

Turdimambetov Izimbet Rakhmetovich, DSc
Professor of the Department of Economic and Social Geography
Karakalpak State University named after Berdakh
Nukus, Uzbekistan

Abatova Aykhan Umirbay kyzy
Basic doctoral student of the Department of Economic and Social Geography
Karakalpak State University named after Berdakh
Nukus, Uzbekistan

**PEDAGOGICAL FACTORS FOR SHAPING AND DEVELOPING
DIGITAL-STATISTICAL COMPETENCE IN GEOGRAPHY MASTER'S
STUDENTS**

Abstract. The article provides a scientific and theoretical analysis of the pedagogical factors that ensure the formation and development of digital-statistical competence in geography master's students at higher education institutions. The concept of "pedagogical condition" is defined on the basis of philological, philosophical, psychological and pedagogical approaches. Using the discipline "Medical Geography" as an example, three main pedagogical conditions are substantiated: ensuring the binary and continuous nature of digital-statistical training, consistently integrating digital-statistical content into professional subjects, and ensuring variability in the methods of mastering digital-statistical activity.

Key words: digital-statistical competence, pedagogical condition, geography education, medical geography, interdisciplinary integration.

Турдымамбетов Изимбет Рахметович, DSc.
Профессор кафедры экономической и социальной географии
Каракалпакский государственный университет имени Бердаха
Нукус, Узбекистан
Абатова Айхан Умирбай кызы
Базовый докторант кафедры экономической и социальной
географии

**ПЕДАГОГИЧЕСКИЕ ФАКТОРЫ ФОРМИРОВАНИЯ И РАЗВИТИЯ
ЦИФРОВО-СТАТИСТИЧЕСКОЙ КОМПЕТЕНТНОСТИ
МАГИСТРАНТОВ-ГЕОГРАФОВ**

Аннотация. В статье представлен научно-теоретический анализ педагогических факторов, обеспечивающих формирование и развитие цифрово-статистической компетентности магистрантов-географов высших учебных заведений. Понятие "педагогическое состояние" определяется на основе филологических, философских, психологических и педагогических подходов. На примере дисциплины "Медицинская география" обоснованы три основных педагогических условия: обеспечение бинарности и непрерывности цифрово-статистической подготовки, последовательная интеграция цифрово-статистического содержания в профессиональные предметы и обеспечение вариативности методов освоения цифрово-статистической деятельности.

Ключевые слова: цифрово-статистическая компетентность, педагогическое состояние, географическое образование, медицинская география, междисциплинарная интеграция.

Introduction. Under conditions of digitalisation, the ability of geography master's students to collect, process and statistically analyse large volumes of geographical, demographic and environmental data is becoming an integral part of their professional training. This need is especially evident in mastering the discipline "Medical Geography", since the analysis of public health and environmental factors relies directly on digital-statistical methods.

Identifying the pedagogical conditions that contribute to the effective implementation of a pedagogical model for developing students' digital-statistical competence is therefore an important scientific and pedagogical task. In particular, the effectiveness of the pedagogical model applied in teaching "Medical Geography" largely depends on how well it is supported by the pedagogical

conditions required for its implementation. This approach to the content and significance of pedagogical conditions is reflected in the research of M.V.Alieva [1], V.I.Desyatov [6] and other scholars [1].

Modern scientific studies [1, 6] propose various systems of pedagogical conditions aimed at ensuring the effectiveness of the pedagogical process. However, the specific character of a pedagogical model aimed at developing digital-statistical competence in geography master's students, as well as the professionally oriented content of "Medical Geography", indicates the need to identify a distinct set of pedagogical conditions suited to this process [1]. Accordingly, factors were divided into two main groups: those ensuring the effectiveness of each component of the pedagogical model, and those enhancing students' readiness for professional activity. The purpose of the article is to scientifically substantiate the main pedagogical conditions that serve this process and to describe the mechanisms of their implementation.

Theoretical Analysis of the Concept of "Pedagogical Condition". In pedagogy, the term "condition" is interpreted as the main factor or requirement that ensures the correct, effective and purposeful organization of the educational process. Pedagogical conditions are usually divided into didactic, educational and psychological-pedagogical types. The term "environment" denotes the complex of surroundings, material-technical base, social environment, psychological climate and organizational factors necessary for the effective organization and development of the educational process [3]. In the educational process, the concept of "pedagogical condition" expresses an interconnected system of internal and external factors that serves the formation of students' professional competencies.

In the scientific literature, the concept of "pedagogical condition" has been defined in various ways by scholars such as A.P.Belyaeva [4], A.Y.Nain [7] and E.V.Yakovlev [12], who have substantiated different methodological approaches to identifying the pedagogical conditions that ensure the effectiveness of a particular activity.

Higher education institutions' complex of pedagogical conditions aimed at developing the digital-statistical competence of geography master's students serves to increase the effectiveness of the pedagogical model that has been developed. In particular, in teaching "Medical Geography", the unity of content-coordinating and subjective-content pedagogical conditions plays an important role in developing students' professional knowledge, practical skills and ability to analyse problematic situations [13].

Pedagogical conditions are usually considered as internal and external factors. External factors include geographical, natural, climatic, political and economic factors, which are usually related to an environment that cannot be changed. Internal factors, on the other hand, are directly related to the organisation of the educational process and include organisational-pedagogical, methodological and ergonomic factors. By improving these internal factors, higher education institutions can organise the process of developing students' digital-statistical competence more effectively (Figure 1).

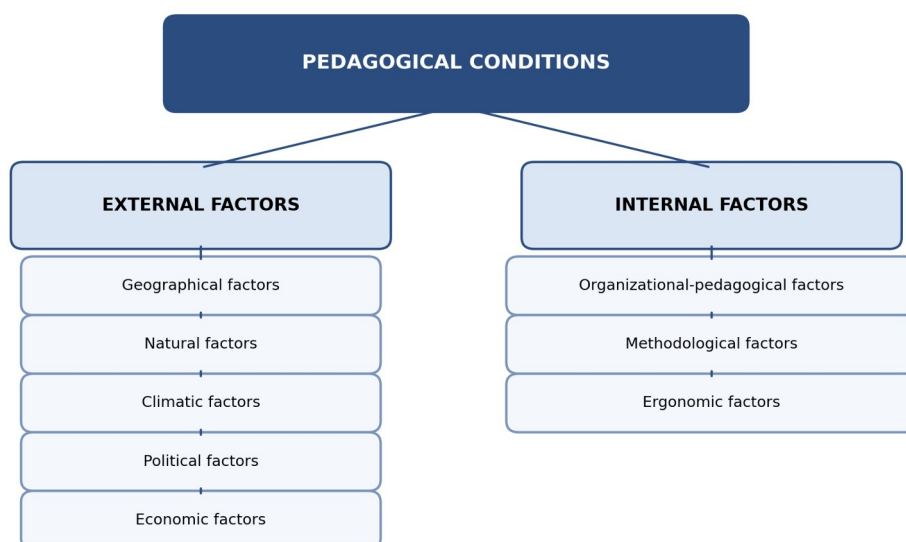


Figure 1. Types of pedagogical conditions

The concept of "condition" is a general scientific category applied across various fields of science, expressing the system of factors that determine the emergence, development and effectiveness of a given process. In the pedagogical interpretation, this concept is characterised by causes, situations, organisational

factors, environmental characteristics and other influencing components that directly or indirectly affect a person's development, upbringing and education. The content interpretations of this category found in various scientific approaches are summarised in Table 1.

Table 1. Content characteristics of the concept of "condition"

Approach	Scientific interpretation of the concept
Philological	A set of circumstances that determine the emergence, realisation, and continuation of a particular phenomenon, process or activity [8].
Philosophical	A holistic complex of objects, processes, states and their interactions that ensure the existence, formation and development of an object or phenomenon [11].
Psychological	A system of internal and external factors that directly or indirectly influence a person's psychological development and the dynamics of activity [10].
Pedagogical	An interrelated complex of natural, social, organizational, external and internal factors that purposefully or indirectly influence the development and formation of the learner as a person [9].

A review of the scientific literature shows that there is no single, universally accepted conceptual approach to the concept of "pedagogical conditions" among researchers. This divergence is explained by the complex, multi-component nature of pedagogical conditions, which varies depending on the purpose and content of a particular pedagogical system. Nevertheless, a synthesis of the scientific views presented shows that although the content of pedagogical conditions is interpreted differently from various methodological positions, there is commonality in their conceptual essence: they appear as a system of interrelated organisational, content-

related, methodological and technological factors that serve to improve the effectiveness of the educational process, achieve the set pedagogical goal and form the necessary competencies.

A synthesis of numerous scientific-pedagogical studies shows that several main types of conditions have been identified in pedagogical theory and practice. Organisational-pedagogical conditions have been covered in the works of V.A.Belikov, E.I.Kozireva, S.N.Pavlov and other researchers in connection with the purposeful organization and management of the pedagogical process; for geography master's students, this type of condition is important in determining the content sequence of the educational process, interdisciplinary integration and cooperation mechanisms among educational subjects. Psychological-pedagogical conditions have been studied by N.V.Zhuravskaya, A.V.Krugliy and other scholars in connection with a person's motivation, cognitive activity and reflection; in the context of digital-statistical competence, these conditions serve to foster students' stable interest in statistical and digital activity and to develop their intrinsic motivation. Didactic conditions have been explained by M.V.Rutkovskaya and other researchers in connection with selecting educational content, systematising learning material, and applying methods and tools appropriately; this group is of particular importance for determining the didactic mechanisms that ensure geography master's students master statistical methods and geographical data in an interconnected manner. Based on this theoretical position, the following three pedagogical conditions were identified as the main ones determining the effectiveness of developing digital-statistical competence within the scope of this research.

Main Pedagogical Conditions. *1. Ensuring the binary and continuous nature of digital-statistical training.*

In the study, special attention was paid to the continuity and gradual complexity of the educational process as one of the important pedagogical factors for developing digital-statistical competence in geography master's students. Continuity means organising digital-statistical training in a logical sequence across

all stages of master's education, clearly defining the knowledge, skills and activities acquired at each stage, and gradually increasing the complexity of content, methods and tasks at subsequent stages. This process consists of the following stages:

- diagnosing the entry-level knowledge and practical skills of students at the admission stage;
- mastering the theoretical and practical foundations of digital-statistical activity through the elective course "Digital-Statistical Methods in Geography";
- gradually deepening theoretical and practical training, moving from descriptive statistics to correlational, dynamic and spatial-statistical analysis;
- gaining professional experience by solving real geographical tasks using digital-statistical methods during research practice and the master's thesis.

Continuity of this kind treats digital-statistical training as a consistent developmental trajectory that begins with the student's existing foundational knowledge and progresses toward complex digital-statistical analysis and independent research activity. Within this trajectory, the content, methods and diagnostic mechanisms used at each subsequent stage are made progressively more complex, ensuring that professional and research subjects are thematically and methodologically linked to one another rather than treated as isolated units.

The binary nature of the training is expressed in the mutual integration of two interrelated content systems: the geographical and the digital-statistical components. The geographical component determines the content of research objects and territorial processes, while the digital-statistical component provides the tools for their quantitative analysis, processing and scientific interpretation. This binary nature is also manifested in that, on the one hand, mastering digital-statistical methods is a result of the student's professional training, and on the other hand, these methods serve as a functional tool for geographical research, monitoring, forecasting and evidence-based decision-making. This pedagogical condition can be implemented through binary lectures, integrated seminars and joint consultations among instructors from geography, statistics and information

technology fields, which requires content-coordinated professional cooperation among teachers.

2. Consistently integrating digital-statistical content into professional subjects.

Analysing the functional role of digital-statistical methods in the system of training a geography specialist makes it possible to identify the content components of this competence and link them to professional subjects. An analysis of the current qualification requirements, curricula and syllabi shows that statistical methods, digital databases and analytical tools serve as a basic integrative component linking the content of several professional subjects. Foundational knowledge is usually formed in the following areas: within mathematical-statistical disciplines, descriptive statistics, sampling, variance, correlation and other quantitative analysis methods; within computer science disciplines, spreadsheets, databases, creating graphs and diagrams, and sorting, filtering and processing data. Accordingly, it is methodologically sound to introduce the special course "Digital-Statistical Methods in Geography" from the very first stage of master's education.

The professional necessity of digital-statistical methods is even more evident in the content of natural and economic geography subjects, for example, in analysing meteorological series in climatology, water regime indicators in hydrology, and demographic dynamics in population geography. Likewise, in research projects, the master's thesis and independent scientific work, processing large volumes of numerical data, comparing them across time and space, and developing scientific forecasts are key forms of digital-statistical activity.

The digital-statistical component should also be integrated into subjects related to geography teaching methodology; for instance, in studying topics such as "Graphic and Cartographic Visualisation of Geographical Data" and "Methods of Working with Digital Data", it is important to reveal the didactic potential of statistical methods. This, in turn, requires updating the content of lectures, seminars, practical classes, independent study and research practice. Such methodological support must correspond to the current level of development of

statistics, digital technologies and geographical science, remain closely connected with professional and research activity, and ensure the balanced development of the cognitive, practical-activity and motivational components that together constitute a geography master's student's digital-statistical competence.

3. Ensuring variability in the methods of mastering digital-statistical activity

This pedagogical condition is characterised by giving the master's student a certain degree of choice and independent decision-making when completing digital-statistical tasks. In this regard, the student is allowed to independently choose, to a certain extent, the form and content of the educational or research task, the level of task complexity, the methods of data processing and digital tools used, and the pace and mode of individual activity. The main purpose of this approach is to reveal each student's individual intellectual and research potential as fully as possible, turning them into an active subject of digital-statistical activity. Such variability is reflected in designing the student's individual educational trajectory, whose structural components are as follows [5]:

- target component – determining individual educational and research goals based on the student's professional motives and interests;
- content component – systematising the content of digital-statistical training and identifying integrative links with professional subjects;
- diagnostic component – selecting diagnostic tools suited to determining the level of digital-statistical competence achieved;
- organisational-pedagogical component – identifying the forms, methods, tools and pedagogical conditions necessary to achieve the set educational and professional goals.

Here, the teacher does not act as the one who dictates ready-made solutions, but rather as a consultant who provides methodological support in choosing the optimal statistical method, data source and research strategy. The effectiveness of an individual educational trajectory depends not only on the student's freedom to choose tasks, but also on their ability to justify that choice professionally and scientifically; accordingly, the principle of variability must be implemented in

harmony with pedagogical guidance rather than as unrestricted freedom. As a result, the student's independent learning activity, analytical thinking and research initiative are strengthened.

Conclusion. The analysis conducted shows that the process of developing digital-statistical competence in geography master's students is not limited to mastering statistical knowledge and digital tools alone, but must rely on a specific complex of pedagogical conditions. Ensuring the binary and continuous nature of digital-statistical training, its consistent integration into professional subjects, and ensuring variability in the methods of mastering this activity – only when these conditions are implemented in an interrelated manner does the pedagogical environment necessary for the sustainable development of this competence arise. This, in turn, creates the methodological basis for preparing a digitally and statistically competent master's student capable of independently carrying out the cycle of searching, systematising, statistically analysing, visualising, and scientifically interpreting geographical information.

The integrated implementation of these conditions enables students to move from separately forming statistical knowledge and digital skills toward being able to mobilise them for solving real geographical problems. This indicates the need to design the content of digital-statistical education, its forms of organisation, and diagnostic tools as an integral methodological system. In future research, it would be advisable to develop diagnostic criteria and methods that allow for a quantitative and qualitative assessment of changes in students' level of digital-statistical competence resulting from the practical implementation of these pedagogical conditions.

References

1. Алиева, М. В. Дидактические условия реализации образовательных технологий: учебное пособие. – Москва: Высшая школа, 2008. – 204 с.
2. Андреев, В. И. Педагогика творческого саморазвития: инновационный курс. Книга 1. – Казань: Изд-во Казанского ун-та, 1996. – 567 с.

3. Бабанский, Ю. К. Оптимизация учебно-воспитательного процесса: методологические основы. – Москва: Просвещение, 1982. – 192 с.
4. Беляева, А. П. Дидактические принципы профессионального обучения. — Москва: Высшая школа, 1991. – 208 с.
5. Воробьева, С. В. Теоретические основы дифференциации образовательных программ в условиях индивидуализации обучения: дис. ... д-ра пед. наук. – СПб., 1999. – 460 с.
6. Десятов, В. И. Педагогические условия повышения эффективности учебной деятельности учащихся. – Москва: Педагогика, 2001. – 184 с.
7. Найн, А. Я. О методологическом аппарате диссертационных исследований по проблемам профессионального образования // Педагогика. – 1995. – № 3. – С. 85–90.
8. Ожегов, С. И. Толковый словарь русского языка. – 4-е изд. – Москва: А ТЕМП, 2006. – 944 с.
9. Полонский, В. М. Словарь по образованию и педагогике. – Москва: Высшая школа, 2004. – 512 с.
10. Рубинштейн, С. Л. Бытие и сознание. Человек и мир. – Санкт-Петербург: Питер, 2003. – 512 с.
11. Философский энциклопедический словарь / гл. ред. Л. Ф. Ильичёв [и др.]. – Москва: Советская энциклопедия, 1983. – 840 с.
12. Яковлев, Е. В. Педагогическая концепция: методологические основания, теория, практика. – Москва: ВЛАДОС, 2010. – 366 с.
13. Komilova, N. K. Tibbiyot geografiyasi va global salomatlik: darslik. – Toshkent: O'zMU, 2018. – 322 b.