METHODOLOGY FOR DEVELOPING STUDENTS' CREATIVE THINKING THROUGH SUBJECT INTEGRATION IN TECHNICAL HIGHER EDUCATION INSTITUTIONS

Professor **Khalmuratova Jumagul Gaybullayevna**
of Tashkent institute of textile and light industry

Abstract. This article provides a scientific analysis of the methodology for developing students' creative thinking based on subject integration in technical higher education institutions. The study examines the theoretical foundations of the integrative approach, scientific views on the formation of creative thinking, and the effectiveness of modern pedagogical technologies. It also highlights the role of the educational process organized on the basis of interdisciplinary integration in developing students' independent thinking, problem analysis skills, and the ability to generate innovative solutions. The obtained results indicate that subject integration is an important pedagogical factor in developing students' creative and professional competencies.

Keywords: subject integration, creative thinking, technical education, integrative approach, problem-based learning, project-based learning, professional competence, innovative education.

Introduction. Today, the reforms being implemented in the higher education system require the organization of the educational process based on modern approaches, as well as the development of future specialists' independent thinking, creative approach, and innovative activities. In particular, training competitive, highly qualified, and creatively thinking specialists in technical higher education institutions is one of the most pressing issues. Therefore, the effective use of subject integration in the educational process to develop students' creative thinking abilities holds significant scientific and practical importance [1].

In modern pedagogical approaches, subject integration is regarded as an important tool for ensuring organic connections between different disciplines, mastering knowledge in a comprehensive manner, and forming students' analytical and creative thinking skills [2]. The educational process organized on the basis of an integrative approach helps students connect theoretical knowledge with practical activities, independently solve problematic situations, and develop their professional competencies [3].

When specialized subjects in technical education are organized in an interconnected manner, students begin to perceive complex technological processes as a holistic system. This has a positive impact on the development of their creative thinking, engineering mindset, and innovative approaches [4]. In particular, project-based learning, problem-based education, interactive methods, and lessons integrated with digital technologies are effective tools for increasing students' creative activity.

In scientific research, creative thinking is interpreted as one of the important competencies of a modern specialist [5]. Although many scholars have studied the pedagogical, psychological, and methodological aspects of creativity, the issue of improving the methodology for developing creative thinking through subject integration in technical higher education institutions remains a pressing scientific problem.

The purpose of this study is to scientifically analyze the methodology of developing students' creative thinking based on subject integration in technical higher education institutions and to highlight its effective pedagogical mechanisms. During the research, the theoretical foundations of the integrative approach, methods of developing creative thinking, and the effectiveness of innovative methods used in the educational process are analyzed.

Literature Review. The issue of developing students' creative thinking in the modern education system is recognized as one of the important scientific directions in pedagogy, psychology, and educational technologies. Particularly in technical

higher education institutions, forming creative competencies based on subject integration is a key factor in increasing the effectiveness of future specialists' professional training. Recent scientific studies have widely discussed the positive impact of the integrative approach on the quality of education, students' independent thinking, and innovative activities.

The theoretical foundations of the concept of creativity are reflected in the research of scholars such as Guilford, Torrance, and Gardner. Guilford linked creative thinking with divergent thinking and described it as the ability to find unconventional solutions to problems [6]. Torrance identified fluency, flexibility, and originality of thought as the main indicators of creativity [7]. In Gardner's theory of multiple intelligences, creativity is interpreted as an individual's ability manifested in various spheres of activity [8].

Studies on subject integration emphasize that the integrative approach serves to enable students to master knowledge systematically and connect it with practical activities. Researchers such as Jacobs, Drake, and Beane have noted that an integrated education model develops students' analytical and creative thinking by strengthening connections between different subjects [9], [10], [15]. According to them, in an integrative educational process, students acquire skills to solve complex problems using a comprehensive approach.

A number of international studies have been conducted on developing creative thinking in technical education. In the works of Robinson and Sternberg, it is emphasized that the creative potential of technical specialists is one of the main factors of competitiveness in an innovative economy [11], [12]. The authors believe that project-based learning, creating problem situations, and interdisciplinary integration in technical education yield effective results in developing students' creative thinking [13].

Furthermore, in the modern STEM education concept, teaching based on the integration of science, technology, engineering, and mathematics is considered an important tool for developing creative and critical thinking [4], [14]. International

experience shows that the STEM approach is valuable for developing students' skills in solving practical problems, generating innovative ideas, and working collaboratively.

The analysis of scientific views of local and foreign scholars shows that subject integration in technical higher education institutions is an important pedagogical factor in improving future specialists' professional competencies. At the same time, there is a need to further deepen scientific research on the methodology of developing creative thinking, the practical effectiveness of integrative technologies, and their application in technical education.

Research Methodology. This study is aimed at scientifically analyzing the methodology for developing students' creative thinking through subject integration in technical higher education institutions. The methodological basis of the research consists of the integrative approach, competency-based education, and theories of creative pedagogy [1],[3]. During the study, the impact of interdisciplinary integration on students' independent thinking, analytical approach, and creative activity was analyzed from a scientific-theoretical perspective. Additionally, the pedagogical possibilities of project-based learning, problem-based education, and interactive methods in developing creative thinking within technical education were examined. Based on the obtained scientific views, the importance of education based on subject integration in developing students' professional competencies was highlighted.

Analysis and Results. During the research, the role of the educational process organized on the basis of subject integration in technical higher education institutions in developing students' creative thinking was scientifically analyzed. The analyses showed that classes organized on the basis of an integrative approach direct students not to be limited to one subject but to apply knowledge gained from different disciplines in an interconnected manner [2]. This contributes to the formation of a systemic approach and creative thinking in their cognition.

In lessons organized through subject integration, students develop skills in independently analyzing problematic situations, generating alternative solutions, and making practical decisions. In particular, the use of project-based learning, problem-solving tasks, and interactive methods increases students' creative activity and motivates them toward independent research.

The analyses revealed that an integrative learning environment ensures greater student engagement in the educational process. Tasks given based on interdisciplinary connections direct students not only to master theoretical knowledge but also to apply it in practice. This process develops their analytical thinking, ability to see problems holistically, and creative approach.

It was also observed that integrated educational technologies strengthen students' collaborative working skills. Through group projects and collaborative tasks, students acquire skills in exchanging ideas, substantiating their positions, and developing joint solutions.

According to the analysis of scientific sources, the educational process organized on the basis of subject integration increases students' cognitive activity compared to traditional teaching methods and activates the creative thinking process. This enables the effective implementation of a competency-based approach in technical education.

Based on the conducted analyses, the following conclusions were reached:

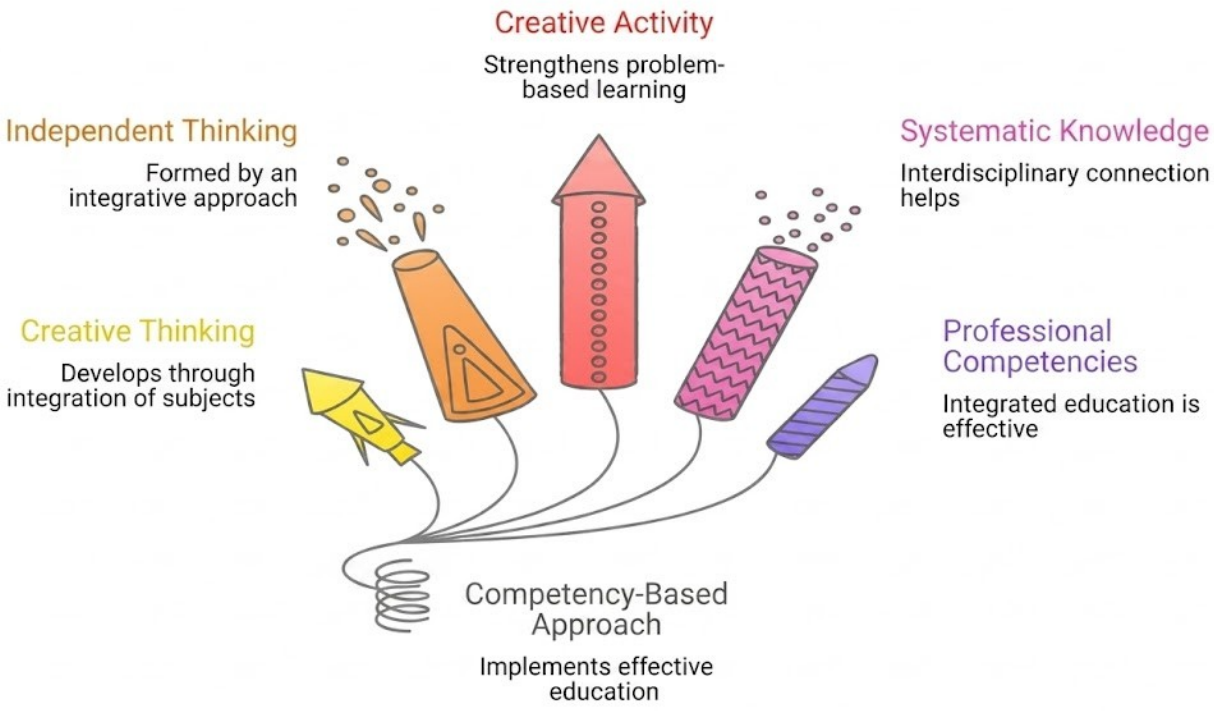
- Subject integration is an important pedagogical tool for developing students' creative thinking;

- The integrative approach forms students' independent and analytical thinking skills;

- Problem-based and project-based learning enhances students' creative activity;

- Classes organized on the basis of interdisciplinary connections help students master knowledge systematically;

- Integrated educational technologies are effective in developing professional competencies.



The educational process organized on the basis of subject integration in technical higher education institutions plays a significant role in developing students' creative thinking, strengthening their professional preparation, and forming specialists who meet modern educational requirements.

Conclusion and Recommendations. According to the research results, it was determined that the educational process organized on the basis of subject integration in technical higher education institutions has important pedagogical significance in developing students' creative thinking. Classes organized on the basis of interdisciplinary connections form students' systemic thinking, problem analysis skills, and independent decision-making abilities. The integrative approach expands students' opportunities to connect theoretical knowledge with practice and contributes to the development of their professional competencies [11].

Furthermore, during the study, it was observed that the use of project-based learning, problem-based education, and interactive methods increases students' creative activity and enhances their interest in the learning process. The

educational environment created through subject integration has a positive impact on developing students' independent research, teamwork, and innovative thinking skills.

To increase the effectiveness of teaching based on subject integration in technical higher education institutions, it is advisable to revise curricula based on interdisciplinary connections and widely introduce educational and methodological materials corresponding to the integrative approach. In addition, it is necessary to regularly use project-based learning and problem-based education technologies in the teaching process and to improve the system of professional development for professors and teachers in the field of integrative pedagogical competencies.

REFERENCES

1. Abdullayeva Z. *Developing Students' Creative Thinking Based on Subject Integration*. Tashkent: Fan va texnologiya, 2022. – 248 p.
2. Ismoilov A. *Integrative Approach in Technical Higher Education*. Tashkent: Uzbekistan National University Publishing House, 2023. – 312 p.
3. Qodirov R. *Modern Educational Technologies and Creative Pedagogy*. Tashkent: "Ilm ziyo", 2021. – 276 p.
4. Xolmatov A. *STEM Education and Interdisciplinary Integration*. Tashkent: TDPU Publishing House, 2024. – 184 p.
5. To'rayev O. *Psychological Foundations of Forming Creative Thinking in Students*. Tashkent, 2020.
6. Guilford J.P. *The Nature of Human Intelligence*. New York: McGraw-Hill, 1967.
7. Torrance E.P. *The Torrance Tests of Creative Thinking*. Bensenville, IL: Scholastic Testing Service, 1998.
8. Gardner H. *Frames of Mind: The Theory of Multiple Intelligences*. New York: Basic Books, 1983.
9. Jacobs H.H. *Interdisciplinary Curriculum: Design and Implementation*. Alexandria, VA: ASCD, 1989.
10. Beane J.A. *Curriculum Integration: Designing the Core of Democratic Education*. New York: Teachers College Press, 1997.

11. Robinson K. *Out of Our Minds: Learning to be Creative*. Oxford: Capstone, 2011.

12. Sternberg R.J. *Creativity: From Potential to Realization*. Washington, DC: American Psychological Association, 2004.

13. Sawyer R.K. *Explaining Creativity: The Science of Human Innovation*. 2nd ed. New York: Oxford University Press, 2012.

14. Bybee R.W. *The Case for STEM Education: Challenges and Opportunities*. Arlington, VA: NSTA Press, 2013.

15. Drake S.M., Reid J.L. *Interdisciplinary Curriculum*. Alexandria, VA: ASCD, 2018.