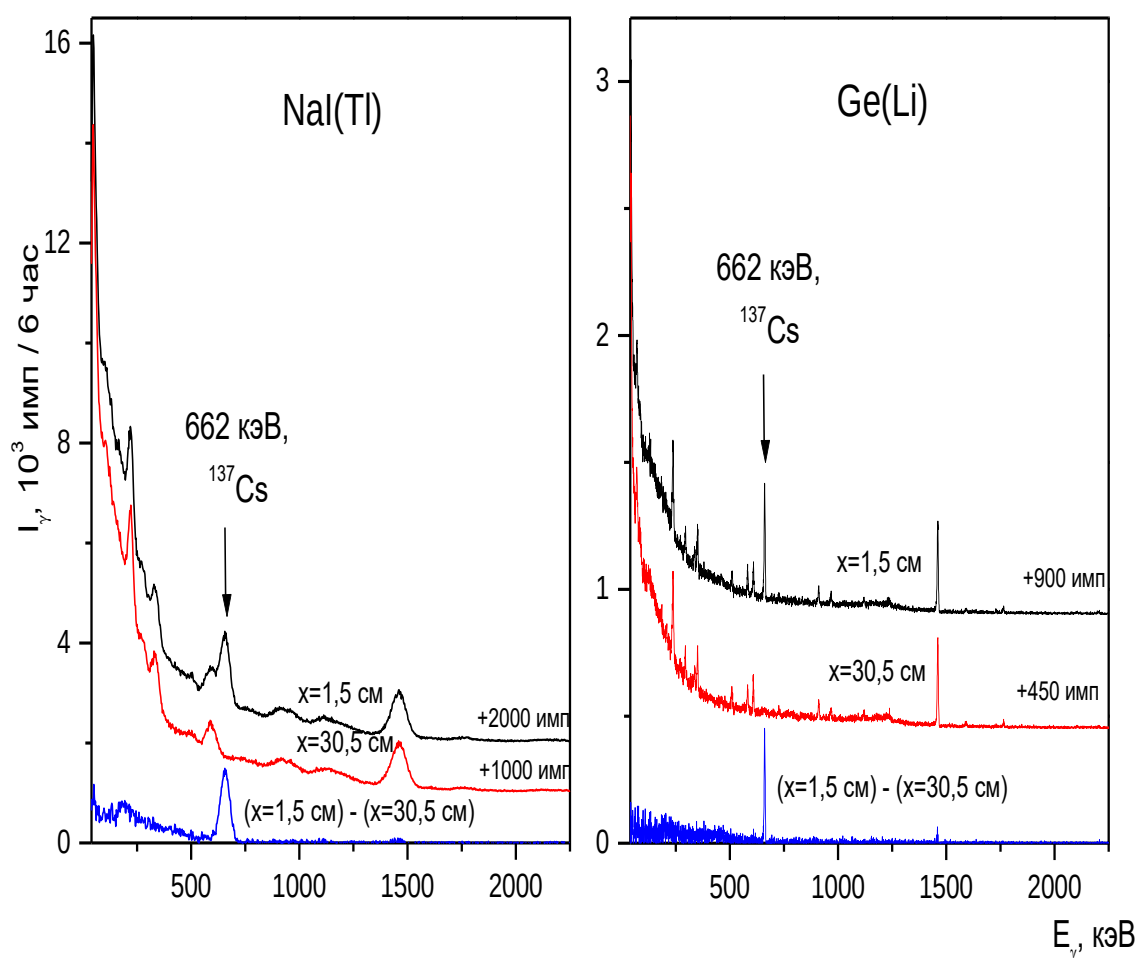


Рис.1. Сцинтилляционный и полупроводниковый  $\gamma$ -спектры образцов почвы ( $x=1,5$  см и  $x=30,5$  см) и их «чистые» спектры. спектр ( $x=1,5$  см) – спектр ( $x=30,5$  см).

Поэтому для определения площади фотопика  $S_\gamma$  в спектре необходимо учесть фоновую составляющую. Принимая во внимание, что  $^{137}\text{Cs}$  содержится только в верхних слоях почвы, а содержание естественных радионуклидов в слоях почвы в пределах глубин  $x \approx 0-50$  см изменяется незначительно, в качестве фонового спектра поверхностного образца можно принять спектр глубинного слоя, не содержащего  $^{137}\text{Cs}$ .

Результаты и корректность этой процедуры демонстрируется на рис.1. как видно, спектр поверхностного образца после вычета фонового соответствует «чистому» спектру  $^{137}\text{Cs}$ .

Таким образом, анализ полученных результатов показывает, что сцинтилляционный спектрометр обеспечивает лучшую точность определения активности  $^{137}\text{Cs}$  в образцах почвы Узбекистана по сравнению с используемым Ge (Li) – детектором.

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## **ДИНАМИКА ВЫРУЧКИ И ЗАПАС ПРОЧНОСТИ КРУПНОЙ МЕЖДУНАРОДНОЙ КОМПАНИИ**

**Аннотация.** В условиях геополитической турбулентности многие международные компании испытывают трудности, связанные с протекционизмом, ввозными пошлинами, новыми барьерами на пути движения товаров. Проблемы с продажами также возникают в связи с усилением конкурентной борьбы на отдельных рынках. В последние годы это ярко проявляется на мировом и региональных рынках электромобилей. В статье исследована динамика продаж и «запас прочности» компании Tesla – одного из лидеров отрасли. Методы исследования: регрессионный и операционный анализ. Результаты свидетельствуют: операционный риск компании в 2024-25 гг. заметно повысился. Это вынуждает менеджмент компании предпринимать усилия, в том числе направленные на пространственное перераспределение производства и реализации электромобилей.

**Ключевые слова:** объем продаж, регрессионный анализ, запас прочности, Tesla.

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## **REVENUE DYNAMICS AND MARGIN OF SAFETY OF A LARGE INTERNATIONAL COMPAN**

**Abstract.** In a context of geopolitical turbulence, many international companies are experiencing difficulties related to protectionism, import duties, and new barriers to the movement of goods. Sales challenges also arise due to increased competition in certain markets. In recent years, this has been particularly evident in the global and regional electric vehicle markets. This article examines the sales dynamics and safety margin of Tesla, one of the industry leaders. The research methods include regression and operational analysis. The results indicate that the



*company's operational risk in 2024-2025 has increased significantly. This is forcing the company's management to undertake efforts, including those aimed at spatially redistributing the production and sales of electric vehicles.*

**Keywords:** sales volume, regression analysis, margin of safety, Tesla.

Производители электромобилей функционируют на растущем, перспективном рынке, и одновременно испытывают сложности, связанные с ресурсным обеспечением, международной логистикой, конкуренцией.

Эти проблемы являются предметом анализа ряда исследователей. Так, Я.Д. Токарев исследовал показатели международной торговли электромобилями, отражающие текущее состояние рынка. Особое внимание автором уделено влиянию запасов природных ресурсов на производство электромобилей, поскольку «доступ к необходимым ресурсам, наравне с инновационными технологиями производства, определяет степень конкурентоспособности стран в данном сегменте. Я.Д. Токарев провел сравнительный анализ стран-экспортеров электромобилей, и сделал вывод об усилении конкуренции не только в сфере инновационных решений, но также и в доступе к необходимым для производства электромобилей ресурсам [3].

Л. Чжэн изучил «факторы, ограничивающие проникновение китайских электромобилей на рынок западной Европы», и выявил проблемы, связанные «с низкой узнаваемостью брендов, несоответствием европейским стандартам, высокой конкуренцией со стороны западных производителей, а также ограниченной сетью послепродажного обслуживания. Результаты исследования позволяют скорректировать «стратегии продвижения китайских электромобилей на международных рынках» [5].

Д. Хуа заметил, что «высокий уровень цифровизации экономики Китая выделяет промышленность электромобилей как основополагающую». Автор обращает особое внимание на проблемы баланса поставок и производства электромобилей, особенно в отношениях США и Китая, появления новых внешних ограничителей в поставках электромобилей [4].

Объектом исследования в данной статье стала компания Tesla – один из мировых лидеров производства электромобилей. В 2019 г. деятельность компании была убыточной. Выручка составляла 24578 млн долл., сумма убытка – 862 млн долл. (3,5% к выручке).

В 2020 г. компанией была получена первая прибыль – 690 млн долларов. В 2021 г. чистая прибыль компании (после налогообложения) составила 5,5 млрд долларов – рост в восемь раз за год. В 2022 г. показатель возрос еще в 2,2 раза.

Пик доходов компании пришелся на 2023 г.

В этой статье нами предпринята попытка выявления пятилетнего тренда развития выручки компании (рис. 1).

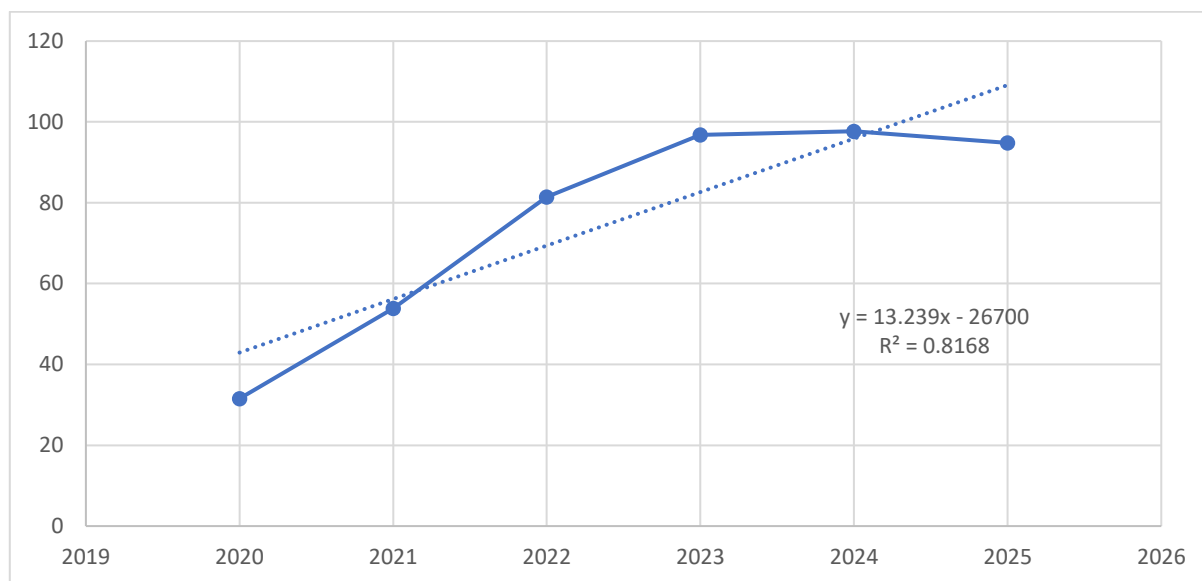


Рисунок 1. Динамика выручки Tesla (млрд долл) в 2020-25 гг.

(Источник: разработано автором по: TESLA. Годовые и квартальные отчеты компании 2020-25 гг. [Электронный ресурс]. URL:<https://ir.tesla.com/#quarterly-disclosure>)

Используя линейную зависимость, автор получил уравнение регрессии вида:

$$y = 13,239x - 26700 \quad (1)$$

Следовательно, среднегодовой прирост выручки Tesla за пять последних лет составлял 13,24 млрд долларов. Достоверность аппроксимации  $R^2$  равна 0,8168 – связь тесная.

При неизменной тенденции выручка 2025 года должна была составить 108,1 млрд долларов:

$$94,827 + 13,239 = 108,066 \quad (2)$$

Фактически в 2025 г. выручка составила 94,8 млрд долларов.

Отставание от прогнозного объема составляет 13,3 млрд долларов.

$$94,8 - 108,1 = 13,3 \quad (3)$$

Негативная по финансовым результатам тенденция наблюдается более двух лет.

Практический интерес вызывает расчет «точки безубыточности» и «запаса прочности» в деятельности компании.

При средней цене электромобиля Tesla, равной 46 тыс. долларов, и переменных затратах в 37,8 тыс. долларов, на покрытие постоянных затрат с единицы продаж остается 8,2 тыс. долларов (табл. 1).

Таблица 1 – «Точка безубыточности» компании Tesla (в натуральных показателях)

| Показатели                           | Метрика |
|--------------------------------------|---------|
| средняя цена электромобиля Tesla, \$ | 45997   |
| переменные затраты на ед., \$        | 37764   |
| сумма покрытия, \$                   | 8233    |
| коэффициент покрытия                 | 0,179   |
| порог рентабельности, единиц в год   | 1599560 |

(Источник: составлено автором)

Для полного покрытия постоянных затрат компании необходимо за год реализовать 1599560 единиц продукции. В 2025 году компания Tesla фактически произвела в общей сложности 1654667 электромобилей – на 6,7% ниже уровня 2024 года. В том числе по Model 3 и Model Y – снижение на 5% к 2024 году. По остальным моделям (S, X, Cybertruck) – снижение сразу на 43% год к году.

Запас прочности компании равен 55,1 млн. единиц продукции:

$$1654,7 - 1599,6 = 55,1 \quad (4)$$

Это составляет лишь 3,3% от фактического объема продаж.

#### *Заключение*

В 2020-23 гг. компания Tesla переживала период интенсивного роста и повышения рентабельности. В 2024 году наблюдалась стагнация, 2025 году – снижение объемов продаж. Фактический объем выручки пока превышает «порог рентабельности», но запас прочности компании невелик – чуть более трех процентов. Следовательно, операционный риск компании заметно повысился. Если негативные тенденции будут иметь продолжение, вполне вероятно возникновение «кассового» разрыва, когда полученных доходов не хватает для покрытия совокупных затрат. Топ-менеджмент компании в таких условиях должен разработать и реализовать меры, направленные на повышение эффективности использования производственных площадок (в США, КНР, Норвегии).

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## **ПОРОГ РЕНТАБЕЛЬНОСТИ ПРОИЗВОДИТЕЛЯ ЭЛЕКТРОМОБИЛЕЙ**

**Аннотация.** На растущем мировом и региональных рынках электромобилей усиливается конкурентная борьба. Проблемы с продажами возникают у многих, в том числе крупных, производителей. В статье исследован «порог рентабельности» компании Tesla – одного из лидеров отрасли. Методы исследования: CVP-анализ, операционный анализ. Результаты свидетельствуют: операционный риск компании в 2024-25 гг. заметно повысился. Это вынуждает менеджмент компании предпринимать усилия, в том числе направленные на сокращение постоянных затрат.

**Ключевые слова:** объем продаж, порог рентабельности, маржинальный доход, Tesla.

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## **ELECTRIC VEHICLE MANUFACTURER'S BREAK-EVEN POINT**

**Abstract.** Competition is intensifying in the growing global and regional electric vehicle markets. Many manufacturers, including large ones, are experiencing sales problems. This article examines the breakeven point of Tesla, one of the industry leaders. The research methods include CVP analysis and operational analysis. The results indicate that the company's operational risk has increased significantly in 2024-2025. This is forcing management to take action, including reducing fixed costs.

**Keywords:** sales volume, breakeven point, marginal income, Tesla.

В работах ряда экономистов динамика объемов производства рассматривается с позиций операционного анализа (иначе – анализ «затраты-объемы-прибыль», CVP-анализ). Так, Т.В. Логинова, И.Н. Якшилов справедливо утверждают, что «модель безубыточности», анализ соотношения

затрат, объема и прибыли (CVP – анализ) важны для принятия практических решений о производстве и продажах, величине переменных и постоянных расходов. «Такой анализ предполагает расчет точки равновесия, порога рентабельности, который соответствует объему производства и продаж, не приносящему компании ни прибыли, ни убытка» [3].

Т.П. Кривецкая детально рассмотрела «суть методик бухгалтерского управленческого учета». Она утверждает: «Маржинальный метод бухгалтерского управленческого учета является эффективным средством контроля и оперативного управления производственной деятельностью предприятий, минимизации затрат, оптимальной ценовой и ассортиментной политики. Для получения практически значимых результатов необходимо исследовать порог рентабельности, запас финансовой прочности, владеть методикой проведения CVP-анализа – это важно руководителям для выбора правильных управленческих решений в области развития бизнеса» [3].

Б.О. Казыбаев, С.Р. Абилдаханова, М.Ж. Каримолдина исследовали порог рентабельности организации с позиций снижения степени риска, за счет диверсификации, лимитирования, страхования [2].

Э.Г. Магомедова, М.Д. Мамаева рассматривали «модель оценки запаса финансовой прочности», ее основные позиции. Предмет анализа – пути повышения запаса прочности предприятия [4].

В этой статье нами предпринята попытка рассчитать «порог рентабельности» компании Tesla – одного из ведущих производителей электромобилей в мире.

Таблица 1 – «Порог рентабельности» компании Tesla  
(по результатам 2025 г.)

| Показатели                    | 2025 г., суммы в млн долл |
|-------------------------------|---------------------------|
| Выручка                       | 94827                     |
| Текущие затраты всего, в т.ч. | 91033                     |
| переменные                    | 77862                     |
| постоянные                    | 13171                     |
| Прибыль чистая                | 3794                      |
| Маржинальный доход            | 16965                     |
| Коэффициент покрытия          | 0,179                     |
| Порог рентабельности          | 73575                     |

(Источник: составлено автором по Официальный сайт Tesla [Электронный ресурс]. – URL: <https://tesla.com/> (дата обращения: 05.03.2026)

Общая сумма текущих затрат компании в 2025 г. составила 91 млрд долларов. В том числе 77,9 млрд долл. – переменные затраты, зависящие от изменения объема производства (стоимость сырья, комплектующих, электроэнергии для производства, и т.п.). Остальные 13,2 млрд долларов – это так называемые «постоянные» (или «фиксированные») затраты, не зависящие от объема производства (расходы на содержание зданий, аренда, и т.п.).

Сумма «маржинального» дохода (или «сумма покрытия») рассчитана нами как разность выручки и переменных затрат:

$$94827 - 77862 = 16965 \text{ (млн долл.)} \quad (1)$$

Следовательно, для покрытия постоянных затрат и формирования прибыли компании остается около 17 млрд долларов из 95 млрд долл. выручки.

Коэффициент покрытия («доля маржинального дохода») рассчитана как отношение маржинального дохода к выручке:

$$16965 / 94827 = 0,179 \quad (2)$$

Это важный показатель: с каждого доллара выручки компании остается 17,9 центов на покрытие постоянных затрат и получение прибыли.

Для расчета порога рентабельности (точки безубыточности, сокращенно ВЕР) следует сумму постоянных затрат разделить на коэффициент покрытия.

$$\text{ВЕР} = 13171 / 0,179 = 73575 \text{ (млн долл)} \quad (3)$$

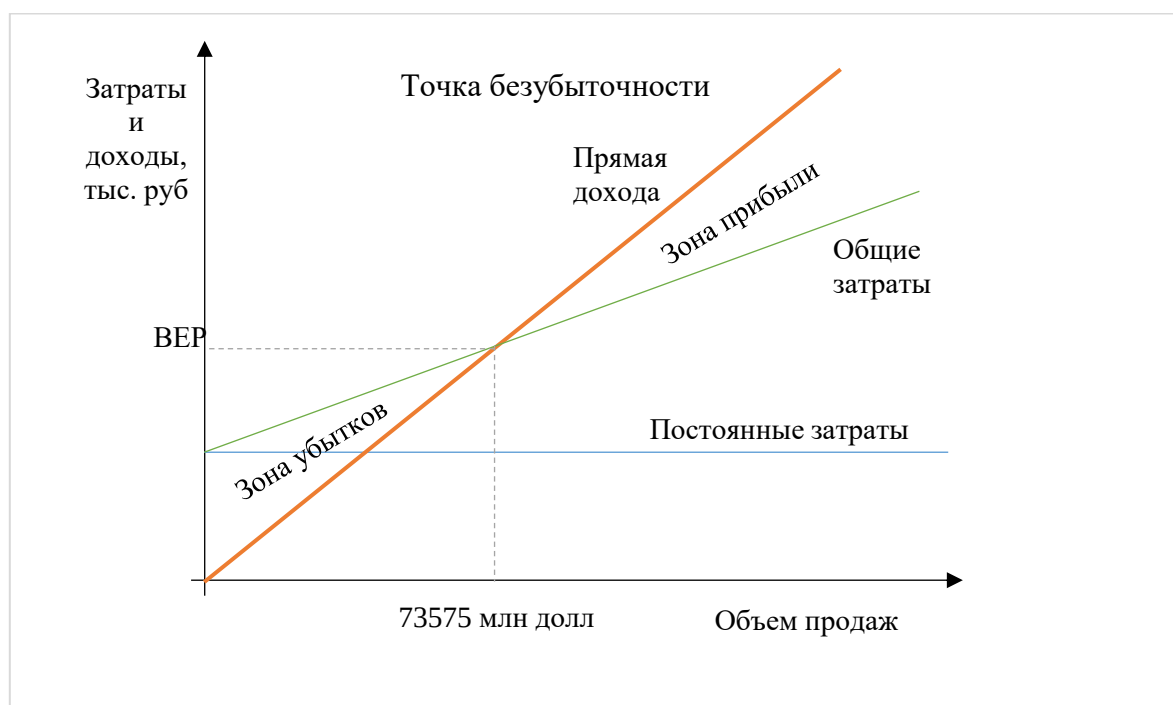


Рисунок 1. Схема «точки безубыточности» компании Tesla

Порог рентабельности — это минимальный объем продаж, необходимый для получения «нулевой» прибыли.

Проведенный анализ свидетельствует: если годовая выручка компании составит 73,58 млрд долларов, это обеспечит безубыточную работу (состояние «ни прибыли, ни убытка»).

Исторически лучшие показатели — 15,5 центов прибыли в расчете на один доллар продаж были достигнуты компанией в 2022-23 гг. Однако к началу 2026 года этот важный показатель снизился почти в четыре раза — до 4 центов. Соответственно возросла степень операционного риска компании.



### *Заключение*

Если негативная тенденция продолжится, Tesla в 2026 г. получит убыток вместо прибыли (в последний раз убытки наблюдались давно – по итогам 2019 года).

Отрицательная по доходам компании тенденция наблюдается уже более двух лет. На многих рынках компанию теснят прямые конкуренты, такие как китайский производитель электромобилей BYD. Топ-менеджменту Tesla в таких условиях необходимо предпринять действенные меры по сокращению фиксированных затрат и интенсификации продаж на новых рынках.

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## **ДИНАМИКА РЕНТАБЕЛЬНОСТИ И ОБОРАЧИВАЕМОСТИ КАПИТАЛА КРУПНОЙ МЕЖДУНАРОДНОЙ КОМПАНИИ**

**Аннотация.** Высокая турбулентность многих товарных рынков повышает риски компаний реального сектора, в том числе – кредитный риск. В таких условиях повышается роль собственных источников капитала. Автор статьи исследует динамику собственного капитала крупной компании Tesla, а также связь между рентабельностью и скоростью его оборота. Методы исследования: динамические ряды, регрессионно-корреляционный анализ. Результаты свидетельствуют: рентабельность капитала компании в 2023-25 гг. заметно снизилась. Одним из факторов этого стало замедление скорости оборота капитала.

**Ключевые слова:** капитал собственный, рентабельность, оборачиваемость, корреляция, Tesla.

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## **DYNAMICS OF PROFITABILITY AND CAPITAL TURNOVER OF A LARGE INTERNATIONAL COMPANY**

**Abstract.** High turbulence in many commodity markets increases various risks for companies in the real sector, including credit risk. In these conditions, the role of internal capital sources increases. The author of this article examines the equity dynamics of Tesla, a large company, as well as the relationship between profitability and its turnover rate. The research methods include time series and regression-correlation analysis. The results indicate that the company's return on equity has significantly declined in 2024-2025. One factor contributing to this decline is the slowdown in capital turnover..

**Keywords:** equity, profitability, turnover, correlation, Tesla.

Проблемы формирования собственного капитала компаний и эффективности его использования интересуют многих экономистов,

менеджеров. Так, О.В. Лазарева исследовала роль собственного капитала в формировании оптимальной структуры капитала организации. Она утверждает, что «на современном этапе собственный капитал носит второстепенный характер, внимание сосредоточено на имуществе и обязательствах организации, хотя именно собственный капитал является фундаментом фирмы». [4].

Г.С. Исбагиева, А. М. Асхабова исследовали «процесс формирования и применения собственного капитала экономического субъекта, актуальные методики его анализа». Авторы сосредоточили свое внимание на том, как правильно интерпретировать данные отчетности для оценки движения и использования собственного капитала предприятия, их взаимосвязь и влияние на финансовые показатели [3].

А.Е. Гуляйкина изучала возможности анализа рентабельности собственного капитала крупной сырьевой компании с использованием трехфакторной модели Дюпон, в том числе – факторного анализа влияния коэффициента рентабельности продаж, оборачиваемости активов, финансового рычага на изменение рентабельности капитала (ROE), методом цепных подстановок. На этой основе автор обосновала рекомендации по повышению эффективности использования собственного капитала компании [2].

С.Д. Аникин исследовал проблемы «построения модели оптимизации структуры капитала по критерию максимизации рентабельности собственного капитала». Автор выявил ряд недостатков методики, и предложил пути решения, на базе оценки соответствия факторам внешней среды компании [1].

В данной статье нами предпринята попытка выявления тенденций изменения рентабельности и оборачиваемости собственного капитала компании Tesla – одного из ведущих производителей электромобилей в мире.

Таблица 1. Динамика индикатора ROE компании Tesla в 2020-25 гг.

(суммы в млрд долл.)

| Годы / Показатели | Собственный капитал, всего | Чистая прибыль (убыток) | Рентабельность капитала |
|-------------------|----------------------------|-------------------------|-------------------------|
| 2025              | 82,6                       | 3,794                   | 0,046                   |
| 2024              | 73,4                       | 8,159                   | 0,111                   |
| 2023              | 63,609                     | 14,976                  | 0,235                   |
| 2022              | 45,898                     | 12,614                  | 0,275                   |
| 2021              | 31,583                     | 5,649                   | 0,179                   |
| 2020              | 23,679                     | 0,831                   | 0,035                   |
| 2025 / 2024       | 1,125                      | 0,465                   | 0,413                   |
| 2025/ 2020        | 3,488                      | 4,566                   | 1,309                   |

(Источник: рассчитано автором по [5], [6])

Собственный (акционерный) капитал Tesla за 2020-25 годы увеличился в 3,5 раза (табл. 1). Если в 2020 году он составлял 23,7, то в 2025 г. – 82,6 млрд долларов. Важную роль в приросте капитала сыграла стоимость акций компании и нераспределенная прибыль прошлых периодов.

Максимум прибыли на один доллар капитала был достигнут Tesla в 2022 году – 27,5 цента. К концу 2025 года он снизился до 4,6 цента. Акционеры компании не могут быть удовлетворены такой динамикой (рис. 1).

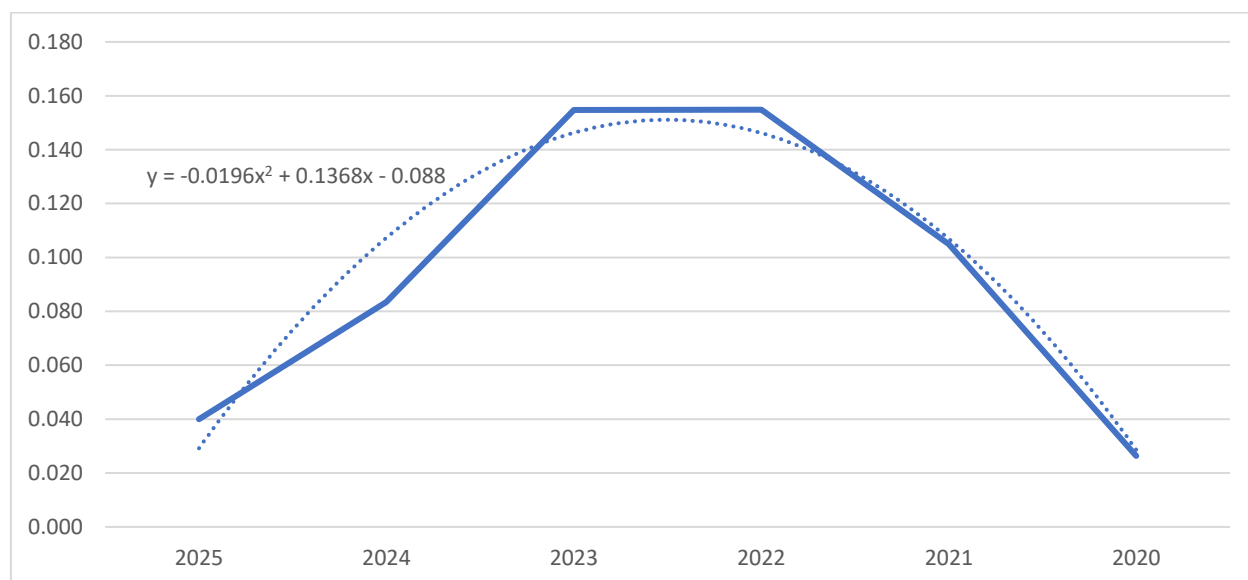


Рисунок 1. Динамика индикатора ROE компании Tesla в 2020-25 гг.  
(Источник: составлено автором)

Мы попытались применить разные функции для формализации этой тенденции (линейная, экспоненциальная, и.т.п.). Лучше всего для описания этого тренда подошла логарифмическая зависимость (самый высокий коэффициент  $R^2 = 0,9445$ ). Получено уравнение регрессии вида:

$$y = -0,0196x^2 + 0,1368x - 0,088 \quad (1)$$

Его можно использовать для целей прогнозирования, наряду с другими методами.

Наша гипотеза состояла в том, что одним из факторов изменения рентабельности капитала является скорость его оборота (табл. 2).

Таблица 2 – Скорость оборота капитала компании Tesla в 2020-25 гг.

| Годы / Показатели | Выручка | Собственный капитал, всего | Оборачиваемость капитала, оборотов за год |
|-------------------|---------|----------------------------|-------------------------------------------|
| 2025              | 94,8    | 82,6                       | 1,148                                     |
| 2024              | 97,7    | 73,4                       | 1,331                                     |
| 2023              | 96,8    | 63,6                       | 1,521                                     |
| 2022              | 81,5    | 45,9                       | 1,775                                     |
| 2021              | 53,8    | 31,6                       | 1,704                                     |
| 2020              | 31,5    | 23,7                       | 1,332                                     |
| 2025 / 2024       | 0,97    | 1,13                       | 0,863                                     |
| 2025/ 2020        | 3,01    | 3,49                       | 0,862                                     |

(Источник: рассчитано автором по [5], [6])

Лучшее значение этого показателя наблюдалось в 2022 г. – 1,775 оборота капитала за год, худшее значение в 2025 г. – 1,148 раза за год.

Один из результатов исследования состоит в определении тесноты связи между скоростью оборота капитала (факторный признак) и его рентабельностью (результативный признак). Получен коэффициент парной корреляции 0,867, следовательно – связь между ними тесная. Наша гипотеза подтверждена.

#### *Заключение*

Установлено: рентабельность собственного капитала Tesla за 2022-25 гг. снизилась в шесть раз. Для описания тенденции наиболее адекватной оказалась логарифмическая функция. Гипотеза подтверждена: одним из значимых факторов изменения результата является скорость оборота капитала.

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## СООТНОШЕНИЕ СОБСТВЕННОГО И ЗАЕМНОГО КАПИТАЛА КРУПНОЙ МЕЖДУНАРОДНОЙ КОМПАНИИ

**Аннотация.** Актуальность проблем формирования структуры капитала компаний реального сектора повышается в силу геополитической неопределенности. Операционный и кредитный риск производителей электромобилей в таких условиях повышается, это требует пристального внимания менеджеров к соотношению собственных и заемных средств. Методы исследования: динамические ряды, сравнение, средние величины. Результаты свидетельствуют: финансовое «плечо» компании Tesla в последние годы снижается, но оборачиваемость кредиторской задолженности замедляется.

**Ключевые слова:** капитал собственный, заемный; финансовое плечо, кредиторская задолженность, Tesla.

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## EQUITY TO DEBT RATIO OF A LARGE INTERNATIONAL COMPANY

**Abstract.** The importance of capital structure issues for companies in the real sector is heightened by geopolitical uncertainty. Electric vehicle manufacturers face increasing operational and credit risks, requiring managers to pay close attention to their debt-to-equity ratios. Research methods include dynamic series, comparisons, and averages. The results indicate that Tesla's leverage has been declining in recent years, but its accounts payable turnover is slowing.

**Keywords:** equity, borrowed capital; financial leverage, accounts payable, Tesla.

Проблемы соотношения собственного и заемного капитала компаний, эффективности их использования интересуют многих экономистов,



менеджеров. Так, Г.Л. Толкаченко, Н.Е. Царева исследовали структуру капитала организаций с позиций разработки механизма ее формирования. Авторы акцентировали важность этой проблемы, исходя из требований учредителей, акционеров, которые могут ограничивать развитие компании [4].

И.Т. Абдукаримов, Л.Г. Абдукаримова глубоко исследовали проблемы привлечения и эффективного использования заемного капитала, предложив методику оценки эффективности его использования. Авторы утверждают, что эффект финансового рычага (приращение собственного капитала за счет эффективного использования привлеченного капитала.) в том числе зависит от соотношения собственного и заемного капитала [1].

Т.Б. Веремеюк, В.В. Палюх обоснованно утверждают, что «оценка структуры капитала позволяет оценить ее удовлетворительность, разработать рекомендации по оптимизации. Структура капитала влияет на финансовую устойчивость организации, определяет рыночную стоимость бизнеса» [2].

В данной статье нами предпринята попытка оценки структуры пассивов компании Tesla – одного из ведущих производителей электромобилей в мире.

Таблица 1 – Динамика собственного и заемного капитала компании «Tesla» в 2020-25 г. (суммы в млрд долл.)

| Показатели  | Пассивы, всего | Собственный капитал, всего | Заемный капитал, всего | Доля заемного капитала, %% |
|-------------|----------------|----------------------------|------------------------|----------------------------|
| 2025        | 137,8          | 82,6                       | 55,2                   | 40,1                       |
| 2024        | 122,1          | 73,4                       | 48,7                   | 39,9                       |
| 2023        | 106,6          | 63,6                       | 43,0                   | 40,3                       |
| 2022        | 82,3           | 45,9                       | 36,4                   | 44,3                       |
| 2021        | 62,1           | 31,6                       | 30,5                   | 49,2                       |
| 2020        | 52,1           | 23,7                       | 28,5                   | 54,6                       |
| 2025 / 2024 | 1,129          | 1,125                      | 1,134                  | 1,005                      |
| 2025/ 2020  | 2,643          | 3,488                      | 1,939                  | 0,734                      |

(Источник: рассчитано автором по [3], [5])

Во всех пассивах компании заемные средства в 2020 г. занимали 54,6%, показатель постепенно снижался, достигнув 40,1% в 2025 г.

Общая сумма финансовых источников компании за пять последних лет увеличилась в 2,6 раза; собственный капитал – в 3,5 раза; заемный капитал – в 1,9 раза. Можно сделать вывод о том, что ускоренный рост собственных финансовых источников (в том числе акционерного капитала – за счет стоимости акций, нераспределенной прибыли прошлых лет) позволил компании осуществлять инвестиции и операционную деятельность, ограниченно привлекая кредиты и займы.

С другой стороны, улучшение коэффициента оборачиваемости дебиторской задолженности свидетельствует о том, что компания эффективно взыскивает свои долги.

Среднее время сбора дебиторской задолженности остается на уровне 13 дней, как и в предыдущие годы. Операционный цикл, включающий в себя время обработки запасов и сбора дебиторской задолженности, составил 90 дней, – медленнее, чем в 2020 г. (82).

Средний срок погашения кредиторской задолженности в 2025 году составил 92 дня, – немногим больше, чем в 2020 году (89).

Цикл конвертации денежных средств, который измеряет время, необходимое для конвертации товарных запасов в денежные средства от продаж, в 2025 году был отрицательным (два дня в среднем). Это указывает на то, что Tesla платит поставщикам быстрее, чем собирает долги и продает товарные запасы.

Представляет интерес оценка соотношения заемных и собственных средств компании в пассивах баланса (табл. 2).

Таблица 2 – Финансовое «плечо» компании «Tesla» в 2020-25 гг.

| Годы        | Финансовое плечо |
|-------------|------------------|
| 2025        | 0,668            |
| 2024        | 0,663            |
| 2023        | 0,676            |
| 2022        | 0,794            |
| 2021        | 0,967            |
| 2020        | 1,202            |
| 2025 / 2024 | 1,008            |
| 2025/ 2020  | 0,556            |

(Источник: рассчитано автором по [3], [5])

В 2020 г. этот показатель был максимальным: на каждый доллар собственных средств приходилось 1,2 доллара заемных средств. В 2025 г. коэффициент финансового «плеча» компании снизился до 0,67. С точки зрения рисков это положительная тенденция.

#### *Заключение*

Tesla в целом – если не считать вложения в биткоины и покупку мессенджеров – реализует осторожную финансовую стратегию. В условиях турбулентности рынка электромобилей это следует оценивать положительно – кредитный риск компании снижается. Вместе с тем выявлено замедление оборачиваемости товарных запасов и кредиторской задолженности, что требует разработки и реализации мер по ее ускорению.

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## **ВЕКОВОЙ ПУТЬ «УЗБЕКФИЛЬМА»: ОТ «ШАЙТАН-АРАВЫ» К НАЦИОНАЛЬНОЙ КИНОШКОЛЕ**

**Аннотация:** Статья посвящена столетнему пути киностудии Узбекфильм — от первых кинопоказов конца XIX века до современного этапа цифровой модернизации. Рассматриваются ключевые этапы становления национального кинематографа: деятельность Худайберген Деванов как основоположника узбекской кинохроники, создание объединения Бухкино и кинофабрики «Шарк юлдузи», формирование профессиональной студийной системы в 1920–1930-е годы, переход к звуковому и цветному кино. Особое внимание уделяется роли узбекских мастеров в годы Второй мировой войны, творческому расцвету 1960–1980-х годов, а также процессам обновления киноиндустрии в период независимости. В статье анализируется вклад ведущих режиссеров — Шухрата Аббасова, Али Хамраев, Латифа Файзиева, Зульфикара Мусакова и других — в формирование гуманистических и художественных традиций национального экрана. Делается вывод о преемственности поколений и сохранении культурной идентичности узбекского кино в условиях глобализации и технологических преобразований.

**Ключевые слова:** Узбекфильм; узбекский кинематограф; национальное кино; Худайберген Деванов; Шухрата Аббасова; Али Хамраев; Латифа Файзиева; Зульфикара Мусакова; золотой век кино; цифровая модернизация; культурное наследие; киноискусство Узбекистана.

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## **A CENTURY-LONG JOURNEY OF UZBEKFILM: FROM THE “SHAITAN-ARAVA” TO A NATIONAL SCHOOL OF CINEMA**

**Abstract:** *The article is devoted to the century-long journey of Uzbekfilm — from the first film screenings at the end of the 19th century to the contemporary stage of digital modernization. It examines the key stages in the development of national cinema: the work of Khudoybergan Devanov as the founder of Uzbek newsreel filmmaking; the establishment of the Bukhkino association and the “Shark Yulduzi” film factory; the formation of a professional studio system in the 1920s–1930s; and the transition to sound and color cinema.*

*Special attention is paid to the role of Uzbek filmmakers during World War II, the creative flourishing of the 1960s–1980s, and the processes of renewal in the film industry during the years of independence. The article analyzes the contribution of leading directors — Shukhrat Abbasov, Ali Khamraev, Latif Fayziev, Zulfikar Musakov and others — to the formation of humanistic and artistic traditions of the national screen. The conclusion emphasizes the continuity of generations and the preservation of the cultural identity of Uzbek cinema in the context of globalization and technological transformation.*

**Keywords:** *Uzbekfilm; Uzbek cinema; national cinema; Khudoybergan Devanov; Shukhrat Abbasov; Ali Khamraev; Latif Fayziev; Zulfikar Musakov; golden age of cinema; digital modernization; cultural heritage; cinema art of Uzbekistan.*

В конце 2025 года киностудия «Узбекфильм» отметила столетний юбилей. Столетие существования национальной киноиндустрии предоставляет основания для научного осмысления ее институционального становления, художественной эволюции и роли в формировании культурной идентичности Узбекистана. История студии демонстрирует, как экранное искусство, трансформируясь под влиянием социально-политических и технологических изменений, сохраняло преемственность гуманистических и национальных традиций.

**Зарождение кинематографа в Узбекистане**

Появление кинематографа в Узбекистане относится к 1897 году, когда в Ташкенте, на площади Эски-Джува, состоялись первые демонстрации фильмов, организованные бродячими антрепренерами. Эти показы последовали вскоре после публичных сеансов Братья Люмьер во Франции и стали частью глобального распространения новой визуальной технологии.

На первоначальном этапе кино воспринималось как технический аттракцион и культурная новация, вызывавшая эффект «движущейся фотографии». В общественном сознании оно нередко ассоциировалось с феноменом «шайтан-арава», что отражало амбивалентность отношения к технологическому прогрессу. Однако уже к 1910-м годам кинопоказы утратили кочевой характер: в Ташкенте начали функционировать стационарные кинотеатры, среди которых особое значение имел зимний кинотеатр «Хива» (1910).

Ключевую роль в становлении национальной операторской традиции сыграл Худайберген Деванов. В 1908 году он привез в Хиву кинокамеру «Pathé» и приступил к документальной съемке архитектурных памятников Ичан-Калы, городской повседневности, народных праздников. Его деятельность положила начало отечественной документалистике и сформировала визуальный архив начала XX века, имеющий исключительную историко-культурную ценность.

### **Институционализация кинопроизводства**

Организованное кинопроизводство начинается в 1920-е годы. В 1924 году в Бухаре было создано объединение «Бухкино», которое совместно с ленинградской студией «Севзапкино» осуществило постановку фильма «Минарет смерти» — одного из первых игровых проектов, снятых на территории Узбекистана. Несмотря на заметное влияние внешнего художественного взгляда, проект стал важным этапом профессиональной подготовки местных кадров.

В 1925 году была основана кинофабрика «Шарк юлдузи», впоследствии преобразованная в «Узбекфильм». Этот период характеризовался одновременным становлением производственной структуры и формированием национальной актерской школы. Существенный вклад в этот процесс внес режиссер Наби Ганиев, принципиально настаивавший на привлечении к съемкам местных актеров как носителей аутентичной культурной традиции.

Значительное место в репертуаре конца 1920-х годов занимала проблематика эмансипации женщин. Фильмы «Вторая жена» и «Чадра» (1927) выполняли не только художественную, но и просветительскую функцию, отражая трансформацию гендерных ролей в обществе.

Одновременно 1930-е годы выявили зависимость кинопроизводства от идеологических установок времени. Показательной является судьба режиссера Сулеймана Ходжаева и его фильма «Перед рассветом» (1933), посвященного событиям 1916 года. Картина была подвергнута критике и



уничтожена, а сам автор — репрессирован, что свидетельствует о сложных взаимоотношениях искусства и власти.

В 1936 году студия была официально переименована в «Узбекфильм», завершив этап организационного формирования.

### **Технологическая модернизация: звук и цвет**

В 1937 году узбекский кинематограф перешел к звуковому формату. Первый звуковой фильм «Клятва» ознаменовал качественное изменение художественной выразительности: голос, интонация и национальная музыкальная традиция стали важнейшими элементами экранной драматургии.

В годы Второй мировой войны Ташкент стал одним из центров союзной киноиндустрии. В период эвакуации в город были переведены студии Мосфильм и Ленфильм. На базе «Узбекфильма» функционировала Центральная объединенная киностудия (ЦОКС), где работали такие мастера, как Сергей Эйзенштейн и Михаил Ромм. Сотрудничество способствовало профессиональному росту национальных кадров.

Послевоенный период ознаменовался освоением цветной технологии. В 1955 году была создана первая цветная игровая картина «Новоселье», что расширило выразительные возможности кинематографа и усилило визуальную репрезентацию национальной эстетики.

### **«Золотой век» узбекского кино**

1960–1980-е годы рассматриваются исследователями как период художественного расцвета. В это время сформировалась оригинальная национальная киношкола, сочетающая элементы поэтического реализма и социально-философской проблематики.

К числу ключевых фигур относится Шухрата Аббасова, автор фильмов «Ты не сирота» и «Ташкент — город хлебный», в которых утверждались идеи гуманизма и нравственной ответственности.

Значительный вклад в развитие авторского кино внес Али Хамраев («Белые, белые аисты», «Седьмая пуля»), сумевший интегрировать национальную образность в современный кинематографический язык.

Международное сотрудничество расширилось благодаря проектам Латифа Файзиева, включая совместную советско-индийскую постановку «Приключения Али-Бабы и сорока разбойников». Параллельно развивалась национальная анимация под руководством Дамир Салимов.

### **Период независимости и цифровая трансформация**

После обретения государственной независимости в 1991 году киноиндустрия столкнулась с необходимостью реформирования системы финансирования и управления. В этот период заметным явлением стало творчество Зулфикар Мусаков, в фильмах которого («Абдулладжон, или Посвящается Стивену Спилбергу», «Бомба», «Мальчики в небе») отразились социальные трансформации переходного общества.

В XXI веке «Узбекфильм» переживает этап технологической модернизации и цифровизации. Реализуется программа реставрации и

оцифровки архивных лент («Золотой фонд»), расширяется жанровый спектр, усиливается внимание к историко-биографическим сюжетам. Современные режиссеры — Юсуп Разыков, Аюб Шахобиддинов, Ёлкин Туйчиев, Баходир Юлдашев, Шокир Холиков — представляют новое поколение национального кино, интегрированного в международный фестивальный процесс.

Столетний путь «Узбекфильма» отражает сложную динамику культурной модернизации, институционального становления и художественного поиска. От первых сеансов конца XIX века до цифровой эпохи студия прошла этапы технологического обновления, идеологических испытаний и творческого расцвета.

Научный анализ этого пути позволяет рассматривать «Узбекфильм» не только как производственную структуру, но и как важнейший социокультурный институт, формировавший визуальную память нации и способствовавший сохранению и развитию национальной идентичности в условиях исторических трансформаций.

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## **СУВ ОМБОРИ ҚИРҒОҚ ЎЗГАРИШИГА ФИЛТРАЦИЯ ВА ЎСИМЛИК ҚОПЛАМИНИ ТАЪСИРИ**

**Аннотация:** Сув омборлари қирғоқларининг ўзгаришида ўсимлик қопламини таъсирини баҳолаш, сув режимида боғлиқ ҳолда қирғоқларда бўладиган турли хил жараёнларни замонавий технологиялар ёрдамида мониторинг қилиш бугунги кунда энг самарали усуллардан бири ҳисобланади. Шу билан бирга сув омбори қирғоқларидаги ўсимлик қопламидан бўладиган филтрацияни ортиши ҳисобига фойдали ҳажмни камайиши, қўйи беефда ер ости сувларининг кўтарилиши, ҳосилдор ерлардаги тупроқнинг шўрланиши, жумладан ўсимликлар таъсири натижасида қирғоқлар шаклланиши ва уларга таъсир қилувчи омиллар асосий муаммонинг негизи ҳисобланади.

**Калим сўзлар:** Сув омбори, Global Land Survey, DEM маълумот, NDWI, силжиш, crop monitoring, кўчувчи масса, ўсимлик қоплами.

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## **THE INFLUENCE OF FILTRATION AND VEGETATION COVER ON RESERVOIR SHORELINE CHANGES**

**Abstract:** In the world, special attention is paid to conducting targeted scientific research using new and modern programs to develop effective operating regimes during the operation of reservoirs, reliable and innovative technologies for reducing the impact of anthropogenic factors in river basins [1,2,3,4]. In this regard, one of the important tasks is to study the formation of reservoir banks and the influence of vegetation cover, as well as the filtration under their influence and

*the improvement of its removal methods [4]. Also, determining the role of vegetation cover on the banks in coastal changes is one of the urgent problems of today.*

**Key words:** Reservoir, Global Land Survey, DEM data, NDWI, landslide, crop monitoring, moving mass, vegetation cover.

**Кириш.** Дунёда сув омборларининг эксплуатацияси жараёнида самарали иш режимини ишлаб чиқиш, дарё ҳавзасида антропоген омиллар таъсирини камайтириш усуллариининг ишончли ва инновацион технологияларини ишлаб чиқишда янги ва замонавий дастурлардан фойдаланиб мақсадли илмий тадқиқот ишлари олиб боришга алоҳида эътибор қаратилиб келинмоқда [1,2,3,4]. Бу борада, сув омборлари қирғоқлари шаклланиши ҳамда ўсимлик қопламларининг таъсири, шунингдек улар таъсирида бўладиган филтрация ва унинг ечиш усуллариини такомиллаштиш муҳим вазифалардан бири ҳисобланади [4]. Шунингдек қирғоқлардаги ўсимлик қопламларини қирғоқдаги ўзгаришлардаги ўрнини аниқлаш бугуннинг долзарб муаммолардан бири ҳисобланади.

**Тадқиқот объекти ва методлар.** Тадқиқод ўтказиш учун Чимқўрғон сув омбори танланди ва сув омборидан фойдаланиш даврида кузатилган турли таъсирлар, улар натижасида сув омбори қирғоқларидаги ўзгариши ўрганиб чиқилди. Чимқўрғон сув омбори қирғоқ чизиғининг узунлиги 49 км га чўзилган бўлса, шундан 12-15 км да турли даражадаги ўсимлик қопламлари мавжуд. Албатта қирғоқ бўйида тарқалган ўсимлик қоплами қирғоқлардаги тупроқ қатламларини ювилишини камайтиришда бевосита иштирок этади. Тажрибалардан маълумки, тупроқ зичлиги  $1,4-1,5 \text{ г/см}^3$  бўлганда, илдишлар қаттиқ қатламга ўта олмай, фақат устки қатламда ёнига қайрилиб ўсади. Бундай ҳолатда ўсимликларнинг илдизи сувнинг таъсирида тупроқни ювилишини камайтиради



1-расм. Чимқўрғон сув омбори қирғоқларида ўсимлик қатламининг шаклланиши.

Олиб борилган тадқиқотларда дастлаб интернетнинг Google Chrome ёки Internet Explorer дастури ишга туширилди ва ундан АҚШнинг 20 дан ортиқ сунъий йўлдош маълумотларини ўз ичига олган Earth Explorerнинг <https://earthexplorer.usgs.gov/> веб саҳифаси, шунингдек crop monitoring дастурлари орқали маълумотлар таҳлил қилинди.

Ерни умумлаштирилган тизим асосида автоматик рақамлаштирилган модели (DEM) маълумотлари ёрдамида рельефнинг силжишини тўғрилаш учун радиометрик тарзда калибрланган ва орторектификация қилинган. Калибрланган тизимли геометрик тузатишлар ёрдамида DEM маълумотлари релефнинг тўғри кўрсатиш учун қўлланилади. Олинган маълумотлардан фойдаланилган ҳолда сув ҳавсасидаги ўсимлик қатламларининг 2014-2022 йиллар мобайнидаги ўзгариши таҳлил қилинди.

Зич бўлмаган грунтлар учун фильтрация коэффицентининг ўртача қийматлари

1-жадвал

| Грунт         | К <sub>ф</sub> , см/сут | К <sub>ф</sub> , м/сут |
|---------------|-------------------------|------------------------|
| Галечник:     |                         |                        |
| ювилган       | ≥ 0,1                   | ≥ 80,0                 |
| қумли         | 0,1...0,2               | 80,0...17,0            |
| Қум:          |                         |                        |
| йирик заррали | 0,05...0,01             | 40,0...8,0             |
| майда заррали | 0,005...0,001           | 4,0...0,8              |
| гилли         | 0,002...0,0001          | 1,5...0,08             |
| Қумок:        |                         |                        |
| зич           | 0,0005...0,0001         | 0,4...0,08             |
| ғовак         | 0,005...0,001           | 4,0...8,0              |
| Соғ тупроқ    | ≤ 0,0001                | ≤ 0,08                 |
| Гилл          | ≤ 0,000001              | ≤ 0,0008               |

Сув омбори ёнидан бўладиган айланма фильтрация ҳисоби

Сув омбори қирғоқларидан бўладиган айланма фильтрация юқори бьефдан пастки бьефга қараб сув омбори қирғоғидаги тоғ жинсларининг сув ўтказувчанлигига боғлиқ бўлади. Ушбу ҳолатда ер ости сувлари оқим ҳаракати қуйи бьефга томон ёки яқин дарё водийси пастлигига томон ҳаракат қилади.

Сув омбори ёнидан бўладиган айланма фильтрация сарфи қуйидаги формула ёрдамида аниқланади:

$$Q = k * m * H * q_r \frac{kHm}{\pi} 1n \frac{B_1}{r_0} - kI_b m (B_1 - r_0)$$

$B_1$ -фильтрация минтақаси кенглиги табиий оқим нишаблигига боғлиқ ҳолда қуйидагича аниқланади:

$$B_1 = H / (\pi * L_b)$$



Сув омбори ёнидан бўладиган айланма филтрация сарфини сув омборидаги босимли сувлар фарқини ҳисобга олган ҳолда қуйидагича қисқача кўринишга келтириш мумкин:

$$Q = \frac{kHm}{\pi} \ln \frac{B_1}{r_0}$$

Ушбу формула ёрдамида II ва III-минтақалардаги умумий филтрация сарфини аниқлашимиз мумкин.

Бу ерда:  $k$ -қирғоқда жойлашган тоғ жинсининг филтрация коэффиценти;

$H$ -юқори ва пастки бьеф орасидаги босимлар фарқи;

$m$ -қатлам қалинлиги;  $p=3,14$

$B_1$  –

оқим кенглиги

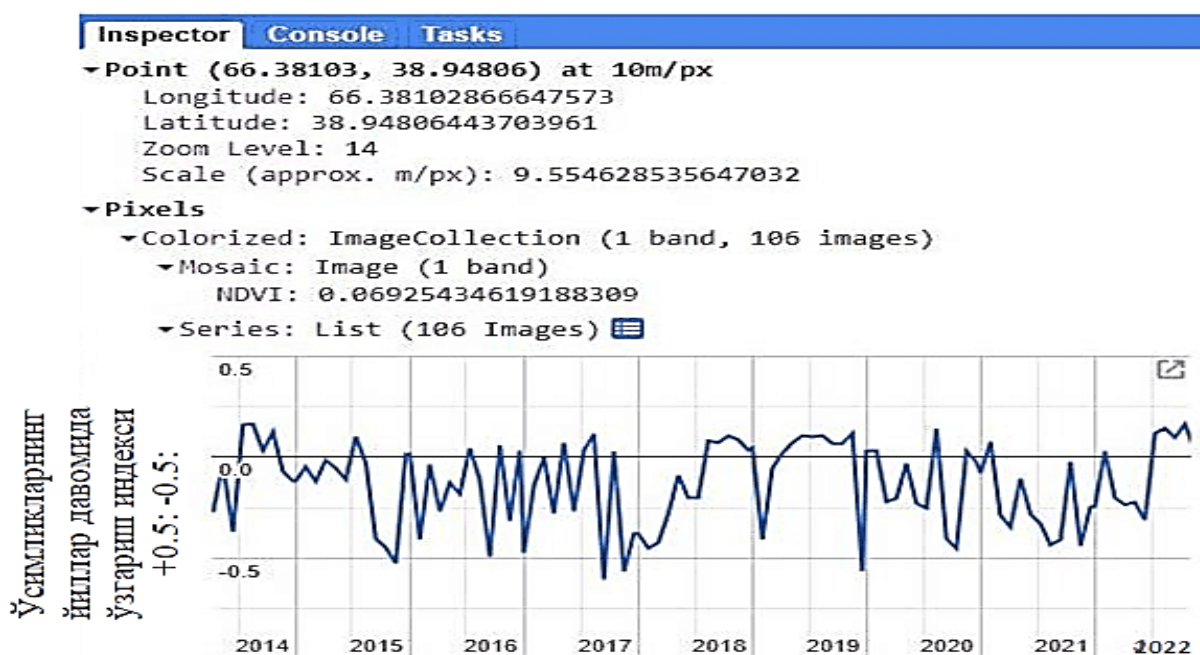
$r_0$ - берилган тўғоннинг қаршилик контур радиуси  $r_0 = l/\pi$

$l$ -тўғоннинг ҳўлланган периметри.

$$Q = \frac{kHm}{\pi} \ln \frac{B_1}{r_0} = \frac{1.8 * 30.55}{3.14} \ln \frac{7500}{10/3.14} = 14.7 m^3$$

Шундай қилиб сув омбори қирғоқларидан бўладиган айланма филтрация сарфи  $14.7 m^3$ /кун ни ташкил қилди.

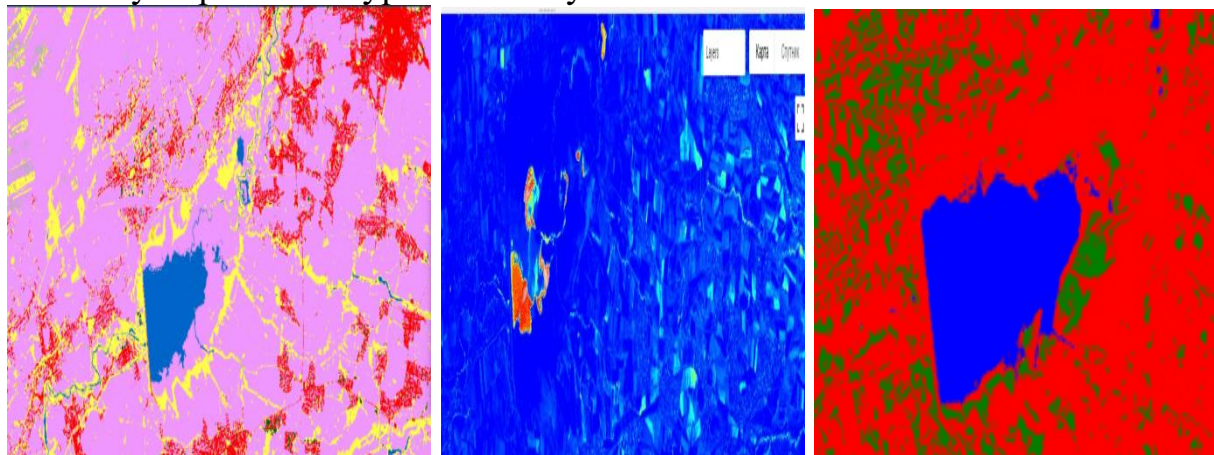
Дастур орқали берилган қийматлар нормаллаштирилганда ўсимликлар фарқи индекс бўйича ҳар бир жой учун (НИР - Қизил)/(НИР + Қизил) яқин-ИР ва Қизил диапазонлардан ҳосил бўлади ва қиймати -1,0 дан 1,0 гача ўзгаради. 2014-2022 йилларда (NDWI) ўсимлик қатлами орқали бўлган филтрация таъсиридаги ўзгаришларини аниқ координаталари бўйича қуйидаги графикда кўришимиз мумкин.



2-расм. Ўсимлик қатламининг 2014-2022 йиллар давомида ўзгариши



Графикдан кўриниб турибдики охириги йилларда атмосфера ёғинларининг кескин камайиши ва сув ҳавзаси керакли сувни йиға олмаганлиги, сув омбори косасида турли хил экинлар экиш учун шудгорлаш ишларини олиб борилганлиги сабабли 2015, 2016, 2017, 2021 йилларда ўсимликларнинг филтрация ривожланишига бўлган таъсирни кескин ўзгарганини кўришимиз мумкин.



3-расм. Сув омбори ҳавзасида шаклланган сув ресурслари ва ўсимлик қатлами

Google earth injenering дастур орқали олиб борилган кузатувлардан олинган натижаларга кўра 2014-2022 йилларда ўсимлик қатламининг шаклланиши бевосита сув омборининг сув йиғиш майдонини сув билан қопланганлигига боғлиқ бўлиб қолаябди, яни кам сувли йиллари ўсимликлар ўсиши учун бир неча йиллар сарф бўлади, сув омбори МДС га чиқганда (2019-йил) сув таъсирида ўсимлик қопламлари нобуд бўлиши, қуриб қолиш ҳолатлари кузатилган (3-расм, сариқ.) Бунинг натижасида сув омборида сатҳ кўтаришганда қуриган ўсимлик илдизидан бўладиган филтрация миқдори ортиб боради. (4-расм) Натижаларни таққослаш мақсадида Crop monitoring орқали таҳлил ўтказиб кўрилди.

Crop monitoring дастури орқали дала тадқиқотлар жараёнида жойнинг ўзида ўрганилаётган майдонларда муаммоли ҳудудлар миқдорини аниқлаш ва уларни зоналарга бўлиш, ўсимликларнинг ўсиш жараёнларини кузатиб бориш, беқарор тупроқ турларини аниқлаш ва қирғоқлардаги филтрация ҳисоблари таҳлилини олиб бориш ишлари амалга оширилган.



4-расм. Crop monitoring дастури орқали сув омборида шаклланган сув ресурслари ва ўсимлик қатламини филтрацияга таъсири.

Сув омбори грунтлардаги намликнинг ўзгаришига боғлиқ ҳолда филтрация миқдори баҳолаш майдонларнинг улушига нисбатан аниқланганда асосий миқдор 33465 га майдонда юзага келаётганлигини кўришимиз мумкин.

**Хулоса.** Олиб борилган тадқиқотлар натижаларига кўра сув омбори хавзасида ўсимликлар қатлами охириги йилларда сув омбори сатҳига боғлиқ кескин ўзгариб бораётганини кўришимиз мумкин. Ўсимлик қатламининг ўзгариши ўз навбатида ўсимлик илдизи орқали бўладиган филтрация миқдорининг ўзгаришига таъсир кўрсатиб келмоқда. Масалан: Сув омбори косасида 2019-йилга қадар турли хилдаги ўқ илдизли ўсимликлар ўсган бўлса, 2019 йилда сув омбори МДСгача тўлиши натижасида юқорида келтирилган ўсимликлар нобуд бўлган. Бунинг натижасида 2020-йилдан бошлаб сув омбори МДСгача етмаганлиги сабабли йирик жулғунзорлар пайдо бўлган ва вегетация даврида улардан бўладиган филтрация миқдори ортиб борган.

Сув омборларининг эксплуатация даврида қирғоқларини ўпирилиши, кўчкилар юзага келиши билан боғлиқ муаммоларнинг ечими жулғунзорларнинг ортиши бўлса, шу ўринда сув омборидан бўладиган филтрацияни белгиланган миқдордан кўпайишига сабаб бўлиб сув чиқариш иншоотларига ҳам жиддий хавф туғдиради

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## **БРЕНДИНГ РАБОТОДАТЕЛЯ: ЛУЧШИЕ ПРАКТИКИ И ОПЫТ HAIER**

***Аннотация.** Возможности дистанционных форм работы повысили мобильность квалифицированного персонала, особенно в сфере информационных технологий. Спрос корпораций на грамотных и активных специалистов неуклонно растет. Это повышает значение брендинга работодателей – важного инструмента работы с потенциальными соискателями. С другой стороны, развитие корпоративных экосистем и интерактивных платформ создает новые возможности коммуникаций с широким кругом заинтересованных лиц, в том числе с потребителями. Практическое применение эмпирического метода исследования, кейс-стади, позволяет выявить лучшие практики в формировании и реализации бренда работодателя в разных компаниях, видах деятельности, экономических структурах. Специфическая организационная структура китайской компании Haier, а также ее опыт активизации предпринимательской инициативы персонала, формируют новые черты брендинга работодателя, дополненные результативной системой экономического стимулирования деятельности микропредприятий. Изучение и обобщение такого опыта – предмет данной статьи.*

***Ключевые слова:** персонал, маркетинг, бренд работодателя, лучшие практики, экономическое стимулирование, предпринимательская инициатива, Haier.*

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## **EMPLOYER BRANDING: BEST PRACTICES AND EXPERIENCE OF HAIER**



**Abstract.** *The possibilities of remote work have increased the mobility of qualified personnel, especially in the field of information technology. The demand of corporations for competent and active specialists is steadily growing. This increases the importance of employer branding - an important tool for working with potential applicants. On the other hand, the development of corporate ecosystems and interactive platforms creates new opportunities for communication with a wide range of interested parties, stakeholders, including consumers. Practical application of the empirical research method, case study, allows us to identify best practices in the formation and implementation of the employer brand in different companies, types of activities, economic structures. The specific organizational structure of the Chinese company Haier, as well as its experience in activating the entrepreneurial initiative of personnel, form new features of employer branding, supplemented by an effective system of economic incentives for the activities of micro-enterprises. The study and generalization of such experience is the subject of this article.*

**Keywords:** *personnel, marketing, employer brand, best practices, economic incentives, entrepreneurial initiative, Haier.*

Дефицит квалифицированных специалистов, особенно в сфере технологических инноваций, наблюдаемый в последние годы во многих странах, предопределил повышенный интерес к проблемам брендинга работодателей. Так, В.В. Лизовская исследовала «..причины появления брендинга работодателя, его основные цели, аудитории, значение HR-брендинга для современной организации» [5].

Е.Ю. Шубина обоснованно утверждает «За последние два десятилетия научный интерес к брендингу работодателей сильно возрос». Исследование Е.Ю. Шубиной нацелено на «..создание непротиворечивой модели оценки бренда работодателя, формирование единой концепции брендинга» [10].

Ю.А. Масалова, О.С. Маковлева определили, что «..благодаря бренду работодателя обеспечивается лояльность и вовлеченность персонала, при этом важно обеспечивать его развитие и продвижение для усиления привлекательности рабочих мест» [6].

Н.С. Зимова, Е.В. Фомин, Е.С. Антипова изучали бренд работодателя в качестве инструмента привлечения персонала в социальных сетях; провели глубокий анализ практик отечественных компаний-лидеров в данной области с целью выявления особенностей и методов формирования HR-бренда. Н.С. Зимова, Е.В. Фомин, Е.С. Антипова разработали ряд актуальных рекомендаций по построению HR-бренда компании [3].

С.В. Семенова рассматривала бренд работодателя как «..мощный инструмент преодоления кризиса, как образ компании у целевой аудитории, кандидатов и сотрудников. Такой бренд невозможно построить без эмоционального наполнения». С.В. Семенова изучила нюансы

брендинга, которые необходимо правильно транслировать целевой аудитории [8].

Л.А. Андросова, А.А. Алешина детально рассмотрели «стратегии укрепления бренда работодателя, уровня вовлеченности персонала в работу организации». Особое внимание авторы уделили лидерам мнений, их роли и влиянию [2].

М.Ф. Алиев акцентирует «..становление брендинга работодателя как стратегической функции; связь между брендингом работодателя и цифровыми инновациями, его роль в привлечении и удержании талантов». Брендинг работодателя автор определяет как процесс, в ходе которого сотрудники усваивают имидж компании, его функциональные, экономические и психологические преимущества. М.Ф. Алиев предлагает оригинальный методический подход к организации работы с персоналом [1].

В данной статье мы предприняли попытку анализа и обобщения лучших практик брендинга работодателя – китайской компании Haier, которая за четыре десятилетия превратилась из небольшого регионального производителя холодильников в одного из мирового лидеров в производстве бытовой техники. Haier функционирует в почти в двух сотнях стран мира. Весной 2025 года Haier заняла 54-е место в рейтинге Kantar BrandZ Top 100 Most Valuable Global Brands 2025 года – стоимость бренда в 48 млрд долларов США означает рост год к году в полтора раза [4].

Специфический подход Haier к развитию заключается в создании сотен микропредприятий – во многом автономных предпринимательских единиц в единой экосистеме.

Бизнес-модель Haier построена вокруг процесса создания ценности, а не иерархии бюрократического формального контроля. Отзывы и пожелания пользователей компания воспринимает как источник креатива и инноваций. При этом процесс создания ценности включает ресурсы экосистемы, в том числе внешних заинтересованных лиц, а не только внутренние ресурсы Haier. Созданная добавленная стоимость затем распределяется между всеми субъектами, принимавшими участие в инновационном процессе, повышая мотивацию участников [7].

Фундаментальные идеи, на которых строится брендинг работодателя Haier, включают, во-первых, IoT (Интернет вещей, англ. Internet of Things) и экосистемное мышление; во-вторых, внутреннее предпринимательство и инновации; в-третьих, «нулевую дистанцию» между потребителем и компанией.

IoT – концепция, по которой устройства, гаджеты, могут общаться с владельцами и друг с другом через интернет, открывая дополнительные возможности для автоматизации, мониторинга и контроля.

Делая сотрудников совладельцами микропредприятий, Haier гарантирует, что каждый работник заинтересован в успехе проектов. Такая



модель мотивирует сотрудников на инновации, так как приложенные усилия непосредственно влияют на заработок, и карьерный рост.

С другой стороны, Haier сформировала так называемый «централизованный пул», куда могли вернуться сотрудники, не преуспевшие в микропредприятиях, в своих проектах. Эта система обеспечивает «страховочную» модель, снижая страх неудачи, поощряя сотрудников проявлять новые инициативы [11].

Реализация принципа «нулевой дистанции» обеспечивает непрерывный цикл совместного создания новой ценности микропредприятиями, и их клиентами. Поддержание «нулевой» дистанции дает микропредприятиям доступ к знаниям рынка (в режиме реального времени), и обеспечивает сотрудничество с пользователями в процессе создания следующего поколения усовершенствованных продуктов [4].

Прежде, чем запустить рекламную кампанию по бренду работодателя, исследователи и менеджеры Haier анализировали особенности «миллениалов», а также поколения Z, многие представители которых нуждаются в четкой, конкретной цели, и движимы желанием изменить существующую ситуацию, проактивно влиять на нее. Важным фактором в брендинге работодателя является то, как он соотносится с ценностным предложением для потенциальных сотрудников.

Кампания по брендингу работодателя была разработана и реализована Haier в сотрудничестве с агентствами iCorporate и The Visual Agency. Ее отличает слоган «Добро пожаловать домой, предприниматель» [4]. Нарративы, используемые Haier в соответствующих обращениях к целевой аудитории потенциальных соискателей, молодых талантов, повествуют о возможностях, предлагаемых компанией; объясняют, – чего ожидать от присоединения к компании, которая предлагает сотрудникам возможность работать в интегрированной среде, полной простора для личного роста и проявления инициативы. Способствуя развитию корпоративной открытой экосистемы, Haier позиционирует себя как сплоченный коллектив умных предпринимателей, которые хотят построить собственное будущее, и будущее «подключенного, умного» дома. Haier позиционирует себя как «дом» для тех, кто обладает сильным предпринимательским духом, предпочитает гибкий, современный, «умный» способ работы [11].

Haier убеждает соискателей, что в структуре компании они смогут расти и развивать креативность, вносить подлинные, результативные изменения. Стремление к предпринимательству делает Haier интегрированной компанией, где сотрудники могут находить единомышленников, формировать команды, делиться идеями, совместно творить, создавать новый опыт, новый продукт, и каждый может извлечь из этого пользу.

Гибкость внутренней организации Haier, позволяет выявлять приоритеты развития, на базе сигналов обратной связи рынка.

Вариативность новых идей и командный поиск альтернативных решений вовлекают членов команды в обмен мнениями на платформах экосистемы компании.

Корпоративная система экономического стимулирования построена с учетом этих приоритетов. Оплата труда сотрудников Naier включает «базовый» доход, переменную (динамическую) компоненту, и – для успешных проектов – механизм «участия в прибыли».

Базовый доход предоставляется всем сотрудникам, включая тех, кто находится в кадровом резерве, в структуре «централизованного пула». Эта часть дохода невысока, что побуждает сотрудников активно искать новые возможности внутри компании, в новых проектах [12].

Динамический компонент появляется, когда предприниматель выигрывает тендер. Структура заработной платы в рамках этой системы включает несколько пороговых значений производительности, определенных в процессе торгов. Чтобы претендовать на первый уровень бонуса, микропредприятие должно достичь базового (минимального) целевого показателя производительности. Соответствие средним показателям по аналогичным проектам и продуктам гарантирует предпринимателю зарплату, соответствующую рынку. Продуктивность, превышающая среднюю, запускает специальный механизм «участия в прибыли». Такая система компенсаций, вознаграждений оказывает стимулирующее воздействие на продуктивность труда сотрудников микропредприятий [12]. При этом микропредприятия взаимодействуют между собой, заказывая друг другу услуги и разработки, и оплачивая их по модели «коммерческого расчета». Это позволяет создать и поддерживать своеобразный «внутренний» рынок.

Таким образом, опыт Naier в формировании и продвижении бренда работодателя свидетельствует о том, что наряду с давно известными в маркетинге методами и механизмами, целесообразно привносить специфические корпоративные черты, соответствующие интересам целевой аудитории потенциальных соискателей. Особенно привлекательными для молодых специалистов поколения Z, миллениалов, оказываются такие компоненты бренда работодателя, как возможности самореализации, проявления предпринимательской инициативы, участия в выдвижении, защите, реализации новых идей и проектов.

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## **ОПРЕДЕЛЕНИЕ И СРАВНИТЕЛЬНАЯ ОЦЕНКА ОСНОВНЫХ ПОКАЗАТЕЛЕЙ ЗВЕНЬЕВ ИММУННОЙ СИСТЕМЫ ПРИ АЛЛЕРГИЧЕСКИХ ЗАБОЛЕВАНИЯХ У ДЕТЕЙ НА ФОНЕ ГЕРПЕСВИРУСНОЙ ИНФЕКЦИИ (ЛИТЕРАТУРНЫЙ ОБЗОР)**

**Аннотация:** Аллергические заболевания у детей характеризуются хроническим воспалением, иммунной дисрегуляцией и высокой клинико-иммунологической вариабельностью. Персистирующие герпесвирусы (HSV, EBV, CMV, HHV-6 и др.) способны модифицировать врождённые и адаптивные иммунные реакции, поддерживая длительную антигенную стимуляцию, влияя на цитокиновый профиль, функцию натуральных киллеров и антигенпрезентирующих клеток, а также на Т-клеточный баланс и гуморальные показатели. В обзоре обобщены современные представления о сравнительной оценке основных показателей врождённого, адаптивного и гуморального звеньев иммунной системы при аллергической патологии у детей на фоне герпесвирусной инфекции. Рассмотрены информативные маркеры клеточного иммунитета (CD3, CD4, CD8, Treg, NK), показатели воспаления и регуляции (IL-4, IL-5, IL-13, IFN- $\gamma$ ), а также гуморальные параметры (общий и специфический IgE, IgG/IgA, комплемент) и их диагностическое значение при сочетанном течении аллергии и вирусной персистенции. Подчёркнута целесообразность комплексного иммунологического профилирования для стратификации риска, оценки тяжести и выбора персонализированных профилактических и лечебных подходов.

**Ключевые слова:** дети, аллергические заболевания, герпесвирусная инфекция, врождённый иммунитет, адаптивный иммунитет, гуморальный иммунитет, NK-клетки, Т-хелперы.

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**DETERMINATION AND COMPARATIVE ASSESSMENT OF THE  
MAIN INDICATORS OF THE IMMUNE SYSTEM IN ALLERGIC  
DISEASES IN CHILDREN WITH HERPESVIRUS INFECTION (literature  
review)**

**Annotation:** Allergic diseases in children are associated with chronic inflammation, immune dysregulation, and substantial clinical–immunological heterogeneity. Persistent herpesviruses (HSV, EBV, CMV, HHV-6, etc.) can modulate innate and adaptive immune responses by sustaining long-term antigenic stimulation, reshaping cytokine networks, altering natural killer (NK) cell function and antigen presentation, and affecting T-cell balance and humoral parameters. This review summarizes current evidence on the comparative assessment of key biomarkers of innate, adaptive, and humoral immunity in pediatric allergic disorders in the setting of herpesvirus infection. Particular attention is paid to informative cellular markers (CD3, CD4, CD8, Treg, NK), regulatory and inflammatory mediators (IL-4, IL-5, IL-13, IFN- $\gamma$ ), and humoral indices (total and allergen-specific IgE, IgG/IgA, complement) and their diagnostic relevance in combined allergy–viral persistence phenotypes. The review highlights the rationale for integrated immunological profiling to support risk stratification, severity assessment, and personalized preventive and therapeutic strategies in children with allergic diseases complicated by herpesvirus infection.

**Keywords:** children; allergic diseases; herpesvirus infection; innate immunity; adaptive immunity; humoral immunity; NK cells; T-helper cells; immunoglobulin E; immunological markers.

**Введение.** Аллергические заболевания у детей остаются одной из наиболее актуальных проблем современной педиатрии и иммунологии, поскольку их распространённость неуклонно возрастает во всём мире и достигает 20–30% среди детского населения [2,6]. Значительную роль в формировании и прогрессировании аллергической патологии играют инфекционные агенты, среди которых особое место занимают вирусы семейства Herpesviridae, обладающие способностью к пожизненной персистенции в организме человека и выраженному иммуномодулирующему действию [3]. Герпесвирусная инфекция может оказывать существенное влияние на функционирование врождённого и



адаптивного иммунитета, изменяя баланс цитокинов, активность клеточных популяций и уровень гуморальных факторов защиты[1].

В последние годы накоплено большое количество данных, свидетельствующих о том, что хроническая герпесвирусная инфекция может способствовать формированию иммунного дисбаланса, который проявляется усилением аллергического воспаления и изменением иммунологической реактивности организма [13]. Особенно уязвимой категорией являются дети, у которых иммунная система находится в стадии формирования и характеризуется высокой чувствительностью к инфекционным и аллергическим факторам. В связи с этим изучение состояния врождённого, адаптивного и гуморального звеньев иммунной системы при аллергических заболеваниях на фоне герпесвирусной инфекции представляет значительный научный и практический интерес[5].

Врожденный иммунитет представляет собой первую линию защиты организма от инфекционных агентов и играет важную роль в инициации и регуляции аллергических реакций. Основными клеточными компонентами врождённого иммунитета являются нейтрофилы, макрофаги, дендритные клетки и натуральные киллеры (NK-клетки), которые участвуют в распознавании патогенов посредством паттерн-распознающих рецепторов (PRR), включая Toll-подобные рецепторы (TLR) [7,11,14].

При аллергических заболеваниях у детей наблюдается активация клеток врождённого иммунитета, сопровождающаяся повышенной продукцией провоспалительных цитокинов, таких как интерлейкин-1 $\beta$ , интерлейкин-6 и фактор некроза опухоли- $\alpha$  (TNF- $\alpha$ ). Эти медиаторы способствуют усилению воспалительной реакции и повышению чувствительности тканей к аллергенам [8]. Наличие герпесвирусной инфекции может дополнительно модифицировать эти процессы, поскольку вирусы герпеса способны подавлять противовирусные механизмы врождённого иммунитета и изменять экспрессию цитокинов[10].

Исследования показывают, что у детей с аллергическими заболеваниями и персистирующей герпесвирусной инфекцией часто выявляется снижение функциональной активности натуральных киллеров и фагоцитарной активности нейтрофилов, что свидетельствует о нарушении противовирусной защиты организма [6]. Одновременно отмечается повышение уровня интерферона- $\gamma$  и некоторых хемокинов, что может отражать компенсаторную активацию иммунной системы.

Адаптивный иммунитет играет ключевую роль в формировании специфического иммунного ответа и развитии аллергических реакций. Основными компонентами адаптивного иммунитета являются Т- и В-лимфоциты, которые обеспечивают клеточные и гуморальные механизмы защиты[9].

При аллергических заболеваниях у детей наблюдается характерный дисбаланс между Т-хелперами первого и второго типов (Th1/Th2), сопровождающийся преобладанием Th2-ответа и повышенной продукцией



интерлейкинов IL-4, IL-5 и IL-13, стимулирующих синтез иммуноглобулина E (IgE) и активацию эозинофилов [16]. Герпесвирусная инфекция может усиливать этот дисбаланс, влияя на дифференцировку Т-лимфоцитов и изменяя регуляцию цитокиновой сети.

По данным ряда исследований, у детей с аллергическими заболеваниями и активной герпесвирусной инфекцией отмечается снижение количества CD4<sup>+</sup> Т-лимфоцитов и увеличение доли CD8<sup>+</sup> клеток, что может свидетельствовать о хронической вирусной стимуляции иммунной системы [14]. Кроме того, наблюдается изменение функциональной активности регуляторных Т-клеток (Treg), которые играют важную роль в контроле иммунного ответа и предотвращении избыточного воспаления.

Нарушение баланса между эффекторными и регуляторными Т-клетками может приводить к усилению аллергического воспаления и повышению чувствительности организма к аллергенам, что особенно выражено при сочетании аллергической патологии с вирусными инфекциями[1].

Гуморальный иммунитет представлен системой иммуноглобулинов, комплемента и различных растворимых факторов иммунной защиты. Наиболее важную роль в патогенезе аллергических заболеваний играет иммуноглобулин E, который участвует в формировании реакций гиперчувствительности немедленного типа [12].

У детей с аллергическими заболеваниями обычно наблюдается значительное повышение уровня общего и специфического IgE, а также увеличение концентрации иммуноглобулинов класса G и A в ответ на хроническое воспаление. При наличии герпесвирусной инфекции отмечается дополнительная активация гуморального иммунитета, сопровождающаяся повышением титров антител к вирусным антигенам[10].

Некоторые исследования свидетельствуют о том, что герпесвирусная инфекция может способствовать поликлональной активации В-лимфоцитов, что приводит к увеличению продукции различных классов иммуноглобулинов и усилению аллергической сенсibilизации [15]. Одновременно может наблюдаться снижение уровня секреторного IgA, играющего важную роль в защите слизистых оболочек, что повышает восприимчивость организма к инфекциям и аллергенам.

Таким образом, сочетание аллергических заболеваний с герпесвирусной инфекцией сопровождается комплексными изменениями гуморального иммунитета, отражающими как аллергическое воспаление, так и хроническую вирусную персистенцию.

Анализ данных современных исследований показывает, что у детей с аллергическими заболеваниями на фоне герпесвирусной инфекции наблюдается комплексное нарушение всех звеньев иммунной системы. Для врождённого иммунитета характерно снижение фагоцитарной активности

и активности NK-клеток при одновременном повышении продукции провоспалительных цитокинов[15]. В адаптивном звене отмечается выраженный дисбаланс Th1/Th2-ответа, изменение соотношения CD4+ и CD8+ лимфоцитов и снижение активности регуляторных Т-клеток. В гуморальном звене наблюдается повышение уровня IgE и антител к вирусам герпеса, а также изменение концентрации других классов иммуноглобулинов[4,9,16].

Комплексная оценка этих показателей позволяет более глубоко понять механизмы взаимодействия инфекционных и аллергических факторов, а также определить перспективные направления диагностики и терапии аллергических заболеваний у детей.

### **Выводы.**

Таким образом, геморрагический инсульт остаётся одной из наиболее тяжёлых форм цереброваскулярных заболеваний, характеризующейся высокой смертностью и инвалидизацией. Основным фактором риска является артериальная гипертензия, однако значительную роль играют и другие сосудистые и метаболические нарушения. Современные методы диагностики, основанные на нейровизуализации и раннем выявлении факторов риска, позволяют своевременно установить диагноз и повысить эффективность лечения, что имеет важное значение для улучшения прогноза и качества жизни пациентов.

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## **РОЛЬ ИНГИБИТОРОВ НАТРИЙ-ГЛЮКОЗНОГО КОТРАНСПОРТЕРА 2-ГО ТИПА ПРИ ХРОНИЧЕСКОЙ БОЛЕЗНИ ПОЧЕК ДИАБЕТИЧЕСКОЙ ЭТИОЛОГИИ**

**Аннотация:** В данной работе рассматриваются современные представления о механизмах действия ингибиторов SGLT2 при хронической болезни почек диабетической этиологии. Особое внимание уделено их влиянию на внутриклубочковую гемодинамику, снижению гиперфльтрации, уменьшению альбуминурии, а также противовоспалительным и антифибротическим эффектам. Анализ результатов клинических исследований демонстрирует, что применение препаратов данной группы способствует замедлению прогрессирования хронической болезни почек, снижению риска развития терминальной почечной недостаточности и уменьшению частоты сердечно-сосудистых осложнений у пациентов с сахарным диабетом..

**Ключевые слова:** ингибиторы натрий-глюкозного котранспортера 2-го типа, SGLT2-ингибиторы, хроническая болезнь почек, диабетическая нефропатия, сахарный диабет 2 типа, нефропротекия, альбуминурия.

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## **THE ROLE OF SODIUM-GLUCOSE COTRANSPORTER TYPE 2 INHIBITORS IN CHRONIC DIABETIC KIDNEY DISEASE**

**Annotation:** This article reviews current data on the role and mechanisms of action of SGLT2 inhibitors in patients with chronic kidney disease of diabetic origin. Particular attention is paid to their effects on intraglomerular hemodynamics, reduction of glomerular hyperfiltration, decrease in albuminuria, and their anti-inflammatory and antifibrotic properties. Evidence from recent clinical trials indicates that SGLT2 inhibitors significantly slow the progression of chronic kidney disease, reduce the risk of end-stage renal disease, and lower the incidence of cardiovascular complications in patients with diabetes mellitus.

**Keywords:** *sodium-glucose cotransporter 2 inhibitors, SGLT2 inhibitors, chronic kidney disease, diabetic nephropathy, type 2 diabetes mellitus, nephroprotection, albuminuria.*

**Введение.** Диабетическая нефропатия - одно из распространенных осложнений сахарного диабета, и важно, что сахарный диабет, являющийся основой этой патологии, в последние годы растет во всем мире как глобальное медико-социальное заболевание [1].

Согласно клиническим исследованиям, проведенным в ряде развитых стран мира, ежегодный рост диабетической нефропатии, а также тот факт, что 40-50% пациентов с хронической болезнью почек, нуждающихся в заместительной почечной терапии, имеют сахарный диабет[1,3]. В этой сфере осуществляются коренные реформы, что требует дальнейшего совершенствования нефрологической и гемодиализной службы среди населения. Более того, ранняя диагностика и своевременное начало лечения почечной недостаточности любого генеза, диета и другие необходимые меры могут просто замедлить прогрессирование хронической почечной недостаточности[4]. Между тем, инвалидность, вызванная хронической почечной недостаточностью, развивающейся в результате диабетических нефропатий, возникающих на фоне сахарного диабета, подтверждает еще большую актуальность социально-экономических аспектов проблемы в нашем обществе[3,6].

Еще одна социальная сторона вопроса заключается в том, что с развитием медицинской и фармацевтической промышленности в новом веке увеличивается выживаемость больных сахарным диабетом и обеспечивается их долголетие[5]. Это приводит к увеличению истинного количества заболеваний и одновременно к росту осложнений.

**Цель исследования.** Оценить нефропротективного эффекта ингибиторов натрий-глюкозного котранспорта 2 типа у больных хронической болезнью почек диабетического генеза.

**Материалы и методы исследования.** Для исследования были отобраны 101 пациент с ХБП II и III А стадии, сформировавшейся на фоне нефропатий сахарной диабетической этиологии, находившихся на стационарном лечении в Республиканском специализированном научно-практическом медицинском центре нефрологии и трансплантации почки и в дальнейшем находившихся под диспансерным наблюдением в данном учреждении. Они были случайным образом разделены на две группы. 1-я группа (n-54) ограничилась только традиционным лечением, т.е. терапией в соответствии со стандартами лечения хронической болезни почек. 2-й группе (n-47) в дополнение к традиционному лечению был рекомендован препарат эмпаглифлозин (эмпаглифлозин 10 мг 1 таб./сут.), относящийся к ингибиторам натрий-глюкозного котранспорта 2-го типа, в течение шести месяцев. Диагноз и функциональное состояние почек были сформированы на основе лабораторных и инструментальных исследований в данном

медицинском учреждении. Была использована классификация стадий ХБП по National Kidney Foundation (НКФ-Международный почечный фонд). Средний возраст пациентов в исследуемых группах составил от 19 до 60 лет, в 1-й группе средний возраст составил  $48,9 \pm 3,76$  лет и во 2-й группе  $49,24 \pm 4,17$  лет. Из пациентов исследуемых групп 67 мужчин и 34 женщины. Под длительностью заболевания подразумевалась не сахарный диабет, а диабетическая нефропатия, а также ХБП, которая в среднем составила  $3,9 \pm 1,54$  года в 1-й группе и  $4,1 \pm 1,37$  года во 2-й группе.

### Результаты.

В наших исследованиях по коррекции нарушений внутрисердечной гемодинамики с использованием ингибиторов натрий-глюкозного котранспорта 2 типа у пациентов с диабетическим течением хронической болезни почек, результаты, полученные на основе доплерографических исследований почечных артерий различных размеров, то есть динамика изменений градиентов внутрисердечной гемодинамики у пациентов с хронической болезнью почек диабетического генеза нефропатии на фоне различных схем лечения, выявили следующую картину.

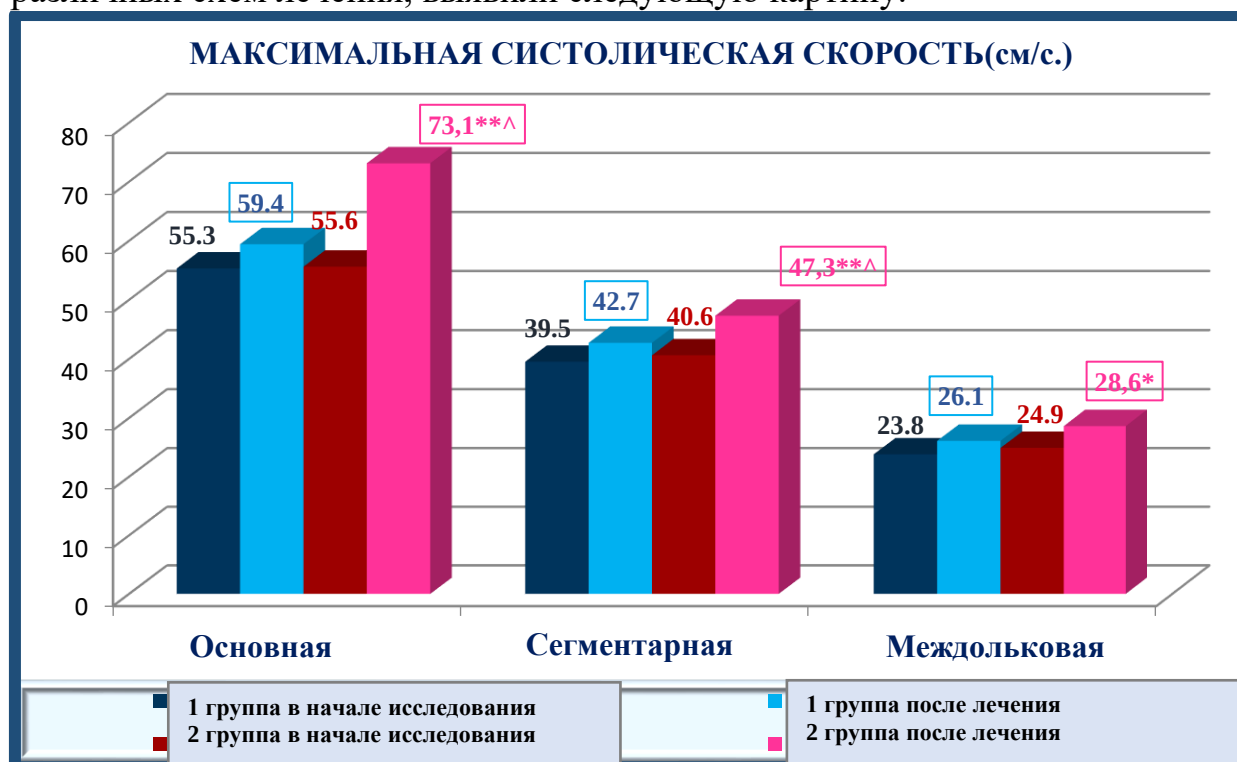


**Рисунок 1. Динамика изменения максимальной систолической скорости в исследуемых группах на фоне различных схем лечения.**

В магистральных почечных артериях в 1-й группе  $V_s \max$  составил  $55,3 \pm 3,27$  см/с в начале исследования и недостоверно ( $p > 0,05$ ) увеличился до  $59,4 \pm 3,74$  см/с в конце исследования. Во 2-й группе  $V_s \max$  в начале исследования составил  $55,6 \pm 3,91$  см/с, а через три месяца он достоверно увеличился до  $73,1 \pm 4,11$  см/с ( $p < 0,01$ ). В конце исследования при сравнении результатов пациентов 1-й и 2-й групп разница была достоверной ( $p < 0,05$ ).



Vd в 1-й группе в начале исследования составил  $16,4 \pm 2,19$  см/с, а в конце исследования увеличился до  $17,5 \pm 2,23$  см/с ( $p > 0,01$ ). Во 2-й группе Vd в начале исследования составил  $16,1 \pm 1,88$  см/с, а через шесть месяцев достоверно увеличился до  $25,3 \pm 1,95$  см/с ( $p < 0,01$ ). В конце исследования при сравнении основных групп разница между ними изменилась достоверно ( $p < 0,05$ ). На основании значений Vmax и Vd индекс резистентности в 1-й группе в начале исследования составил  $0,70 \pm 0,01$ , а в конце исследования снизился недостоверно ( $p > 0,05$ ) до значения  $0,68 \pm 0,01$ . Во 2-й группе ИР в начале исследования составил  $0,70 \pm 0,012$ , а в конце лечения достоверно снизился до значения  $0,65 \pm 0,01$  ( $p < 0,01$ ). В конце исследования при сравнении основных групп наблюдалось достоверное ( $p < 0,05$ ) изменение разницы (рис. 1,2,3).

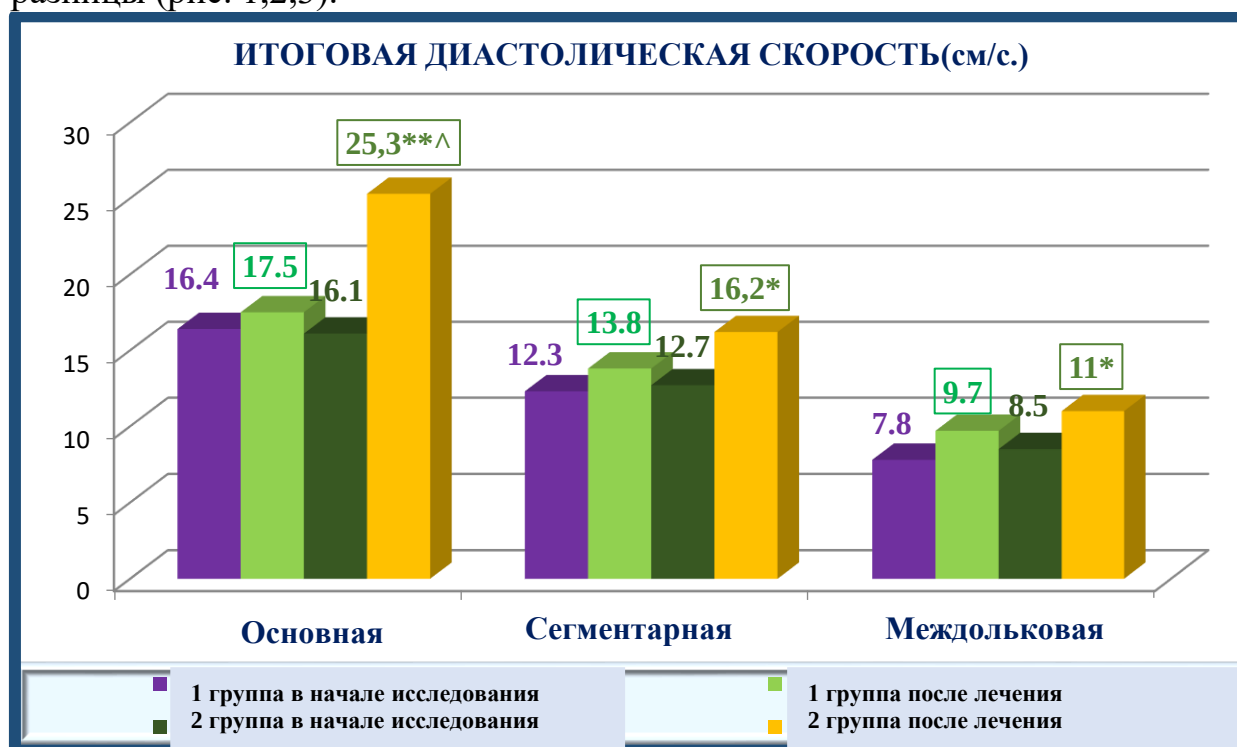


**Рисунок 2. Динамика изменения конечной диастолической скорости в исследуемых группах на фоне различных схем лечения.**

В сегментарных почечных артериях в 1-й группе Vs max в начале исследования составил  $39,5 \pm 1,52$  см/с, а в конце исследования недостоверно увеличился до  $42,7 \pm 1,44$  см/с ( $p > 0,05$ ). Во 2-й группе Vs max в начале исследования составил  $40,6 \pm 1,46$  см/с, а через шесть месяцев он достоверно увеличился до  $47,3 \pm 1,78$  см/с ( $p < 0,01$ ). В конце исследования при сравнении групп разница между ними изменилась достоверно ( $p < 0,05$ ). Vd в 1-й группе в начале исследования составил  $12,3 \pm 1,1$  см/с, а в конце исследования увеличился до  $13,8 \pm 1,03$  см/с. недостоверно ( $p > 0,05$ ). Во 2-й группе Vd в начале исследования составил  $12,7 \pm 1,22$  см/с, а через шесть месяцев наблюдалось достоверное ( $p < 0,05$ ) увеличение до  $16,2 \pm 1,15$  см/с. В конце исследования при сравнении групп разница между ними изменилась

недостаточно (p>0,05). Индекс резистентности в 1-й группе составил 0,69±0,01 в начале исследования и недостаточно снизился до 0,67±0,01 в конце исследования (p>0,05). Во 2-й группе ИР в начале исследования составил 0,69±0,01, а в конце лечения достоверно снизился до значения 0,64±0,01 (p<0,01). В конце исследования при сравнении групп разница между ними изменилась достоверно (p<0,05). В междольковых почечных артериях в 1-й группе Vs max в начале исследования составил 23,8±0,88 см/с, а после лечения недостаточно увеличился до 26,1±0,87 см/с (p>0,05). Во 2-й группе Vs max в начале исследования составил 24,9±0,99 см/с, а через шесть месяцев он достоверно (p<0,05) увеличился до 28,6±0,98 см/с. В конце исследования при сравнении групп разница между ними изменилась недостаточно (p>0,05). Vd в 1-й группе в начале исследования составил 7,8±0,67 см/с, а в конце исследования увеличился до 9,7±0,63 см/с. недостаточно (p>0,05). Во 2-й группе Vd в начале исследования составил 8,5±0,68 см/с, а через шесть месяцев достоверно (p<0,05) увеличился до 11,0±0,54 см/с. При сравнении результатов после лечения между группами наблюдалось недостаточно (p>0,05) изменение разницы. Индекс резистентности в 1-й группе составил 0,67±0,01 в начале исследования и недостаточно (p>0,05) снизился до 0,65±0,01 в конце исследования. Во 2-й группе ИР был равен 0,67±0,01 в начале исследования и достоверно (p<0,05) снизился до 0,63±0,01 в конце лечения. В конце исследования при сравнении групп разница между ними изменилась недостаточно (p>0,05) (рис. 1,2,3).



**Рисунок 3. Динамика изменений индекса резистентности в исследуемых группах на фоне различных схем лечения.**

### **Выводы.**

Таким образом, в наших исследованиях, наблюдая влияние препарата эмпаглифлозин на внутрипочечную гемодинамику в исследуемых группах, состоящих из хронических заболеваний почек, сформированных на основе диабетических нефропатий, эффективное повышение градиентов  $V_{\max}$  и  $V_d$  в конце лечения, снижение  $RI$  были особенно выражены в магистральных и сегментарных артериях. Этот процесс также имеет некоторое значение для реализации нефропротективного эффекта препарата.

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## СОВРЕМЕННЫЕ МЕТОДЫ ЛЕЧЕНИЯ И ПРОФИЛАКТИКИ ЗАБОЛЕВАНИЙ ДЕСЕН

*Аннотация* Заболевания десен — одна из самых распространённых проблем стоматологии, сопровождающаяся воспалением, кровоточивостью и разрушением тканей пародонта. В статье рассматриваются основные причины возникновения гингивита и пародонтита, а также современные методы их лечения и профилактики. Особое внимание уделено роли гигиены, правильного питания, использования антисептических средств и инновационных технологий — лазерной и плазмотерапии.

*Ключевые слова:* дёсны, гингивит, пародонтит, лечение, профилактика, гигиена, лазер, плазмотерапия

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## MODERN METHODS OF TREATMENT AND PREVENTION OF GUM DISEASES

**Abstract:** Gum diseases are among the most common problems in dentistry, often accompanied by inflammation, bleeding, and destruction of periodontal tissues. This article discusses the main causes of gingivitis and periodontitis, as well as modern methods of their treatment and prevention. Special attention is given to the importance of oral hygiene, proper nutrition, antiseptic agents, and innovative technologies such as laser and plasma therapy.

**Keywords:** gums, gingivitis, periodontitis, treatment, prevention, hygiene, laser, plasma therapy

**Введение:** Заболевания десен являются одним из наиболее частых обращений пациентов к стоматологу. По данным ВОЗ, около 80% взрослых людей в мире имеют признаки воспаления десен. Наиболее распространённые

формы — гингивит и пародонтит. Основная причина их развития — бактериальный налёт, вызванный недостаточной гигиеной полости рта.

Длительное воспаление без лечения приводит к разрушению связочного аппарата зуба, подвижности и последующей потере зубов. Поэтому ранняя диагностика и профилактика заболеваний десен имеют ключевое значение для сохранения стоматологического здоровья.

### **Материалы и методы исследования**

Основой работы стали анализ литературных источников, данные клинических наблюдений и современные методики, применяемые в пародонтологии. Рассматривались следующие направления терапии:

профессиональная гигиена (удаление налёта и камня);  
местное лечение антисептиками (хлоргексидин, мирамистин);  
применение противовоспалительных гелей (метрогил-дента, холисал);  
физиотерапевтические процедуры;  
инновационные методы — лазерная терапия и плазмотерапия.

Результаты и обсуждение

#### **1. Гигиенические меры**

Регулярная чистка зубов дважды в день, использование нити и ирригатора предотвращают образование зубного налёта. Профессиональная чистка у стоматолога каждые 6 месяцев значительно снижает риск воспаления десен.

#### **2. Медикаментозное лечение**

При гингивите эффективны полоскания антисептиками, аппликации противовоспалительных гелей и витаминизированные средства (витамины С и Р).

#### **3. Лазерная терапия**

Лазер оказывает противовоспалительное и антисептическое действие, улучшает микроциркуляцию, ускоряет заживление тканей.

#### **4. Плазмотерапия (PRP)**

Применение аутоплазмы, обогащённой тромбоцитами, стимулирует регенерацию и восстановление тканей десны, особенно после хирургических вмешательств.

#### **5. Профилактика**

Главное направление профилактики — повышение стоматологической грамотности населения. Правильное питание, богатое витаминами и минералами, отказ от курения и регулярные осмотры у стоматолога позволяют сохранить здоровье десен.

### **Выводы**

Заболевания десен имеют воспалительную природу и требуют комплексного лечения.

Основой профилактики является соблюдение гигиены и рациональное питание.

Инновационные методы, такие как лазер и PRP-терапия, ускоряют заживление и повышают эффективность лечения.

Регулярные профилактические визиты к стоматологу — лучший способ сохранить здоровье пародонта.

### **Заключение**

Благодаря развитию современных технологий стоматология располагает эффективными средствами лечения и профилактики заболеваний десен. Комбинация профессиональной гигиены, медикаментозной и аппаратной терапии обеспечивает высокие результаты и долговременный эффект.

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## СОВРЕМЕННЫЕ МЕТОДЫ ЛЕЧЕНИЯ ПАРОДОНТИТА

**Аннотация:** Пародонтит представляет собой хроническое воспалительное заболевание тканей, окружающих зуб, которое приводит к разрушению опорных структур и потере зубов. В статье рассмотрены современные методы диагностики и лечения пародонтита, включая механическую обработку пародонтальных карманов, применение антисептиков и антибиотиков, лазерную терапию, плазмотерапию и хирургические методы восстановления тканей. Особое внимание уделено комплексному подходу, объединяющему консервативное, хирургическое и профилактическое лечение, а также роли пациента в поддержании стабильного результата.

**Ключевые слова:** пародонтит, воспаление, лечение, лазерная терапия, антибиотики, плазмотерапия, хирургия, профилактика

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## MODERN METHODS OF PERIODONTITIS TREATMENT

**Abstract:** Periodontitis is a chronic inflammatory disease of the supporting tissues of the teeth, leading to the destruction of the periodontal structures and tooth loss. This article discusses modern methods of diagnosing and treating periodontitis, including mechanical debridement, the use of antiseptics and antibiotics, laser therapy, plasma therapy, and surgical tissue regeneration. Special attention is given to the comprehensive approach combining conservative, surgical, and preventive treatment, as well as the patient's role in maintaining long-term clinical stability.

**Keywords:** periodontitis, inflammation, treatment, laser therapy, antibiotics, plasma therapy, surgery, prevention

**Введение:** Пародонтит является одной из наиболее распространённых причин потери зубов у взрослых. По статистике ВОЗ, более 70% населения в возрасте старше 35 лет имеют признаки воспаления тканей пародонта различной степени тяжести. Заболевание характеризуется разрушением связочного аппарата зуба, резорбцией альвеолярной кости и образованием патологических карманов.

Основными этиологическими факторами считаются микробный налёт, нарушение гигиены, курение, системные заболевания (сахарный диабет, остеопороз) и снижение иммунной защиты организма. Развитие воспалительного процесса приводит к постепенному разрушению тканей пародонта и подвижности зубов.

Современная стоматология рассматривает лечение пародонтита как комплексную задачу, требующую участия стоматолога-терапевта, хирурга, физиотерапевта и самого пациента.

### **Материалы и методы исследования**

Для написания статьи использованы данные современных научных публикаций, а также результаты клинических наблюдений за пациентами стоматологической клиники. Анализировались различные методы диагностики (зондирование карманов, рентгенография, индекс КПИ), а также терапевтические и хирургические подходы лечения пародонтита.

Методы лечения классифицируются следующим образом:

Консервативное лечение — устранение микробного налёта и камня, полоскания антисептиками (хлоргексидин, мирамистин), назначение антибиотиков.

Физиотерапия — дарсонвализация, УФ-облучение, лазерная терапия.

Плазмотерапия (PRP-терапия) — введение плазмы, обогащённой тромбоцитами, для стимуляции регенерации тканей.

Хирургические методы — открытый и закрытый кюретаж, лоскутные операции, костная пластика и применение мембран для направленной регенерации тканей.

### **Результаты и обсуждение**

#### **1. Консервативное лечение**

На начальной стадии (гингивит, лёгкий пародонтит) достаточно профессиональной гигиены и местного лечения. Удаление зубного камня с помощью ультразвука и кюретаж пародонтальных карманов уменьшают воспаление. Дополнительное использование антисептических растворов снижает бактериальную нагрузку.

#### **2. Медикаментозная терапия**

В случаях средней и тяжёлой формы назначаются антибиотики (амоксциллин, метронидазол, доксициклин). Комбинированное применение системных и местных форм обеспечивает эффективное подавление патогенной микрофлоры.

#### **3. Лазерная терапия**

Лазерное лечение является одной из наиболее современных и щадящих методик. Оно обеспечивает стерилизацию карманов, улучшает микроциркуляцию и стимулирует регенерацию тканей. Применение диодных и эрбиевых лазеров позволяет достичь глубокого антибактериального эффекта без травматизации тканей.

#### 4. Плазмотерапия (PRP)

Использование аутологичной плазмы, обогащённой тромбоцитами, является инновационным направлением в пародонтологии. Факторы роста, содержащиеся в плазме, ускоряют заживление тканей, уменьшают воспаление и восстанавливают костную структуру.

#### 5. Хирургическое лечение

При глубине карманов более 5 мм показано хирургическое вмешательство. Лоскутные операции позволяют удалить грануляции, провести санацию корня и обеспечить регенерацию тканей. Применение биоматериалов (коллагеновые мембраны, синтетические костные заменители) повышает эффективность лечения и стабильность результата.

#### 6. Комплексный подход

Эффективное лечение возможно только при сочетании нескольких методов. После завершения терапии пациент должен соблюдать гигиену, регулярно проходить профессиональную чистку и контрольные осмотры.

#### Выводы

Пародонтит — многофакторное заболевание, требующее комплексного лечения и постоянного наблюдения.

Консервативная терапия эффективна на ранних стадиях, тогда как тяжёлые формы требуют хирургического вмешательства.

Лазерная и плазмотерапия ускоряют регенерацию тканей и повышают эффективность традиционных методов.

Профилактика и обучение пациентов правильной гигиене — ключевой элемент предупреждения рецидива.

**Заключение:** Пародонтит остаётся серьёзной проблемой стоматологии, однако благодаря развитию технологий стало возможным не только остановить воспалительный процесс, но и частично восстановить разрушенные ткани. Современный подход к лечению основан на сочетании традиционных и инновационных методов, индивидуальном планировании и активном участии пациента. Только совместные усилия врача и пациента способны обеспечить долгосрочную стабилизацию и сохранение зубов.

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## СОВРЕМЕННЫЕ МЕТОДЫ ПРОФИЛАКТИКИ И ЛЕЧЕНИЯ КАРИЕСА ЗУБОВ

**Аннотация:** Кариез зубов является одной из самых распространённых стоматологических патологий, поражающей как взрослых, так и детей. В статье рассмотрены основные причины возникновения заболевания, механизмы его развития, современные методы профилактики и лечения. Отмечается важность комплексного подхода, включающего профессиональную и домашнюю гигиену, рациональное питание, использование фторсодержащих и реминерализующих средств, а также регулярные профилактические осмотры. Особое внимание уделено новым технологиям, таким как наноматериалы, лазерная терапия и минимально инвазивные методы лечения.

**Ключевые слова:** кариез, стоматология, профилактика, лечение, фтор, реминерализация, гигиена, нанотехнологии

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## MODERN METHODS OF PREVENTION AND TREATMENT OF DENTAL CARIES

**Abstract:** Dental caries is one of the most common oral diseases affecting both adults and children. This article examines the main causes and mechanisms of caries development, as well as modern methods of prevention and treatment. The importance of an integrated approach is emphasized, including professional and home oral hygiene, balanced nutrition, the use of fluoride and remineralizing agents, and regular dental check-ups. Special attention is given to new technologies such as nanomaterials, laser therapy, and minimally invasive treatment methods.

**Keywords:** caries, dentistry, prevention, treatment, fluoride, remineralization, hygiene, nanotechnology



**Введение** Кариес зубов — хронический процесс разрушения твёрдых тканей зуба, который развивается под влиянием микроорганизмов и характеризуется локальной деминерализацией эмали и дентина. По данным ВОЗ, около 90–95% населения земного шара страдает различными формами кариеса. Заболевание имеет полиэтиологическую природу и связано с целым рядом факторов: нарушением гигиены полости рта, частым употреблением сахара, недостаточным количеством фтора в воде и пище, пониженной резистентностью эмали.

Современная стоматология рассматривает профилактику кариеса как приоритетное направление, поскольку именно предупреждение заболевания значительно снижает затраты на лечение и сохраняет здоровье зубочелюстной системы.

### **Материалы и методы исследования**

Исследование основано на анализе научной литературы, клинических наблюдений и практического опыта стоматологов. Рассмотрены традиционные и современные методы профилактики, включая профессиональную чистку зубов, герметизацию фиссур, использование фторидов, реминерализующих гелей, паст и лаков.

Методы профилактики классифицируются следующим образом:

Первичная профилактика — предупреждение появления кариеса (гигиеническое обучение, диета, фторпрофилактика).

Вторичная профилактика — раннее выявление и лечение начальных форм кариеса.

Третичная профилактика — восстановление функций зуба и предупреждение осложнений.

Также изучались современные терапевтические технологии: применение лазера, озонотерапии, а также нанокомпозитных материалов, повышающих прочность реставраций.

### **Результаты и обсуждение**

#### **1. Роль гигиены полости рта**

Регулярная гигиена является основой профилактики. Чистка зубов дважды в день пастой, содержащей фтор (1000–1500 ppm), уменьшает риск кариеса на 40–60%. Дополнительное использование зубной нити, ирригаторов и антисептических растворов (например, хлоргексидина) обеспечивает удаление микробного налёта в труднодоступных участках.

#### **2. Рациональное питание**

Частое употребление углеводов способствует образованию кислоты, которая разрушает эмаль. Уменьшение количества сладостей, газированных напитков и перекусов между приёмами пищи снижает риск кариеса. Рацион должен включать кальций, фосфор, витамины D и C, а также воду с оптимальным содержанием фтора.

#### **Фторпрофилактика**

Фтор является ключевым элементом в укреплении эмали и торможении деминерализации. Эффективными мерами считаются использование

фторированных зубных паст, аппликации лаков и профессиональные процедуры фторирования. В некоторых регионах проводится системная фторизация воды или соли.

#### 4. Современные методы лечения

Современные технологии позволяют лечить кариес на ранних стадиях без бормашины — методом инфильтрации (ICON), озонотерапией, а также с использованием лазера. Эти методы являются щадящими и безболезненными, не требуют удаления здоровых тканей.

#### 5. Композитные материалы и нанотехнологии

В последние годы разработаны нанокомпозиты с высокой эстетикой и прочностью, обеспечивающие надёжную адгезию и долговечность реставраций. Они обладают антибактериальными свойствами и способствуют реминерализации тканей зуба.

#### Выводы

Профилактика кариеса должна начинаться с детского возраста и включать обучение правильной гигиене полости рта.

Регулярная чистка зубов, ограничение сахара и использование фторидов снижают риск заболевания.

Современные технологии — лазер, озон, нанокомпозиты — делают лечение менее травматичным и более долговечным.

Комплексный подход, включающий профилактику, диагностику и своевременное лечение, является залогом успешной борьбы с кариесом.

#### Заключение

Кариес остаётся глобальной проблемой стоматологического здоровья. Однако развитие технологий, внедрение профилактических программ и повышение уровня стоматологической культуры населения позволяют эффективно контролировать распространённость этого заболевания. Сочетание научных достижений и ответственного отношения пациентов к своему здоровью является основой успешной профилактики кариеса.

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# ИНФОРМАЦИОННЫЕ И КОММУНИКАТИВНЫЕ ТЕХНОЛОГИИ

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## МЕТОДОЛОГИЯ ФОРМИРОВАНИЯ НАЦИОНАЛЬНОЙ ИННОВАЦИОННОЙ СИСТЕМЫ УЗБЕКИСТАНА В УСЛОВИЯХ ЦИФРОВИЗАЦИИ И УСТОЙЧИВОГО РАЗВИТИЯ

**Аннотация:** Национальная инновационная система (НИС) Узбекистана формируется в условиях глобальных вызовов цифровизации, интеграции искусственного интеллекта и перехода к зелёной экономике, что требует системного методологического подхода к её развитию. Исследование опирается на работы классиков теории НИС (Нельсон, Розенберг, Лундвалл, Фримэн) и отечественных авторов, применяя системный, институциональный и функциональный анализы, дополненные fsQCA на данных ГИ 2011–2025 годов. Глобальные кейсы (Южная Корея, Китай, США) демонстрируют эффективность моделей «тройной спирали» и государственного лидерства в R&D, в то время как Узбекистан показывает прогресс: подъём до 79-го места в ГИ 2025, освоение проекта MUNIS (85% бюджета к декабрю 2025) и запуск AI-кластеров к 2026 году. Авторское определение НИС подчёркивает взаимодействие субъектов и институтов для производства знаний, ориентированных на конкурентоспособность и качество жизни. Предлагаемые рекомендации включают усиление межсекторного взаимодействия, регуляторных песочниц для ИИ, зелёных инвестиций и международного партнёрства в рамках UNSDCF 2026–2030. Развитие НИС позволит Узбекистану диверсифицировать экономику, снизить сырьевую зависимость и достичь целей Стратегии «Узбекистан-2030».

**Ключевые слова:** национальная инновационная система, Узбекистан, цифровизация, искусственный интеллект, устойчивое развитие, методология НИС

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## **NATIONAL INNOVATION SYSTEM OF UZBEKISTAN METHODOLOGICAL ASPECTS OF FORMATION IN THE ERA OF DIGITALIZATION AND SUSTAINABLE DEVELOPMENT**

**Abstract:** *Uzbekistan's National Innovation System (NIS) is being formed amid global challenges of digitalization, artificial intelligence integration, and the transition to a green economy, necessitating a comprehensive methodological approach to its development. The study draws on foundational works of NIS theory classics (Nelson, Rosenberg, Lundvall, Freeman) and domestic authors, employing systemic, institutional, and functional analyses supplemented by fuzzy-set qualitative comparative analysis (fsQCA) based on Global Innovation Index (GII) data for 2011–2025. Global cases (South Korea, China, United States) illustrate the effectiveness of the “triple helix” model and state leadership in R&D, while Uzbekistan demonstrates notable progress: advancement to 79th position in the GII 2025, 85% budget utilization of the MUNIS project by December 2025, and the planned launch of AI clusters in 2026. The author’s definition of the NIS emphasizes the interaction between actors and institutions for knowledge production oriented toward competitiveness and quality of life. Proposed recommendations include strengthening cross-sectoral collaboration, developing regulatory sandboxes for AI, promoting green investments, and deepening international partnerships within the UNSDCF 2026–2030 framework. The further development of the NIS will enable Uzbekistan to diversify its economy, reduce commodity dependence, and achieve the strategic objectives of the “Uzbekistan-2030” Strategy.*

**Keywords** *national innovation system, Uzbekistan, digitalization, artificial intelligence, sustainable development, NIS methodology.*

### **Введение**

В условиях ускоряющихся глобальных экономических трансформаций инновации выступают основным фактором конкурентоспособности национальных экономик и стратегического развития государств. Современные вызовы, включая цифровизацию, переход к устойчивой (зелёной) экономике и интеграцию искусственного интеллекта (ИИ), требуют комплексного, системного подхода к формированию национальной инновационной системы (НИС). Согласно данным Глобального инновационного индекса (Global Innovation Index,

GII) 2024 года, опубликованного Всемирной организацией интеллектуальной собственности (ВОИС), лидирующие позиции сохраняют Швейцария (1-е место), Швеция (2-е), США (3-е), Сингапур (4-е) и Великобритания (5-е), где наблюдается высокая степень интеграции исследований и разработок (R&D) с бизнес-сектором и институциональная поддержка инноваций [45][17]. В глобальном масштабе объём инвестиций в инновационные проекты превысил 3,3 трлн долларов в 2024 году, с акцентом на ИИ, зелёные технологии и цифровизацию, что подчёркивает необходимость системного анализа НИС для адаптации к этим тенденциям.

Узбекистан, как развивающаяся экономика, активно формирует свою НИС в рамках Стратегии развития Нового Узбекистана на 2022–2026 годы и обновлённой Стратегии «Узбекистан-2030», предусматривающих удвоение доли цифровой экономики в ВВП, привлечение 120 млрд долларов инвестиций (в том числе 70 млрд долларов прямых иностранных) и создание условий для устойчивого роста [22][19]. К 2026 году планируется запуск двух национальных кластеров ИИ с общей вычислительной мощностью до 1 МВт, создание Центра передового опыта в области промышленного ИИ, а также реализация программы подготовки «миллиона программистов» [27][35]. Эти меры направлены на диверсификацию экономики, снижение зависимости от сырьевых секторов и интеграцию в глобальные цепочки создания стоимости.

Глобальные кейсы демонстрируют эффективность различных моделей НИС. В Южной Корее модель «тройной спирали» (государство – бизнес – университеты) позволила занять 6-е место в GII 2024 года, обеспечив рост экспорта высокотехнологичной продукции на 25% в период 2020–2024 годов [29]. Китай, инвестируя более 2,5% ВВП в R&D, доминирует в сферах ИИ и 5G, где компания Huawei контролирует около 30% глобального рынка телекоммуникаций к 2026 году [29]. В сравнении, проект Всемирного банка «Модернизация национальной инновационной системы Узбекистана» (MUNIS, P170206) к июню 2025 года освоил 55% бюджета (27,7 млн долларов), реализовав 287 субпроектов по повышению качества научных исследований и коммерциализации технологий, с мобилизацией 16,8 млн долларов частных инвестиций [21]. Другим ярким локальным примером служит IT-Парк в Ташкенте, где к 2026 году введены новые правила для резидентов с фокусом на экспорт IT-продуктов, а оценка стартап-экосистемы достигла 3,9 млрд долларов по данным Dealroom [20][37]. Эти примеры подчёркивают, что успешная НИС требует не только финансовых вливаний, но и глубоких институциональных реформ, стимулирующих инновационное предпринимательство и межсекторное взаимодействие.

#### Методы и материалы

Национальная инновационная система представляет собой сложный, многоуровневый комплекс взаимосвязанных элементов, определяющих



долгосрочный экономический прогресс государства. Настоящее исследование опирается на фундаментальные работы классиков теории НИС – Р. Нельсона и Н. Розенберга [1], Б.-А. Лундвалла [13][14], К. Фримена [16], а также отечественных авторов – З.Т. Гаибназаровой [19], К. Курпаяниди [6][11], Д.Э. Мамурова [20]. Несмотря на значительный накопленный теоретический и эмпирический материал, методология оценки эффективности НИС, её структурной организации и влияния на конкурентоспособность остаётся предметом активных дискуссий, особенно в контексте глобализации, цифровизации и геополитических сдвигов.

Для углубления анализа применяются современные подходы, включая fuzzy-set qualitative comparative analysis (fsQCA), позволяющий проводить кросс-национальные и кросс-временные сравнения конфигураций НИС на основе данных ГИ за 2011–2022 годы [43]. Методологическая база включает концепции НИС, теории инновационного менеджмента, эволюции социально-экономических систем, дополненные данными из отчётов ВОИС, ОЭСР и Всемирного банка. Используются системный анализ, эконометрическая статистика, методы индукции, дедукции и диалектический подход для выявления причинно-следственных связей. Графическая интерпретация применяется для визуализации динамики инвестиций в R&D, патентной активности и инновационной производительности.

Цель исследования – не только теоретическое обогащение понимания НИС, но и выработка практических рекомендаций для Узбекистана. В частности, предлагается усиление интеграции с глобальными партнёрами в рамках Национальной политики по науке, технологиям и инновациям на 2022–2030 годы (при поддержке ЮНЕСКО и Исламского банка развития), с акцентом на социокультурные факторы, регуляторные песочницы для ИИ и зелёные инвестиции [24][3].

## Результаты

### Теоретические основы понятия «инновация» и концепции НИС

Понятие «инновация» лежит в основе всей теории НИС, определяя её содержание и механизмы функционирования. Р. Нельсон и Н. Розенберг определяют инновацию как процесс создания и внедрения новых для фирмы, страны или мира продуктов и процессов [1]. А.И. Пригожин различает «новшество» как объект и «инновацию» как процесс зарождения, диффузии и рутинизации [2]. Б. Твисс подчёркивает экономическое наполнение интеллектуального продукта [3], А.Ю. Парфенова – общественную полезность изменений [4]. Наиболее комплексное определение предлагает Б. Санто: инновация как социально-техническо-экономический процесс от исследований до маркетинга, ориентированный на добавленную стоимость [5]. К. Курпаяниди трактует её как превращение творческой идеи в полезный продукт, услугу или метод

[6], а С.Ю. Глазьев и Ю.В. Яковец связывают инновации с длинными циклами обновления для преодоления кризисов [7][8].

Закон Республики Узбекистан «Об инновационной деятельности» от 24.07.2020 № ЗРУ-630 определяет инновацию как новую разработку, введённую в оборот и обеспечивающую значительный социально-экономический эффект (ст. 3) [9]. В авторском понимании инновация представляет собой конечный результат интеллектуальной деятельности, воплощённый в новом или усовершенствованном продукте, процессе или услуге, востребованном рынком и генерирующем добавленную стоимость.

Концепция НИС сформировалась в конце XX века в рамках трёх ведущих школ: американской (М. Портер), британской (К. Фримэн) и скандинавской (Б.-А. Лундвалл, Б. Йонсон, Б. Асхайм). Лундвалл ввёл понятие «экономики обучения» (learning economy), подчеркнув кумулятивный характер инноваций и выделив типы: инкрементальные (для малых открытых экономик), радикальные (для крупных стран) и технологические революции [10][11][12][13]. В узком смысле НИС – это организации, занятые поиском и изобретением; в широком – вся экономическая и институциональная структура, влияющая на создание и распространение знаний [14]. Б. Асхайм и А. Изаксен предложили интерактивную модель вместо линейной, где знание – ключевой ресурс, а обучение – центральный процесс [15].

Глобализация привела к эволюции концепции: от национальных к региональным (РИС) и глобальным (ГИС) инновационным системам. К. Фримэн определяет НИС как сеть институтов, иницирующих, импортирующих, модифицирующих и распространяющих новые технологии [16]. С. Меткалф акцентирует роль в создании, хранении и передаче знаний [17]. Н.И. Иванова подчёркивает национальные корни институтов и организаций [18]. Отечественные исследователи (З.Т. Гаибназарова, Д.Э. Мамуров) выделяют социокультурные факторы и механизмы взаимодействия субъектов [19][20].

Авторское определение: национальная инновационная система – это совокупность хозяйствующих субъектов (НИИ, предприятия, потребители) и институтов (законодательных, финансовых, социальных), взаимодействующих в процессах производства, распространения и использования передовых знаний и технологий для реализации приоритетных направлений развития и повышения конкурентоспособности страны.

#### Сравнительный анализ моделей НИС

Сравнительный анализ НИС ведущих стран (США, Корея, Китай, Япония, Тайвань) показывает разнообразие подходов [29]. США лидируют в радикальных инновациях благодаря венчурному капиталу Silicon Valley (рост на 20% к 2025 году) [29]. Корея фокусируется на корпоративных инновациях (Samsung, Hyundai), Китай – на масштабном государственном финансировании R&D (2,5% ВВП), Тайвань – на узкой специализации

(TSMC – 60% глобального рынка полупроводников к 2026 году) [29]. Эти модели демонстрируют, что эффективность НИС зависит от баланса между государственным регулированием, частными инвестициями и институциональной средой.

В Узбекистане НИС находится на этапе активного становления. Стратегия развития ИИ до 2030 года (утверждена в 2024 году) предусматривает запуск вычислительных мощностей к 2026 году, создание 10 лабораторий ИИ, подготовку 1000 высококвалифицированных специалистов и достижение объёма AI-продуктов в 1,5 млрд долларов ежегодно [27][15]. Кейс IT-Парка: экспортно-ориентированная модель, рост экосистемы до 3,9 млрд долларов, запуск Центрально-Евразийского венчурного форума в 2026 году [20][37]. Интеграция ИИ в здравоохранение, сельское хозяйство (проект AGRIN EC) и государственные услуги повышает эффективность, однако требует усиления регуляторных механизмов (включая закон о регулировании ИИ от января 2026 года) для баланса инноваций и рисков [26][50].

#### Обсуждение

Цель функционирования национальной инновационной системы (НИС), вытекающая из сущности инновационной деятельности и её концептуального определения, заключается в повышении качества жизни населения через усиление конкурентоспособности национальной экономики. Это достигается посредством активизации инновационных процессов при максимально полной реализации имеющегося инновационного потенциала и стимулировании эффективного спроса на результаты инноваций [1][13]. Под качеством жизни в данном контексте понимается не только рост уровня конечного потребления домашних хозяйств, но и обеспечение широкой доступности услуг мирового уровня в здравоохранении, образовании и культурной сфере, что соответствует современным подходам к измерению человеческого развития и устойчивого экономического роста [17][30].

В современной экономической науке сложилось несколько методологических подходов к анализу НИС: институциональный, системный, функциональный и эволюционный. Каждый из них акцентирует внимание на различных аспектах формирования, функционирования и оценки инновационных систем.

Институциональный подход, представленный работами Б.-А. Лундвалла, К. Фримена и их последователей, рассматривает институты (формальные и неформальные) как фундаментальный элемент НИС [13][14][16]. Институты формируют правила игры, регулируют взаимодействия участников инновационного процесса и обеспечивают стабильность инновационной среды. Особое внимание уделяется механизмам возникновения, поддержания и эволюции норм, влияющих на инновационную деятельность. Механизм в широком смысле трактуется как система правил, процедур и инструментов, определяющих порядок

деятельности [1]. С экономической точки зрения механизм представляет собой совокупность инструментов воздействия на интересы хозяйствующих субъектов для достижения поставленных целей в конкретных социально-экономических условиях.

Ключевыми механизмами на различных уровнях НИС выступают экономический и организационный, взаимодействие которых образует комплексный организационно-экономический механизм. Его эффективность напрямую зависит от соответствия национальному законодательству в сфере инноваций: отсутствие адекватной правовой базы может блокировать реализацию механизмов [9]. Современные исследования подчёркивают, что качество институционального регулирования определяется комплексом механизмов — законодательным, финансовым, бюджетно-налоговым, денежно-кредитным — и степенью их адаптации к рыночным требованиям и влияния на подсистемы НИС [18][32].

Системный подход акцентирует внимание на совокупности взаимосвязанных элементов и подсистем НИС: предпринимательский сектор, академические и отраслевые НИИ, органы государственного управления, центры трансфера технологий, технопарки, финансовые институты [14][15]. Эффективность системы определяется наличием обратных связей и синергией между элементами, а не доминированием какой-либо одной структуры. В современных условиях глобализации и цифровизации системный подход дополняется анализом сетевых взаимодействий и региональных инновационных систем (РИС), где региональные кластеры становятся ключевыми узлами распространения инноваций [15][42].

Функциональный подход фокусируется на функциях, выполняемых элементами НИС, и их вкладе в достижение системных целей. Он предполагает последовательный анализ: определение границ системы, выявление ключевых элементов и подсистем, установление функций и оценку слабых звеньев (отсутствующих элементов или связей) [2]. Среди функций центрального правительства выделяются формирование политики, распределение ресурсов, регуляторные меры и международное сотрудничество. Совместные функции с частным сектором включают финансирование инноваций, создание сетей передачи знаний, проведение НИОКР, развитие кадрового потенциала и обеспечение инфраструктуры [2].

А. Джонсон, обобщая ряд исследований, выделила две базовые функции НИС: идентификацию проблем и выработку решений (создание нового знания), а также дополнительные функции косвенного влияния: стимулирование инноваций компаний, обеспечение ресурсами, выбор приоритетных направлений, развитие обмена знаниями, определение точек роста, создание новых рынков и преодоление барьеров нововведениям [2]. Современные подходы (2024–2025 гг.) расширяют этот перечень, включая

функции устойчивого развития, инклюзивности и адаптации к глобальным вызовам (климат, цифровизация, ИИ) [28][30][32].

***На основе анализа литературы и современных тенденций предлагается следующий набор ключевых функций НИС:***

1. Формализация и реализация индустриально-инновационной политики: разработка комплексной стратегии, охватывающей всех участников, создание эффективной законодательной базы (защита ИС, стандарты, экология), выбор приоритетов [9][24].

2. Рациональное распределение ограниченных ресурсов на НИОКР и инновации с максимальной эффективностью [21].

3. Проведение фундаментальных и прикладных исследований как основы долгосрочных инноваций [3][7].

4. Формирование и развитие человеческого капитала через систему образования и переподготовки [11][35].

5. Создание системы стимулов (финансовых и нематериальных) для инновационной активности [6].

6. Поддержка перспективных отраслей и услуг с потенциалом глобальной конкурентоспособности [29][57].

**Синтез подходов и оценка эффективности НИС**

Несмотря на обширную литературу, оценка эффективности НИС остаётся методологически сложной задачей. Отмечается недостаточная разработанность индикаторов, учитывающих входные (ресурсы), выходные (патенты, продукты) и структурные параметры системы в эпоху экономики знаний [17][43]. Сравнительный анализ НИС разных стран показывает отсутствие универсальной модели: каждая система формируется под влиянием исторических, культурных и институциональных факторов [29]. Основные сложности: сложность функциональных связей, непредсказуемость вторичных эффектов вмешательств и длительность обратных связей [27].

В Узбекистане НИС формируется в рамках Стратегии «Цифровой Узбекистан-2030» и Стратегии развития ИИ до 2030 года. Проект MUNIS (Всемирный банк) к июню 2025 г. освоил 55% бюджета (27,7 млн долл.), поддержал 287 субпроектов, мобилизовав 16,8 млн долл. частных инвестиций; к 2026 г. ожидается полное освоение [21]. IT-Парк в Ташкенте к 2025 г. оценивается в 3,9 млрд долл., число стартапов достигло 750, инвестиции выросли на 522% [16][37]. В GII-2025 Узбекистан поднялся на 79-е место среди 139 стран (7-е среди lower-middle-income), демонстрируя прогресс в предпринимательской культуре и финансировании стартапов [20][45].

**Структура НИС**

Структура НИС не фиксирована и варьируется по странам. Б.-А. Лундвалл выделяет прямые (компании, научная система, инфраструктура) и косвенные компоненты (макроэкономическая политика, образование,



рынки) [13][14]. В Узбекистане выделяются научный потенциал (организации при Министерстве высшего образования, науки и инноваций), инновационное предпринимательство, инфраструктура (технопарки, инкубаторы) и финансовая инфраструктура (государственные фонды, венчурный капитал, банки) [4][11]. Ключевые тенденции: переход от линейной к нелинейной модели, эволюционный характер систем, приоритет взаимодействию элементов, роль институтов и государства в создании условий [14][47].

В заключение, НИС Узбекистана демонстрирует динамичное развитие, интегрируя глобальные лучшие практики с национальными особенностями. Дальнейшее совершенствование требует усиления межсекторного взаимодействия, развития человеческого капитала и адаптации к вызовам ИИ и устойчивости.

Современные тенденции в развитии НИС. Глобальный контекст

В современных условиях научно-исследовательские и опытно-конструкторские разработки (НИОКР) и инновационная активность воспринимаются большинством стран как фундамент для обеспечения стабильного экономического роста и конкурентоспособности. Согласно отчету ЮНЕСКО "Technology and Innovation Report 2025", глобальные инвестиции в НИОКР достигли 2,5% мирового ВВП в 2025 году, с акцентом на ИИ и устойчивые технологии [30]. Страны, активно реализующие инновационную политику и создающие благоприятный контекст для инноваций, демонстрируют высокие темпы прогресса и конкурентоспособность на международных рынках. Для правительств многих государств НИС стали основой индустриально-инновационной политики, как указано в отчете ОЭСР "Dynamising National Innovation Systems" [63].

Глобальные кейсы иллюстрируют эффективность различных моделей. В Южной Корее модель "тройной спирали" (государство–бизнес–университеты) позволила занять 6-е место в ГИ 2025, с инвестициями в R&D на уровне 4,9% ВВП и лидерством в 5G и полупроводниках (Samsung инвестировал 20 млрд долларов в AI к 2026 году) [29][61]. Китай, с R&D на 2,5% ВВП, доминирует в ИИ (70% глобальных патентов) и зеленых технологиях, где Huawei контролирует 30% рынка 5G; к 2026 году ожидается рост экспорта высокотехнологичной продукции на 15% [29][63]. В США, несмотря на предложенные сокращения R&D на 20–57% в 2026 году, Silicon Valley остается лидером в венчурном капитале (рост на 20% к 2025), но риски отставания от Китая оцениваются в 1,5 трлн долларов ВВП за 10 лет [50][60]. Эти примеры подчеркивают роль государства в стимулировании инноваций через инвестиции и регуляции.

Значимость НИС для сырьевых экономик пример Узбекистана

Тема приобретает особую актуальность для стран с сырьевой ориентацией экономики, включая Узбекистан, где доля сырьевых секторов (нефть, газ, хлопок) превышает 40% ВВП [33]. Современная



инновационная система Узбекистана не обеспечивает условий для широкомасштабного внедрения НИОКР, разработанных отечественными учеными. По данным GII 2025, Узбекистан занимает 79-е место, отставая от лидеров по индикаторам R&D (0,6% ВВП) и патентной активности, но демонстрируя прогресс в бизнес-среде (9-е место в субпилларе Business environment) [45][1]. Активно развиваются инновационная и финансовая инфраструктуры: IT-Парк в Ташкенте к 2026 году ввел новые правила для резидентов, фокусируясь на экспорте (минимум 20% выручки), с оценкой экосистемы в 3,9 млрд долларов и 750 стартапами [60].

Однако механизмы взаимодействия элементов НИС (НИИ, бизнес, государство) не полностью сформированы. Тенденции глобального инновационного развития, включая появление сетевых взаимодействий и региональных кластеров, стимулируют интерес к организационно-экономическим механизмам НИС Узбекистана [11][36]. Кейс MUNIS: к 2026 году проект Всемирного банка (50 млн долларов) поддержал 287 субпроектов, мобилизовав 16,8 млн долларов частных инвестиций для коммерциализации исследований, что способствовало росту инновационной активности [21][10]. Аналогично, Стратегия ИИ до 2030 года предусматривает 1,5 млрд долларов в AI-продуктах к 2030, с запуском мощностей в 2026 году [20][27]. Эти инициативы, интегрированные с Green DFA, позволят диверсифицировать экономику, снижая зависимость от сырья и повышая устойчивость [40][48].

#### Заключение

Изучение и совершенствование национальных инновационных систем (НИС) продолжает оставаться одной из приоритетных задач современной экономической науки и практики государственного управления. В условиях глобальных вызовов, таких как цифровизация, климатические изменения и геополитическая нестабильность, НИС выступают ключевым механизмом обеспечения устойчивого роста и конкурентоспособности. Согласно данным Глобального инновационного индекса (GII) 2025 года, опубликованного Всемирной организацией интеллектуальной собственности (ВОИС), ведущие позиции занимают Швейцария (1-е место), Швеция (2-е), США (3-е), Великобритания (4-е) и Сингапур (5-е), где высокая интеграция R&D с бизнес-сектором и институциональная поддержка способствуют инновационному лидерству [45]. Общий объем глобальных инвестиций в инновации превысил 3,5 трлн долларов в 2025 году, с акцентом на ИИ, зеленые технологии и биотехнологии, что подчеркивает необходимость адаптации НИС к этим тенденциям [17].

Для Узбекистана предлагаемые рекомендации по развитию НИС включают усиление международного сотрудничества в рамках UNSDCF 2026–2030, с акцентом на инновационное предпринимательство среди молодежи и женщин, что позволит расширить доступ к финансированию, менторству и акселераторам [31][30]. Необходима ускоренная интеграция

ИИ в реальный сектор экономики, включая запуск вычислительных мощностей к маю 2026 года и создание 10 AI-лабораторий в соответствии со Стратегией развития ИИ до 2030 года [27][22]. Развитие регуляторных песочниц для тестирования инноваций, продвижение зеленых инвестиций через Green DFA (оценка ежегодных нужд в зеленом переходе на уровне 8–10% ВВП) и укрепление межсекторного взаимодействия (государство–бизнес–университеты) также являются приоритетами [40][32]. Эти меры опираются на анализ Green DFA, который подчеркивает необходимость мобилизации 18–20 млрд долларов ежегодно для декарбонизации и адаптации, с фокусом на энергетику и инфраструктуру [40].

Критический анализ демонстрирует, что без гармоничного сочетания глобальных трендов (цифровизация, устойчивость) и национальных особенностей (социокультурных, институциональных), НИС рискует отставанием. В качестве примера можно привести США, где сокращение федерального финансирования R&D на 20% в бюджете 2026 года (предложение администрации Трампа) может привести к потере 700 млрд долларов ВВП за 10 лет и снижению производительности, как прогнозирует ITIF [50][59]. Аналогично, в Узбекистане игнорирование этих аспектов может усугубить зависимость от сырьевых секторов. Реализация предложенных мер позволит Узбекистану улучшить позиции в ГИ (с 83-го в 2024 году до 79-го в 2025-м, 7-е среди lower-middle-income стран) и достичь целей устойчивого развития, включая удвоение доли цифровой экономики в ВВП к 2030 году [45][1][22].

Стратегия развития НИС каждой страны формируется под влиянием государственной политики в области индустриального и инновационного развития, нормативно-правового регулирования, механизмов прямого и косвенного стимулирования, научно-технического потенциала, уровня развития внутренних рынков товаров, труда и капитала, а также уникальных культурно-исторических традиций. В глобальном контексте, по данным ОЭСР, эффективные НИС способствуют росту ВВП на 1–2% ежегодно за счет инноваций [38]. Для Узбекистана это подразумевает интеграцию в глобальные цепочки создания стоимости, как в проекте MUNIS Всемирного банка, где к 2026 году ожидается полное освоение 50 млн долларов на поддержку 300+ субпроектов по коммерциализации исследований [21][10].

В заключение, развитие НИС Узбекистана требует комплексного подхода, учитывающего глобальные уроки и национальные специфики. Реализация рекомендаций позволит стране достичь целей "Узбекистан-2030", включая 240 млрд долларов ВВП и лидерство в региональной цифровизации [33][25].

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## **AKSIOLOGIK YONDASHUV ASOSIDA KURSANTLARDA FUQAROLIK KOMPETENSIYASINI TAKOMILLASHTIRISHDA TIZIMLI, KOMPLEKS VA INDIVIDUAL YONDASHUVLARNING METODOLOGIK ASOSLARI**

**Annotatsiya:** Maqolada aksiologik yondashuv asosida kursantlarda fuqarolik kompetensiyasini takomillashtirishning nazariy-metodologik asoslari tahlil qilingan. Pedagogik strategiyalarni loyihalashda qo'llaniladigan tizimli, kompleks va individual yondashuvlar chuqur o'rganilgan. Ushbu yondashuvlarning mohiyati, tamoyillari, afzallik va kamchiliklari, shuningdek, ularni O'zbekiston ta'lim tizimi sharoitiga moslashtirish imkoniyatlari yoritilgan. Fuqarolik kompetensiyasini shakllantirish tizimining modeli ishlab chiqilgan va uni amaliyotga joriy etish mexanizmlari bayon etilgan. Tadqiqot natijalari yuqori samarali pedagogik strategiyalarni ishlab chiqishga metodologik asos yaratadi hamda O'zbekistonda fuqarolik jamiyatini rivojlantirishga xizmat qiladi.

**Kalit so'zlar:** aksiologik yondashuv, fuqarolik kompetensiyasi, tizimli yondashuv, kompleks yondashuv, individual yondashuv, pedagogik strategiya, kursant, ta'lim tizimi, integratsiya, shaxsga yo'naltirilgan ta'lim

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## **METHODOLOGICAL FOUNDATIONS OF SYSTEMIC, КОМПЛЕКСНОГО AND INDIVIDUAL APPROACHES TO IMPROVING CIVIC COMPETENCE OF CADETS BASED ON THE AXIOLOGICAL APPROACH**

**Abstract:** The article analyzes the theoretical and methodological foundations for improving civic competence among cadets based on the axiological approach. The systemic, comprehensive, and individual approaches used in designing pedagogical strategies are examined in detail. Their essence, principles,



*advantages, and limitations are discussed, as well as the possibilities of adapting them to the conditions of the educational system of Uzbekistan. A model for the formation of civic competence is developed, and mechanisms for its practical implementation are described. The research results provide a methodological basis for developing effective pedagogical strategies and contribute to the development of civil society in Uzbekistan.*

**Keywords:** *axiological approach, civic competence, systemic approach, comprehensive approach, individual approach, pedagogical strategy, cadet, educational system, integration, learner-centered education*

Aksiologik yondashuvga asoslangan holda kursantlarda fuqarolik kompetensiyasini takomillashtirish – zamonaviy pedagogikaning muhim vazifalaridan biri hisoblanadi. Ushbu jarayon samarali bo‘lishi uchun pedagogik strategiyalarni ishlab chiqishda muayyan metodologik asoslarga tayanish zarur. Mazkur paragrafda biz aynan shu masalaga e’tibor qaratamiz va kursantlarda fuqarolik kompetensiyasini takomillashtirishga yo‘naltirilgan pedagogik strategiyalarni loyihalashtirishda qo‘llaniladigan uchta asosiy yondashuvni - tizimli, kompleksli va individual yondashuvlarni chuqur tahlil qilamiz. Biz ushbu yondashuvlarning mohiyatini, tamoyillarini, afzalliklari va kamchiliklarini, shuningdek, O‘zbekiston ta’lim tizimiga moslashuvchanligini ko‘rib chiqamiz. Bundan tashqari, mazkur yondashuvlarning amaliyotga joriy etish mexanizmlari ham batafsil yoritib beriladi. Ushbu tahlilning maqsadi - yuqori samarali pedagogik strategiyalarni ishlab chiqish uchun metodologik asos yaratish va O‘zbekistonda fuqarolik jamiyatini rivojlantirishga hissa qo‘shishdir.

Tizimli yondashuv – bu obyektlarni o‘zaro bog‘langan elementlar majmui sifatida ko‘rib chiqadigan ilmiy metodologiya bo‘lib, ularning yaxlitligini ta’minlaydi. Ta’lim sohasida tizimli yondashuv XX asrning o‘rtalarida o‘z rivojlanishini topdi va u ta’lim tizimiga yaxlitlik va maqsadlilikni kiritishga imkon berdi.

Tizimli yondashuvning tarixi, rivojlanishi va asosiy vakillari: Tizimli yondashuvning shakllanishiga Lyudvig fon Bertalanfi, Norbert Viner, Uilyam Ross Eshbi kabi olimlar katta hissa qo‘shgan. Bertalanfi umumiy tizimlar nazariyasining asoschisi hisoblanadi, Viner esa kibernetika sohasida ish olib borgan va boshqaruv tizimlarining asosiy tamoyillarini ishlab chiqqan.

Umumiy tizimlar nazariyasi va uning ta’limga tatbiqi: Umumiy tizimlar nazariyasi turli xil tabiatdagi tizimlarning tuzilishi, funksiyalari va rivojlanishining umumiy qonuniyatlarini o‘rganadi. Ta’limga nisbatan bu nazariya, ta’lim jarayonini o‘zaro bog‘liq elementlardan tashkil topgan yaxlit tizim sifatida ko‘rib chiqishga imkon beradi. Bunda ta’lim maqsadi, o‘quv mazmuni, metodlar, vositalar va tashkiliy shakllar o‘rtasida uyg‘unlik ta’minlanadi.

Ta’lim tizimining tashqi muhit bilan o‘zaro ta’siri: Ta’lim tizimi tashqi muhit bilan doimiy o‘zaro ta’sirda bo‘ladi. Ijtimoiy, iqtisodiy, siyosiy va

madaniy omillar ta'lim tizimining maqsadlari, mazmuni, metodlari va tashkiliy shakllariga ta'sir qiladi. Masalan, jamiyatning rivojlanish darajasi, mehnat bozorining talablari, davlatning ta'lim siyosati va milliy qadriyatlar ta'lim tizimining yo'nalishini belgilaydi.

Ta'lim tizimining barqarorligi va rivojlanishini ta'minlash mexanizmlari: Ta'lim tizimining barqarorligi va rivojlanishini ta'minlash uchun quyidagi mexanizmlar muhim ahamiyatga ega:

boshqaruv: Ta'lim tizimining maqsadlarini belgilash, resurslarni taqsimlash, jarayonlarni nazorat qilish va natijalarni baholash;

rejalashtirish: Ta'limning uzoq muddatli va qisqa muddatli rejalarini ishlab chiqish;

moliya: Ta'limni moliyalashtirish, resurslarni taqsimlash va ulardan samarali foydalanish;

kadrlar: Malakali o'qituvchilar va rahbarlarni tayyorlash, ularning malakasini oshirish va ularni rag'batlantirish;

innovatsiyalar: Ta'lim tizimiga yangi texnologiyalar, metodlar va dasturlarni joriy etish.

Fuqarolik kompetensiyasini shakllantirish tizimining modeli quyidagi elementlarni o'z ichiga oladi:

Maqsad: Kursantlarda fuqarolik kompetensiyasini shakllantirish, ularning jamiyatda faol va mas'uliyatli ishtirok etishini ta'minlash.

Vazifalar:

kursantlarga fuqarolik jamiyati, inson huquqlari va davlat tuzilishi haqida bilim berish;

ularda muloqot, muzokara va qaror qabul qilish kabi fuqarolik ko'nikmalarini shakllantirish;

ularda vatanparvarlik, adolat, hurmat va mas'uliyat kabi fuqarolik qadriyatlarini tarbiyalash.

Mazmun: O'quv dasturlari, darsliklar, qo'llanmalar va boshqa o'quv materiallari.

Metodlar: Interfaol darslar, munozaralar, loyihalar, simulyatsiyalar, ekskursiyalar va o'yinlar.

Shakllar: Darslar, seminarlar, to'garaklar, klublar, konferensiyalar, aksiyalar va boshqa tadbirlar.

Vositalar: O'quv materiallari, texnik vositalar, internet resurslari va boshqa vositalar.

Natija: Fuqarolik kompetensiyasiga ega bo'lgan, jamiyatda faol va mas'uliyatli ishtirok etadigan, vatanparvarlik, adolat va hurmat kabi qadriyatlarga ega bo'lgan kursantlar.

Ushbu tizimning elementlari o'rtasida o'zaro bog'liqlik mavjud. Masalan, maqsadga erishish uchun muayyan vazifalarni bajarish, muayyan mazmunni o'zlashtirish, muayyan metodlar va shakllardan foydalanish zarur.

Tizimning tashqi muhit bilan o‘zaro ta’siri ham muhim ahamiyatga ega. Jamiyatning talablari, davlatning siyosati va madaniy qadriyatlar fuqarolik kompetensiyasini shakllantirish tizimiga ta’sir qiladi.

Tizimli yondashuv pedagogik strategiyalarni ishlab chiqishda bir qator afzalliklarni taqdim etadi:

- ta’lim jarayonini yaxlit ko‘rish imkoniyati;
- strategiyaning barcha elementlari o‘zaro bog‘langanligini ta’minlash;
- strategiyaning samaradorligini oshirish;
- natijalarni aniq baholash imkoniyati;
- Biroq, tizimli yondashuvning kamchiliklari ham mavjud:
- Murakkablik;
- ko‘p vaqt talab qilishi;
- statiklik (tizim o‘zgarishlarga moslashmasligi mumkin).

O‘zbekiston ta’lim tizimida tizimli yondashuvni qo‘llashda quyidagi xususiyatlarni hisobga olish zarur:

O‘zbekiston ta’lim tizimining tuzilishi, boshqaruv tizimi va o‘ziga xos xususiyatlari;

tizimli yondashuvni O‘zbekiston ta’lim tizimiga moslashtirish yo‘llari;

Kompleksli yondashuv – bu hodisalarni faqatgina alohida elementlar yig‘indisi sifatida emas, balki ularning o‘zaro bog‘liqligi va ta’sirini hisobga olgan holda o‘rganishni nazarda tutuvchi metodologik prinsipdir. Ta’limda kompleksli yondashuv o‘quv jarayoniga ta’sir etuvchi turli omillarni hisobga olish, fanlararo aloqalarni o‘rnatish va o‘quvchilarda yaxlit dunyoqarashni shakllantirishga qaratilgan.

Kompleksli yondashuvning tarixi, rivojlanishi va asosiy vakillari: Kompleksli yondashuvning ildizlari qadimgi falsafaga borib taqaladi, ammo uning ilmiy metod sifatida shakllanishi XX asrda tizimli yondashuv, kibernetika va informatsion nazariyaning rivojlanishi bilan bog‘liq. Edgar Moren, Talcott Parsons, Pyotr Anoxin kabi olimlar kompleksli yondashuvning rivojlanishiga katta hissa qo‘shgan.

Bilish nazariyasi va ijtimoiy bilishning ahamiyati: Kompleksli yondashuv bilish nazariyasiga asoslanadi, bu nazariya bilimning shakllanishi, tuzilishi va rivojlanish qonuniyatlarini o‘rganadi. Ijtimoiy bilish esa shaxsning ijtimoiy muhit, madaniyat va jamiyat bilan o‘zaro ta’siri orqali bilim olish jarayonini o‘rganadi. Ta’limda ijtimoiy bilishning ahamiyati o‘quvchilarda ijtimoiy tajriba, qadriyatlar va me’yorlarni o‘zlashtirishni ta’minlashda namoyon bo‘ladi.

Ta’limga sotsiologik yondashuv va uning roli: Sotsiologik yondashuv ta’limni ijtimoiy hodisa sifatida ko‘rib chiqadi va jamiyatning ta’limga ta’sirini o‘rganadi. Sotsiologik yondashuv ta’limning ijtimoiy funktsiyalari, ta’limdagi tengsizlik, ta’limning ijtimoiy mobillikka ta’siri kabi masalalarni tahlil qilish imkonini beradi.

Ta’lim jarayoniga ta’sir etuvchi omillarni kompleks tahlil qilish quyidagilarni o‘z ichiga oladi:

ijtimoiy omillar: Ijtimoiy tuzum, siyosiy barqarorlik, iqtisodiy rivojlanish, demografik vaziyat, migratsiya kabi omillar ta'limning maqsadlari, mazmuni va sifatiga ta'sir qiladi;

iqtisodiy omillar: Ta'limni moliyalashtirish darajasi, mehnat bozorining talablari, aholining turmush darajasi ta'limning imkoniyatlari va o'quvchilarning motivatsiyasiga ta'sir etadi;

siyosiy omillar: Davlatning ta'lim siyosati, ta'lim qonunchiligi, siyosiy barqarorlik ta'lim tizimining rivojlanish yo'nalishini belgilaydi;

madaniy omillar: Milliy qadriyatlar, an'analar, urf-odatlar va ma'naviyat ta'lim mazmuni va metodlariga ta'sir qiladi.

Fuqarolik kompetensiyasini shakllantirishda turli fanlarning integratsiyasi o'quvchilarda yaxlit dunyoqarashni shakllantirish va ularning ijtimoiy hayotda faol ishtirok etishiga tayyorlashga yordam beradi.

Tarix, huquq, siyosatshunoslik, sotsiologiya, falsafa, psixologiya va pedagogikaning integratsiyasi: Ushbu fanlar fuqarolik kompetensiyasining turli jihatlarini o'rganadi va ularning integratsiyasi o'quvchilarga fuqarolik haqida to'liq tasavvur beradi.

Fanlararo aloqalarni o'rnatish metodlari: Fanlararo aloqalarni o'rnatish uchun quyidagi metodlardan foydalanish mumkin:

integratsiyalashgan darslar o'tkazish;

fanlararo loyihalar tashkil etish;

turli fanlarga oid materiallardan foydalanish;

muammoli ta'lim metodlaridan foydalanish.

Fuqarolik kompetensiyasini shakllantirishga oid integratsiyalashgan o'quv dasturlarini yaratish: Fuqarolik kompetensiyasini shakllantirishga oid integratsiyalashgan o'quv dasturlari o'quvchilarga turli fanlar orqali fuqarolik haqida bilim berish va ularda fuqarolik ko'nikmalarini shakllantirishga qaratilgan bo'lishi kerak.

Pedagogik strategiyalarni ishlab chiqishda kompleksli yondashuv quyidagi afzalliklarni taqdim etadi: ta'lim jarayoniga ta'sir etuvchi barcha omillarni hisobga olish imkoniyati; turli fanlarning integratsiyasi; o'quv jarayonining qiziqarli va samarali bo'lishini ta'minlash; kursantlarning bilimlarini kengaytirish va ularning dunyoqarashini shakllantirish.

Biroq, kompleksli yondashuvning kamchiliklari ham mavjud: murakkablik; ko'p vaqt talab qilishi; koordinatsiya qiyinligi; integratsiya uchun yetarli shart-sharoitlar mavjud emasligi.

O'zbekiston ta'lim tizimida kompleksli yondashuvni qo'llashda quyidagi xususiyatlarni hisobga olish zarur:

O'zbekistonning ijtimoiy, iqtisodiy, siyosiy va madaniy sharoitlari.

Kompleksli yondashuvni O'zbekiston ta'lim tizimiga moslashtirish yo'llari.

Amaliy misollar (O'zbekiston ta'lim tizimida kompleksli yondashuv asosida amalga oshirilgan loyihalar).

Misol uchun, O'zbekistonda "Milliy tiklanishdan – milliy yuksalish sari" g'oyasi asosida amalga oshirilayotgan islohotlar, ta'lim sohasida kompleksli yondashuvni qo'llashning namunasidir. Bu islohotlar ta'limning milliy qadriyatlarga asoslanganligi, jamiyatning ehtiyojlariga mosligi va o'quvchilarning har tomonlama rivojlanishini ta'minlashga qaratilgan.

Individual yondashuv - bu ta'lim jarayonida har bir o'quvchining o'ziga xos xususiyatlarini (qobiliyatlari, qiziqishlari, ehtiyojlari, tajribasi) hisobga olishga qaratilgan prinsipdir. Individual yondashuv o'quv jarayonini har bir o'quvchining individual xususiyatlariga moslashtirish va ularning shaxsiy rivojlanishiga ko'maklashishga qaratilgan.

Individual yondashuvning tarixi, rivojlanishi va asosiy vakillari: Individual yondashuvning ildizlari qadimgi pedagogikaga borib taqaladi, ammo uning ilmiy asoslari XX asrda shaxs psixologiyasi, differensial psixologiya va pedagogik psixologiyaning rivojlanishi bilan bog'liq. Jan-Jak Russo, Iogann Geynrix Pestalotsi, Mariya Montessori kabi pedagoglar individual yondashuvning rivojlanishiga katta hissa qo'shgan.

Shaxs psixologiyasi, differensial psixologiya va pedagogik psixologiyaning ahamiyati: Shaxs psixologiyasi shaxsning tuzilishi, rivojlanishi va xususiyatlarini o'rganadi. Differensial psixologiya odamlar o'rtasidagi individual farqlarni o'rganadi. Pedagogik psixologiya ta'lim jarayonining psixologik asoslarini o'rganadi. Ushbu fanlarning bilimlari individual yondashuvni amalga oshirish uchun zarurdir.

Ta'limga shaxsga yo'naltirilgan yondashuv va uning tamoyillari: Ta'limga shaxsga yo'naltirilgan yondashuv individual yondashuvning zamonaviy shakli bo'lib, u quyidagi tamoyillarga asoslanadi:

shaxsni hurmat qilish: Har bir o'quvchi noyob shaxs ekanligini tan olish va uni hurmat qilish;

individuallikni hisobga olish: Har bir o'quvchining qobiliyatlarini, qiziqishlarini va ehtiyojlarini hisobga olish;

faoliyatga yo'naltirilganlik: O'quv jarayonida o'quvchining faol ishtirokini ta'minlash;

hamkorlik: O'quvchi va o'qituvchi o'rtasida hamkorlik munosabatlarini o'rnatish;

ijodkorlik: O'quvchilarda ijodiy qobiliyatlarni rivojlantirish.

Kursantlarning individual xususiyatlarini aniqlash uchun turli xil metodlardan foydalanish mumkin:

Qobiliyatlarni, qiziqishlarni, ehtiyojlarni, tajribani, o'rganish uslublarini va motivatsiyani aniqlash metodlari:

testlar: Intellekt, qobiliyatlar, shaxsiy xususiyatlarni aniqlash uchun;

so'rovnomalar: Qiziqishlar, ehtiyojlar va motivatsiyani aniqlash uchun;

kuzatuv: O'quv jarayonida o'quvchilarning xatti-harakatlarini kuzatish;

suhbat: O'quvchilar bilan individual suhbat o'tkazish, ularning fikrlarini bilish.

Har bir kursantning o'ziga xos "ta'lim yo'nalishini" yaratish: Olingan ma'lumotlar asosida har bir kursant uchun individual ta'lim yo'nalishi tuziladi, bu ularning qobiliyatlarini rivojlantirish va ehtiyojlarini qondirishga yordam beradi.

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## ПОНЯТИЕ И ЗНАЧЕНИЕ МЕР ПРЕСЕЧЕНИЯ В УГОЛОВНОМ СУДОПРОИЗВОДСТВЕ

**Аннотация:** статья посвящена институту мер пресечения в уголовном судопроизводстве Российской Федерации. Рассматриваются цели, виды и порядок применения мер пресечения, подчеркивается необходимость балансирования между обеспечением надлежащего ведения процесса и соблюдением прав и свобод личности.

**Ключевые слова:** меры пресечения, личное ограничение, гарантия правосудия, свобода личности, выбор меры, эффективность расследования, процессуальные нормы, превентивные меры, юридическое регулирование.

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## THE CONCEPT AND SIGNIFICANCE OF PRESERVATIVE MEASURES IN CRIMINAL PROCEEDINGS

**Abstract:** This article examines the concept of preventive measures in criminal proceedings in the Russian Federation. It examines the purposes, types, and procedures for applying preventive measures, emphasizing the need to balance the proper conduct of proceedings with respect for individual rights and freedoms.

**Keywords:** preventive measures, personal restraint, guarantee of justice, individual freedom, choice of measure, investigation effectiveness, procedural rules, preventive measures, legal regulation.

Меры пресечения в уголовном судопроизводстве Российской Федерации выполняют ключевую функцию: обеспечивают надлежащее ведение процесса, предотвращают препятствия для расследования и гарантируют явку подозреваемых либо обвиняемых в суд. Применяемые ограничения стабилизируют ситуацию до вынесения окончательного судебного решения.

Цели мер пресечения строго определены: предупреждение новых преступлений, недопущение уклонения от правосудия и вмешательства в установление истины, включая влияние на свидетелей и доказательства. Перечень мер пресечения в российском праве включает заключение под стражу, домашний арест и иные формы ограничения, выбираемые с учетом обстоятельств дела.

В большинстве зарубежных правопорядков меры пресечения характеризуются как временные ограничения личной свободы, имущественных прав либо отдельных свобод подозреваемого или обвиняемого, применяемые при наличии законодательно закреплённых оснований и условий. Как в континентальных, так и в англосаксонских правовых системах закрепляется общая идея, согласно которой любое вмешательство в сферу личной свободы допустимо лишь при наличии разумного подозрения в совершении преступления и при доказанности конкретных рисков, связанных с уклонением от правосудия, воздействием на свидетелей, уничтожением доказательств или повторным совершением преступления. Тем самым понятие мер пресечения в зарубежном уголовном процессе неразрывно связано с конституционными гарантиями личной свободы, правом на справедливое судебное разбирательство и требованием соразмерности вмешательства государства в сферу частной жизни.

Значение мер пресечения в зарубежных странах проявляется прежде всего в их роли для обеспечения устойчивости и управляемости уголовного судопроизводства. Без действенного механизма процессуального принуждения органы расследования и суд лишились бы возможности гарантировать явку обвиняемого, защиту потерпевших и свидетелей, сохранность доказательств, соблюдение процессуальных сроков. Меры пресечения позволяют минимизировать риск срыва судебного разбирательства, создать условия для всестороннего исследования обстоятельств дела и последующей реализации приговора. В этом смысле они выполняют функцию организационного стержня предварительного расследования и судебной стадии, связывая воедино интересы публичного преследования и процессуальные гарантии личности.

Уголовно процессуальный Кодекс Российской Федерации содержит специализированную главу 13, где систематизированы меры пресечения. Несмотря на значительный массив норм о мерах пресечения, законодатель не закрепил их дефиницию. Закон содержит лишь перечень видов, оснований, целей, условий избрания, процессуального порядка оформления и сопутствующих элементов.

В теории права используется родовая категория мер государственного принуждения. В ее составе обычно разграничивают меры предупреждения, меры пресечения и меры ответственности, образующие общую конструкцию принуждения. Для уголовно-процессуальных отношений указанная схема неприменима: в УПК РФ

действует собственная система, где раздел 4 посвящен мерам процессуального принуждения и, помимо мер пресечения, включает задержание подозреваемого и иные инструменты [9, с. 177].

«Структура элементов принуждения в уголовно-процессуальной сфере вызывает активные дискуссии. Одни авторы отвергают выделение задержания как самостоятельной меры принуждения. Другие предлагают пересмотреть перечень иных мер, пригодных для применения не только к подозреваемому либо обвиняемому, но и к свидетелю, потерпевшему, эксперту и иным участникам. Вместе с тем исследователи почти единодушно настаивают на законодательном закреплении понятийного аппарата, включая понятие мер пресечения» [2].

Обзор научных работ подтверждает наличие узко ограничительных задач, связанных с регулированием общественных отношений в сфере уголовного процесса.

И.М. Алексеев и А.В. Соболев «определяют меры пресечения как один из видов мер уголовно-процессуального принуждения, которые могут применяться уполномоченными должностными лицами, осуществляющими уголовное судопроизводство, с целью наложения на подозреваемого (обвиняемого) ограничений отдельных прав, включая права на свободу, свободу передвижения, мер имущественного и другого характера для минимизации возможности скрыться от органов следствия и суда, повторного совершения преступлений, воздействия на иных участников уголовного судопроизводства» [1, с. 175].

Отдельные авторы, как например А.А. Касымов «указывают, что меры пресечения необходимо ассоциировать с процессуальными средствами, которые ограничивают личную свободу подозреваемого (обвиняемого) и применяются с целью предотвращения возможности процессуальных нарушений с его стороны» [4, с. 88].

По нашему мнению, указанный подход к пониманию мер пресечения представляется не полным, так как не охватывает всех целей мер пресечения, которые предусматриваются положениями уголовно-процессуального законодательства РФ.

И.Д. Мальцагов в своей статье предлагает понимать под мерами пресечения «законодательно закрепленные средства, с помощью которых следователь, дознаватель, иные должностные лица органов расследования и суда обеспечивают должное поведение подозреваемого (обвиняемого), в том числе, связанное с необходимостью его явки в органы расследования, суд, а также для обеспечения исполнения приговора суда» [7, с. 60].

Процессуальная значимость мер пресечения обусловлена важностью правильного выбора конкретной меры, исходя из обстоятельств дела и особенностей личности обвиняемого. Тем не менее, существующие нормы УПК РФ вызывают целый ряд вопросов и нуждаются в дополнительном изучении и уточнении.

Как справедливо замечает Л.В. Кокорева, ч. 1 ст. 99 УПК РФ фиксирует обстоятельства, подлежащие учету при выборе меры пресечения, однако, ситуация складывается иначе, когда речь идет о резонансных событиях с большим числом пострадавших. Такие ситуации требуют включения в норму фактора тяжести последствий, вызванных действиями обвиняемого [5, с. 102]. Это означает, что при определении меры пресечения следует учитывать не только формальные характеристики правонарушения, но и реальные последствия, вызвавшие большой общественный резонанс.

«Для углубленного понимания института мер пресечения в сфере уголовно-процессуальных отношений целесообразно обратиться к нормам УПК РФ. Базовой нормой выступает ст. 97 УПК РФ, озаглавленная как основания избрания меры пресечения. В ней предусмотрено, что следователь, дознаватель и суд вправе применить к подозреваемому либо обвиняемому меры, перечень которых установлен ст. 98 УПК РФ. Применение допускается при наличии оснований полагать, что лицо будет уклоняться от следственных органов или суда, продолжит преступную деятельность, либо окажет давление на участников судопроизводства с целью воспрепятствовать эффективному расследованию уголовного дела» [5].

Законодатель не формулирует дефиницию мер пресечения, ограничиваясь целями и условиями их использования. Дополнительно внимание привлекает терминологический оборот «при наличии достаточных оснований полагать». Указанная формула носит оценочный характер и нуждается в уточнении содержания.

«Любая мера, предусмотренная УПК РФ, неизбежно влечет ограничения для лица, к которому она применена. Механизм ограничения корреспондирует Конституции РФ: ст. 55 допускает ограничение отдельных прав граждан для обеспечения основ конституционного строя, нравственности, здоровья, прав и законных интересов других лиц, обороны страны и безопасности государства. Уголовно-процессуальные отношения подпадают под перечисленные критерии, поэтому в УПК РФ закреплена соответствующая ограничительная процедура» [6, с. 118].

Необходимо отметить, что «похожие институты существуют и в иных отраслях законодательства. В частности, при регулировании административно-правовых отношений, также могут иметь меры пресечения, а также сходные с ними меры процессуального обеспечения по делам об административных правонарушениях. К примеру, заключение под стражу можно сравнить с административным задержанием, которое также ограничивает несколько прав граждан, а именно право на свободу и право передвижения с целью обеспечения эффективности деятельности заинтересованных должностных лиц государственных органов» [8, с. 59].

Анализ ряда исследований позволило выявить определенные элементы, которые, по нашему мнению, должны фигурировать в понятии

мер пресечения. В частности, это «их ограничительная природа, обязательное применение в установленном процессуальном порядке, возможность применения только к подозреваемому (обвиняемому), а также только уполномоченными должностными лицами, среди которых следователь, дознаватель или суд» [2].

В связи с этим, «под уголовно-процессуальными мерами пресечения следует понимать установленный уголовно-процессуальным законодательством механизм ограничения отдельных прав подозреваемого (обвиняемого), который может применяться только уполномоченными должностными лицами (следователем, дознавателем или судом) на основании установленных нормами УПК РФ процессуального порядка в целях обеспечения невозможности подозреваемого (обвиняемого) скрыться от органов расследования и суда, исключения возможности продолжения преступной деятельности, а также минимизации воздействия на иных участников уголовного процесса с целью воспрепятствования достижения целей уголовного судопроизводства» [3].

Правильное применение мер пресечения требует баланса между необходимостью обеспечения порядка в уголовном процессе и защитой прав и свобод личности. Это означает, что такие меры должны быть обоснованными, соразмерными и ограниченными минимально возможным вмешательством в личные права. В каждом конкретном случае необходимо тщательно оценивать, будет ли менее строгая мера достаточной для достижения целей правосудия.

Таким образом, меры пресечения служат важным инструментом в системе уголовного правосудия РФ, обеспечивая его эффективное функционирование и поддержание законности и порядка в процессе. Их применение отражает стремление к справедливому разрешению уголовных дел при одновременном уважении прав человека и основополагающих принципов правового государства.

Следует отметить и политико-правовой аспект значения мер пресечения, который выражается в их влиянии на доверие общества к системе правосудия. Чрезмерно мягкая практика применения мер пресечения может восприниматься как угроза общественной безопасности и неэффективность уголовной юстиции, тогда как чрезмерно жёсткая, ориентированная на широкое использование заключения под стражу, способна подорвать авторитет суда и вызвать представление о репрессивном характере государственно-правовой системы.

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# СОВРЕМЕННЫЕ ТЕХНОЛОГИИ УПРАВЛЕНИЯ ОРГАНИЗАЦИЕЙ

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## ТРАНСФОРМАЦИЯ ВНЕШНЕЭКОНОМИЧЕСКИХ СТРАТЕГИЙ РОССИЙСКИХ КОМПАНИЙ В УСЛОВИЯХ САНКЦИОННОГО ДАВЛЕНИЯ: ПЕРЕОРИЕНТАЦИЯ НА РЫНКИ ГЛОБАЛЬНОГО ЮГА И БРИКС (2022–2024)

**Аннотация:** В статье исследована трансформация внешнеэкономических стратегий российского бизнеса в 2022–2024 годах под влиянием беспрецедентного санкционного давления. На основе зеркальной торговой статистики таможенных служб КНР и Индии установлено, что совокупный товарооборот России с ключевыми партнёрами БРИКС вырос за период 2021–2024 годов на 95%, достигнув 326 млрд долл. Вместе с тем выявлен преимущественно экстенсивный и сырьевой характер переориентации: доля углеводородов в экспорте в Китай превышает 73%, в Индию — 85%, тогда как несырьевой экспорт не превышает 12–15%. Проанализированы институциональные механизмы адаптации — параллельный импорт, де-долларизация расчётов (95% торговли с Китаем переведено в рубли и юани к августу 2024 г.), альтернативные платёжные архитектуры. Определены ключевые структурные ограничения: дефицит пропускной способности Восточного полигона РЖД, вторичные санкции США и нарастающий торговый дисбаланс с партнёрами.

**Ключевые слова:** санкции; БРИКС; Глобальный Юг; внешнеэкономическая стратегия; геоэкономическая фрагментация; параллельный импорт; де-долларизация; Восточный полигон.

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# TRANSFORMATION OF RUSSIAN COMPANIES' FOREIGN ECONOMIC STRATEGIES UNDER SANCTIONS PRESSURE: REORIENTATION TOWARDS GLOBAL SOUTH AND BRICS MARKETS (2022–2024)

**Abstract:** *The article examines the transformation of Russian business foreign economic strategies in 2022–2024 under unprecedented sanctions pressure. Based on mirror trade statistics from Chinese and Indian customs authorities, it is established that Russia's total trade turnover with key BRICS partners grew by 95% over 2021–2024, reaching \$326 billion. However, the reorientation is predominantly extensive and commodity-driven: hydrocarbons account for over 73% of exports to China and 85% to India, while non-commodity exports remain below 12–15%. Institutional adaptation mechanisms are analysed — parallel imports, de-dollarisation (95% of China trade shifted to rubles and yuan by August 2024), and alternative payment architectures. Key structural constraints are identified: capacity deficit of the Eastern Railway Corridor, US secondary sanctions, and growing trade imbalances with partners.*

**Keywords:** *sanctions; BRICS; Global South; foreign economic strategy; geoeconomic fragmentation; parallel imports; de-dollarisation; Eastern Railway Corridor.*

## 1. Введение

Введение антироссийских санкций в 2022–2024 годах — по охвату и темпам нарастания беспрецедентных в новейшей истории мировой экономики — повлекло за собой радикальную перестройку внешнеэкономических связей Российской Федерации. К началу 2025 года против России было введено свыше 16 000 санкционных мер, что делает её наиболее санкционированной страной мира в абсолютном выражении. Отключение от системы SWIFT, «заморозка» валютных резервов, секторальные ограничения в энергетике и технологическом импорте сформировали принципиально новую институциональную среду для российских участников внешнеэкономической деятельности (ВЭД).

Реакцией делового сообщества и государства стала стратегия «поворота на Восток» и «разворота к Глобальному Югу» — переориентация торговых, логистических и финансовых потоков в направлении стран БРИКС и их партнёров. Вместе с тем, несмотря на очевидные успехи краткосрочной адаптации, дискуссионным остаётся вопрос о качественном содержании этой трансформации: является ли она подлинной диверсификацией или лишь географическим замещением при сохранении прежней сырьевой специализации?

Цель исследования — на основе верифицированных количественных данных проанализировать динамику, товарную структуру и институциональные механизмы переориентации российского бизнеса на

рынки БРИКС в 2022–2024 годах, а также оценить структурные ограничения и перспективы устойчивости складывающейся модели.

**Гипотеза исследования:** переориентация российского экспорта на рынки Глобального Юга и БРИКС носит преимущественно экстенсивный и сырьевой характер; качественная диверсификация — увеличение доли несырьевого экспорта и технологической кооперации — пока не достигнута, что создаёт риски долгосрочной зависимости от конъюнктуры сырьевых рынков и узкого круга стран-партнёров.

## **2. Теоретические основания исследования**

### ***2.1. Геоэкономическая фрагментация и де-глобализация***

Теоретическим фундаментом исследования служит концепция геоэкономической фрагментации мировой торговли. А.П. Портанский показывает, что ослабление ВТО и распространение политически мотивированных торговых ограничений ведут к «блокизации» мировой экономики, при которой транзакционные издержки межблоковой торговли резко возрастают, однако внутриблоковая кооперация может интенсифицироваться [3]. Эта концепция задаёт контекст для понимания «поворота на Восток» не как сугубо российского феномена, но как частного случая глобального тренда.

Концепция «weaponized interdependence» (Фаррелл и Ньюман) [11] описывает механизм, при котором экономическая взаимозависимость превращается в инструмент геополитического принуждения. В условиях санкций Россия оказалась на «периферии» долларово-ориентированных сетей, что объясняет форсированный поиск альтернативных финансовых и логистических архитектур — явление, систематически наблюдаемое в эмпирическом материале настоящей работы.

### ***2.2. Региональная диверсификация ВЭД в условиях санкций***

О.В. Кузнецова и А.В. Кузнецов в работе об «Азиатском повороте» как факторе регионального развития России обосновывают тезис о том, что перенаправление экспортных потоков в восточном направлении создаёт мультипликативный эффект для приграничных регионов лишь при условии опережающего развития транспортно-логистической инфраструктуры [1]. Этот вывод остаётся методологически значимым: любая оценка «поворота на Восток» должна включать инфраструктурное измерение.

Д.И. Ушкалова в серии работ о влиянии антироссийских санкций на внешнюю торговлю 2022–2023 годов фиксирует высокий уровень адаптивности российской торговой системы при существенном удорожании транзакционных издержек и переориентации структуры импорта [5, 6]. Её аргументация о «ловушке большой страны» — невозможности полного замещения утраченных объёмов — служит важным контрапунктом оптимистичным нарративам об успехах диверсификации.

### ***2.3. Роль БРИКС в формировании альтернативных экономических архитектур***

Расширение БРИКС в 2024 году и институционализация формата БРИКС+ создают предпосылки для формирования самостоятельного экономического контура, способного снизить зависимость участников от долларовых расчётных систем [2]. Вместе с тем БРИКС остаётся сложно-составной группой с принципиально разными экономическими интересами участников: Китай, Индия и Бразилия не разделяют ни санкционного режима против России, ни стратегического интереса к полному разрыву с западными финансовыми структурами, что накладывает существенные ограничения на глубину интеграции [2].

### **3. Методология исследования**

Информационную базу составляют: данные Главного таможенного управления КНР (GACC) за 2021–2024 гг., официальные данные Министерства торговли и промышленности Индии за 2021–2024 гг., доклады ЮНКТАД об объёмах мировой торговли, данные ФТС РФ в части, находящейся в открытом доступе, а также официальные заявления Председателя Правительства РФ и Президента РФ о валютной структуре расчётов, верифицированные через «Ведомости» и ТАСС.

Применялась методология зеркальной торговой статистики: в условиях частичного закрытия российских таможенных данных после 2022 года данные об экспорте РФ восстанавливались по статистике импорта стран-партнёров (КНР, Индия). Данный метод обладает известными ограничениями — прежде всего, несопадением методик учёта (CIF против FOB) — однако является общепринятым стандартом в ситуациях непрозрачности первичных источников [5]. Временной горизонт: 2021 год (до-санкционный базовый уровень) — 2024 год (актуальные верифицированные данные).

### **4. Результаты исследования**

#### **4.1. Динамика товарооборота России со странами БРИКС (2021–2024)**

Анализ зеркальных торговых данных демонстрирует кардинальное смещение центра тяжести российской внешней торговли в сторону стран БРИКС. Совокупный товарооборот России с Китаем и Индией — двумя ключевыми азиатскими партнёрами — вырос с 158,9 млрд долл. в 2021 году до 315,4 млрд долл. в 2024 году, что соответствует росту на 98,5% (таблица 1). Доля Китая в общем товарообороте России, по данным ФТС, превысила треть всех внешнеторговых операций.

**Таблица 1 — Динамика товарооборота РФ со странами БРИКС (2021–2024 гг.), млрд долл. США**

| Страна       | 2021         | 2022         | 2023         | 2024               | Рост<br>2024/2021,<br>% |
|--------------|--------------|--------------|--------------|--------------------|-------------------------|
| Китай        | 146,9        | 190,0        | 240,1        | 244,8 <sup>1</sup> | +66,6%                  |
| Индия        | 12,0         | 37,0         | 65,0         | 70,6 <sup>2</sup>  | +488,3%                 |
| Бразилия     | 7,5          | 8,4          | 11,0         | 9,8 <sup>3</sup>   | +30,7%                  |
| ЮАР          | 1,1          | 1,2          | 1,3          | 1,3 <sup>3</sup>   | +18,2%                  |
| <b>Итого</b> | <b>167,5</b> | <b>236,6</b> | <b>317,4</b> | <b>326,5</b>       | <b>+94,9%</b>           |

<sup>1</sup> Данные ГАСС, РИА Новости, 13.01.2025. <sup>2</sup> Данные Минторгпрома Индии, РИА Новости, 12.03.2025. <sup>3</sup> Оценка по зеркальной статистике.

После феноменального роста на 29,3% в 2022 году и 26,3% в 2023 году темпы прироста российско-китайского товарооборота в 2024 году резко снизились до 1,9%. Это замедление объясняется двумя взаимосвязанными факторами: насыщением ряда сегментов двусторонней торговли и нарастающими проблемами трансграничных платежей, обусловленными усилением вторичных санкций США в отношении китайских банков, работающих с Россией.

#### **4.2. Структурный анализ: сырьевая зависимость как системный ограничитель**

Товарооборот значителен по объёму, однако его товарная структура воспроизводит традиционную сырьевую модель российского экспорта. По данным ГАСС, в 2024 году более 73% российского экспорта в Китай составляло минеральное топливо: нефть — 62,4 млрд долл., трубопроводный газ — 8 млрд долл. (+25% г/г), уголь — 8 млрд долл. (-25% г/г). Аналогичная картина характерна для российско-индийской торговли: нефть и нефтепродукты формируют около 85% российского экспорта в Индию.

Вместе с тем прослеживается ряд позитивных структурных сдвигов в несырьевых позициях: рост поставок медного концентрата (+71% г/г, до 1,47 млрд долл.), руд (+26%), алюминия (+25%), неорганической химии (+81%), удобрений (+10%). Совокупная доля этих позиций в структуре экспорта в Китай не превысила 20%, что подтверждает гипотезу об экстенсивном характере диверсификации (таблица 2).

**Таблица 2 — Товарная структура экспорта России в Китай, 2024 г.**

| Товарная группа                         | Стоимость,<br>млрд долл. | Доля в<br>экспорте | Изм. г/г |
|-----------------------------------------|--------------------------|--------------------|----------|
| Минеральное топливо (нефть, газ, уголь) | 95,0                     | 73,5%              | +0,1%    |
| — нефть и нефтепродукты                 | 62,4                     | 48,3%              | +4,8%    |
| — трубопроводный газ                    | 8,0                      | 6,2%               | +25,0%   |



|                               |              |             |                |
|-------------------------------|--------------|-------------|----------------|
| — уголь энергетический        | 8,0          | 6,2%        | –25,0%         |
| Руды и металлургическое сырьё | ~7,5         | ~5,8%       | +26,0%         |
| Алюминий и изделия            | ~2,5         | ~1,9%       | +25,0%         |
| Удобрения                     | ~3,0         | ~2,3%       | +10,0%         |
| Прочий несырьевой экспорт     | ~21,3        | ~16,5%      | разл.          |
| <b>ИТОГО</b>                  | <b>129,3</b> | <b>100%</b> | <b>ст. ур.</b> |

Источник: GACC; РБК, 23.01.2025; InfraNews, 23.01.2025. Знак «~» — оценочные данные.

#### 4.3. Институциональные механизмы адаптации

**Параллельный импорт.** Легализованный постановлением Правительства РФ №506 от 29.03.2022, механизм параллельного импорта стал первичным антикризисным инструментом, обеспечившим ввоз критически важных товаров в обход запретов правообладателей. По данным Минпромторга, в 2023 году объём поставок по этой схеме составил около 20 млрд долл. Данный механизм носит по природе своей транзитный, а не стратегический характер: он смягчает «импортный шок», но не решает проблему технологической зависимости.

**Де-долларизация расчётов.** Изменение валютной архитектуры двусторонней торговли является наиболее выраженным структурным сдвигом рассматриваемого периода. Президент РФ В.В. Путин 16 мая 2024 года констатировал, что доля рубля и юаня в российско-китайских коммерческих операциях превысила 90%; Председатель Правительства РФ М.В. Мишустин 21 августа 2024 года уточнил эту цифру — 95% [10]. Для сравнения: в 2020 году совокупная доля рубля и юаня не превышала 12%. Вместе с тем де-долларизация двусторонней торговли не равнозначна формированию полноценной резервной альтернативы: в мировом масштабе доля юаня в системе SWIFT в 2024 году составляла лишь около 4,7%.

### 5. Структурные барьеры и долгосрочные вызовы

#### 5.1. Инфраструктурный дефицит

Восточный полигон РЖД (БАМ и Транссиб) является «узким местом» всей стратегии переориентации. По оценкам ОАО «РЖД», пропускная способность полигона к 2024 году доведена до 173 млн т/год при потребности экспортёров в 230–260 млн т/год. Инвестиционная программа третьего этапа предполагает достижение 210 млн т/год к 2032 году — разрыв между спросом и предложением сохранится ещё минимум на десятилетие. Данный структурный дефицит воспроизводит вывод Кузнецовой и Кузнецова [1] об условности «азиатского поворота» без опережающей инфраструктурной политики.

#### 5.2. Вторичные санкции и проблемы трансграничных платежей

Крупнейшие государственные банки КНР (ICBC, Bank of China, China Construction Bank) с конца 2023 года фактически ограничили расчёты с российскими контрагентами под угрозой вторичных санкций США. Это, в частности, объясняет замедление товарооборота в 2024 году до 1,9% против



26,3% в 2023 году. Аналогичная ситуация наблюдается в расчётах с Турцией, Индией и рядом стран ОАЭ.

### **5.3. Структурный торговый дисбаланс**

В торговле с Китаем разрыв постепенно сокращается: экспорт (129,3 млрд долл.) лишь незначительно опережает импорт (115,5 млрд долл.), тогда как импорт растёт опережающими темпами (+4,1% г/г). Торговый дисбаланс с Индией носит исключительно острый характер: соотношение экспорта к импорту — 13,4:1 (65,7 против 4,9 млрд долл.). Россия де-факто сбывает партнёрам дисконтированные энергоносители, не получая встречного потока конкурентоспособных промышленных товаров, что подтверждает гипотезу об экстенсивном характере «разворота».

## **6. Обсуждение результатов**

Полученные результаты позволяют сформулировать два взаимодополняющих вывода. Краткосрочная успешность адаптации несомненна: торговля с Китаем и Индией компенсировала выпадение порядка 300 млрд долл. ежегодного товарооборота с «недружественными» странами. Легализация параллельного импорта и де-долларизация расчётов позволили поддержать критически важные цепочки поставок в острой фазе санкционного шока.

Однако долгосрочная устойчивость новой модели вызывает серьёзные сомнения. «Поворот на Восток» воспроизводит, а не преодолевает сырьевую структуру экономики: Россия экспортирует в БРИКС те же энергоносители и сырьё, что прежде поставляла в Европу, — только по более низким ценам и с большими транспортными затратами. Нарастающая концентрация торговли на единственном крупном партнёре — Китае — воспроизводит логику новой формы зависимости. Для превращения тактического манёвра в устойчивую долгосрочную стратегию необходима качественная компонента: рост несырьевого экспорта, производственная кооперация, создание независимой платёжно-расчётной инфраструктуры (BRICS Bridge) и опережающее развитие МТК «Север–Юг».

## **7. Выводы**

– Гипотеза исследования подтверждена: переориентация России на рынки БРИКС в 2022–2024 годах носит преимущественно экстенсивный и сырьевой характер — доля углеводородов в экспорте в Китай превышает 73%, в Индию — около 85%.

– Институциональные механизмы адаптации (параллельный импорт, де-долларизация, СПФС/CIPS) обеспечили краткосрочную стабилизацию, однако не устраняют системных структурных рисков.

– Дефицит пропускной способности Восточного полигона РЖД (~60–90 млн т/год) является критическим ограничителем реализации стратегии как минимум до 2030–2032 годов.

– Вторичные санкции США ограничивают расчётные возможности России даже в «дружественном» контуре, что зафиксировано в замедлении роста российско-китайской торговли с 26,3% (2023) до 1,9% (2024).

– Устойчивость новой внешнеэкономической модели требует диверсификации товарной структуры экспорта, снижения торгового дисбаланса с партнёрами и создания независимой расчётной инфраструктуры в формате БРИКС+.

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