

# PEDAGOGICAL TECHNOLOGIES AS A MEANS OF INCREASING THE EFFECTIVENESS OF TEACHING MATHEMATICS

Lola Urinboyeva

Associate Professor, Department of Mathematics and Methods of Teaching,  
Tashkent State Pedagogical University Named After Nizami

Ahmadjon Sagdullayev

A Student of the Chemistry Education Program at the Faculty of Natural  
Sciences, Tashkent State Pedagogical University Named After Nizami

## **Abstract:**

The article presents a number of measures that should be taken to introduce digital technologies and modern methods into the teaching process in order to implement the strategic goals and objectives of the development of mathematics education, and reveals their importance.

**Keywords:** Mathematical literacy, critical, creative and systematic thinking, intellectual abilities, technology, pedagogical technology, digital and modern technologies.

## **Introduction**

Great scholars like Muhammad al-Khwarizmi, Ahmad al-Farghani, Abu Rayhan al-Biruni, and Mirzo Ulugbek made significant contributions to the foundations of mathematics. Raising a young generation worthy of such luminaries, imparting modern knowledge to students, and creating conditions for the youth of our country to appreciate the beauty of mathematics is both a duty and a moral obligation for all.

Mathematics is the foundation for understanding the world. It plays a crucial role in uncovering the underlying patterns of events and phenomena occurring around us, as well as in the development of industry, science, technology, and innovation. It is well known that mathematics sharpens the human mind, develops concentration, fosters determination and willpower, encourages logical thinking,

and promotes discipline. Most importantly, it teaches analytical reasoning and broadens intellectual horizons. As President Shavkat Mirziyoyev stated: “Mathematics is the foundation of all sciences. A child who is well-versed in this subject will grow up intelligent and broad-minded and will succeed in any field.” In Uzbekistan, mathematics has been identified as a priority in the development of science and education. Systematic efforts are being made to bring mathematical science and education to a new quality level.

The strategic objectives of developing mathematics education include:

- modernizing mathematics education based on international experience and labor market demands, ensuring socio-economic sustainability;
- enabling graduates to apply mathematical knowledge and skills independently, choose careers, and engage in social relations based on national and universal values while developing competencies needed in the labor market;
- creating conditions for the development of mathematical literacy, critical and creative thinking, system-level reasoning, independent decision-making, and intellectual and moral growth.

To achieve these goals, the following tasks are carried out:

- establishing a consistent mathematics education system at all levels;
- enhancing the scientific-methodological support for mathematics education;
- improving the material and technical base and equipping institutions with modern technology;
- integrating digital technologies and modern teaching methods to form an innovative infrastructure;
- aligning the education system's status with its fundamental importance in fostering human creativity and its role in the interaction between the environment and education content;
- ensuring coherence among pre-school, general secondary, specialized, professional, and higher education in mathematics;
- serving as the foundational stage for preparing specialists in strategically important professions;
- modernizing staff training, optimizing human resources;
- introducing new methods for identifying required competencies and implementing updated education standards;

- developing an evaluation system based on the content, specific characteristics, skill requirements, and expected competencies;
- identifying and supporting talented students through competitions and exhibitions in mathematical modeling;
- fostering a culture of research and project work among students;
- promoting best practices and encouraging diversity in mathematics education.

Key measures for incorporating digital technologies and modern methods into math education include:

- accelerating the teaching process and increasing its efficiency with new information and pedagogical technologies;
- utilizing all capabilities of ICT and software tools to enhance education quality and effectiveness;
- deepening interdisciplinary connections and expanding the application of modern technologies;
- ensuring integration between digital and educational technologies, providing conditions for continuous professional development of teachers;
- personalizing the learning process using digital technology;
- developing QR-code based access to electronic instructional packages (textbooks, workbooks, teacher guides, multimedia supplements) for mobile devices;
- organizing distance learning programs;
- expanding access to electronic resources and digital libraries for math education;
- encouraging the use of internationally adopted educational software in math teaching.

Scientific-didactic and methodological research shows that one of the most effective ways to achieve these objectives is the implementation of innovative pedagogical technologies.

The word “technology” comes from the Greek “techne” (skill, art) and “logos” (science, knowledge).

Pedagogical technology refers to a comprehensive approach to selecting teaching, communication, information, and management tools and methods to guarantee the achievement of educational objectives defined in the national curriculum.

To date, various definitions of pedagogical technology have been given, including:

- According to the Russian scientist V.P. Bespalko, who comprehensively scientifically substantiated the need to introduce pedagogical technology into the educational process, "Pedagogical technology is a project for the process of forming the personality of a student, which can guarantee pedagogical success without depending on the teacher's skills."
- Russian scientist V.M. Monakhov briefly defines pedagogical technology as a system of ordered actions that lead to pre-planned results and are mandatory for implementation, and draws attention to its main features, saying: "Pedagogical technology technologizes the educational process, increases its reproducibility and stability of the pedagogical process, freeing it from the subjective characteristics of the performer of this process."
- According to M.V. Klarin, "Pedagogical technology is the design of the educational process based on predetermined goal indicators, taking a technological approach to the educational process."
- According to I.Y. Lemer, "Pedagogical technology represents a defined goal that can be reliably understood through the results of learning reflected in the actions of students."
- According to V.P. Bespalko's Uzbek students Nurali Saydahmedov and Abdurakhmon Ochilov, "Pedagogical technology is the process of a teacher (educator) influencing students (pupils) in certain conditions using teaching (educational) tools and intensively forming predetermined personal qualities from them as a product of this activity."
- According to Otkir Tolipov, "Pedagogical technology is a system with clearly defined tasks for all stages and parts of the pedagogical process, programmed in accordance with the time distribution, scientifically based, and ensuring the achievement of the expected result."
- According to the definition of the creative group "Improvement of Teaching Methods and Pedagogical Technologies", formed by the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan, "Pedagogical technology is a systematic method of designing, implementing and evaluating the educational process, which is focused on the learner, democratic and guarantees repeatable learning outcomes."

- To compare these definitions with those given far abroad, we present the definition given by the Japanese pedagogical scientist T. Sakomoto. “Pedagogical technology,” says Sakomoto, “is the incorporation of a systematic way of thinking into pedagogy, in other words, the bringing of the pedagogical process into a specific system.”
- According to the definition of UNESCO, one of the authoritative organizations of the United Nations, “Pedagogical technology is the use of the principle of an integrated approach in the design and implementation of the entire educational process, considering technical and human resources as interconnected in the provision and acquisition of knowledge.” The definition of pedagogical technology given by scientists from the United States and Germany is close to the definition given by UNESCO.
- According to Professor B. Ziyomukhammadov, "Pedagogical technology is a technological educational event that effectively forms the social qualities of a person, determined in advance by the needs of society, and is aimed at a specific goal, and that is a complex of educational processes that are formed by the teacher (pedagogue) using teaching tools, which are its constituent parts, in a certain sequence and using certain pedagogical methods, and that monitors the impact of the teacher (pedagogue) on students under certain conditions and evaluates the results of education."

The variety of definitions aimed at clarifying the concept of pedagogical technology, on the one hand, indicates that this topic is being studied to one degree or another in developed countries, and on the other hand, it represents a certain result of attempts to introduce pedagogical technology into pedagogical practice.

The following three categories of pedagogical methods used in organizing the educational process based on modern pedagogical technology play an important role in the acquisition of knowledge by learners at the level of state educational standards and qualification requirements:

- 1) “Traditional methods”. Such pedagogical methods are based on the principle of “Delivering” knowledge to learners;
- 2) “Unconventional” or “Interactive” methods. These pedagogical methods are based on the principle of “Activating” learners in acquiring knowledge;
- 3) “Advanced” or “Modern methods”. These methods are based on the principle of “Accelerating and increasing the efficiency” of the educational process.

Today, teachers are required to have sufficient knowledge of modern methods and be able to use them correctly and appropriately in the process of their professional activities. Because:

- to interest learners in the process of knowledge;
- to prepare them for socially useful work;
- to teach them to acquire knowledge consciously and to independently improve their knowledge;
- to develop their interest in science;
- to teach them to think logically;
- to increase and improve the effectiveness of education

without modern educational technologies, the previously guaranteed educational goals cannot be achieved.

The core idea of pedagogical technology is to ensure full comprehension and retention of knowledge.

For example, in the process of studying mathematics, students learn various formulas. If they do not consciously understand these formulas (a consciously understood concept or formula is stored in memory for a long time and quickly recalled when necessary), then they will have difficulty solving problems and examples, acquiring new theoretical knowledge. This will extinguish the students' interest in studying this subject. Pedagogical technologies help address such issues by making learning more effective.

Therefore, every modern teacher is required to be based on the following factors in the process of their professional activities:

- ✓ guarantee the achievement of educational goals at the level of State Educational Standards and qualification requirements;
- ✓ be able to independently solve problems of a creative and research nature;
- ✓ each teacher should understand the role and importance of their spiritual and moral potential in their professional activities and, based on this, work independently on themselves;
- ✓ continuously master advanced technologies and advanced practices of modern education and upbringing;
- ✓ be fully prepared to solve new complex professional pedagogical problems requiring interdisciplinary integration;
- ✓ be able to adequately study the comprehensive development of the learner and analyze them from a pedagogical, psychological and physiological perspective;



✓ be able to make complex (complex) changes in the modern education system and overcome contradictions in it.

In practice, both the concepts of “methodology” and “technology” are used, each with distinct features.

Methodology focuses on how to teach a specific subject and the strategies used by the teacher. It is grounded in the curriculum and implemented through teaching methods and tools. It is closely linked to didactics and based on pedagogical principles. Methodology involves:

- 1) organizing the teacher’s activity with appropriate methods and tools;
- 2) a system of orderly techniques for effective teaching;
- 3) structuring the learning process purposefully and systematically to develop knowledge, skills, and competencies.

Educational technology that encourages the teacher to perform effectively, unlike the methodological development of the lesson, is focused on the activities of learners, and it serves to create the necessary conditions for their independent mastery of educational materials, taking into account their individual and collaborative activities with the teacher.

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