

THE CONCEPT OF METHODOLOGICAL PREPAREDNESS OF FUTURE  
TEACHERS

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**Annotatsiya:** Ushbu maqolada pedagoglarning metodik tayyorgarligi nazariy asoslari, O'zbekiston oliy ta'lim muassasalaridagi hozirgi holat, STEAM asosida tayyorgarlikdagi muammolar va mavjud o'quv dasturlari tahlili ilmiy yondashuv bilan ko'rib chiqiladi.

**Kalit so'z:** pedagog, metodik tayyorgarlik, STEAM, kadr, nazariy tayyorgarli, amaliy tayyorgarlik, kommunikativ qobiliyat, ijodkorlik, pedagogik etika.

**Аннотация:** В данной статье рассматриваются теоретические основы методической подготовки учителей, текущая ситуация в высших учебных заведениях Узбекистана, проблемы обучения на основе STEAM-подхода, а также проводится анализ существующих учебных программ с научной точки зрения.

**Ключевые слова:** учитель, методическая подготовка, STEAM, кадры, теоретическая подготовка, практическая подготовка, коммуникативные навыки, креативность, педагогическая этика.

**Abstract:** This article examines the theoretical foundations of methodological training of teachers, the current situation in higher education institutions of Uzbekistan, problems in STEAM-based training, and an analysis of existing curricula with a scientific approach.

**Keywords:** teacher, methodological training, STEAM, personnel, theoretical training, practical training, communicative skills, creativity, pedagogical ethics.

In the modern education system, the high-quality preparation of pedagogical personnel is considered a strategic task not only at the school level but also in higher education. The methodological preparedness of future teachers represents the process of transforming their theoretical knowledge into practical application, implementing innovative pedagogical approaches, and developing socio-pedagogical competencies. If this process is not successfully implemented, the quality of education inevitably declines.

Methodological preparedness is a complex and integrated process that shapes the professional qualifications and competencies of individuals who will work as teachers in the future. It includes the following key components:

- **Theoretical preparation** – acquiring deep knowledge in pedagogical theory, psychology, and teaching methodology.
- **Practical preparation** – developing skills in planning the educational process, effectively organizing lessons, and fostering independent thinking among students.
- **Personal professional qualities** – communicative competence, creativity, and adherence to pedagogical ethics.

Methodological preparedness prepares teachers not only for conducting lessons but also equips them with the competencies necessary to apply innovative pedagogical approaches, modern technologies, and integrated methodologies such as STEAM.



In higher education institutions of Uzbekistan, the process of preparing future teachers in pedagogical fields is largely characterized by its theoretical orientation. Several conditions can be observed:

- **Theoretical knowledge is sufficient, but practical training is limited** — students understand teaching methodologies but have limited experience applying them in real classroom settings.
- **Pedagogical practice is not sufficiently systematic** — it is often short-term and conducted under controlled conditions, while real classroom environments are not fully explored.
- **The level of scientific-practical integration is low** — students often struggle to connect their academic research with practical methodological approaches.

International research shows that the excessive theoretical orientation of teacher education programs makes it difficult to develop practical competencies. For instance, a study conducted in India found that due to insufficient practical training within pedagogical programs, students demonstrated low performance in lesson planning, classroom management, and the use of educational technologies, with approximately 40% of respondents reporting only average competence.

In the contemporary educational environment, teachers must possess not only methodological knowledge but also digital literacy, the ability to use interactive teaching tools, and skills in working with online platforms. However, these competencies are not sufficiently developed in many higher education institutions. This situation complicates the process of adapting teachers' methodological preparedness to modern educational requirements.

STEAM (Science, Technology, Engineering, Arts, Mathematics) is an interdisciplinary approach that fosters competencies such as critical thinking, creativity, and problem solving among students. STEAM pedagogy prepares future teachers to respond to real-world challenges and strengthens their readiness for innovative educational practices. However, several key challenges have been identified in implementing STEAM methodology within teacher preparation. Many teachers lack specialized training in teaching through the STEAM approach. Mastering STEAM methods requires designing educational processes, organizing integrated lessons, and applying innovative pedagogical strategies—elements that are not sufficiently reflected in traditional methodology programs.

STEAM education also requires technological laboratories, interactive tools, programming platforms, and practical materials. However, many higher education institutions experience shortages of such resources, which hinders the effective implementation of STEAM-based methodological training.

Traditional pedagogical assessment systems are largely based on rigid testing methodologies and do not adequately evaluate project-based learning, creativity, or problem-solving approaches. This makes it difficult to accurately assess the outcomes of students trained through STEAM methodologies.

Researchers in Uzbekistan are actively conducting studies on STEAM education. Scientific publications have demonstrated that the use of the STEAM approach significantly enhances creativity and innovative thinking skills among students of pedagogical higher education



institutions. Additionally, several studies analyze the development of digital competencies through STEAM-based instruction.

These findings indicate that positive trends exist in the implementation of the STEAM approach, although further work is needed to ensure systematic integration and sufficient resource support.

Curricula and methodological support play a crucial role in preparing future teachers in higher education institutions. They should not only provide theoretical knowledge but also help develop practical skills, creative thinking, and interdisciplinary competencies through innovative and STEAM-based approaches. Although current curricula in the pedagogical faculties of Uzbekistan partially achieve these goals, several shortcomings remain.

Existing educational programs in pedagogical faculties mainly focus on theoretical pedagogical knowledge. Students study subjects such as pedagogy, psychology, methodology, and didactics, which help strengthen their theoretical foundations and enable them to analyze pedagogical processes. However, these programs often lack sufficient practical components. The following main shortcomings have been identified:

### **1. Insufficient practical training.**

Future teachers engage in limited exercises related to teaching and performing real pedagogical tasks. In many universities, teaching practice is limited to only a few weeks, which does not allow students to gain sufficient experience in classroom management, interactive lesson organization, or fostering independent thinking among students. As a result, theoretical knowledge is not adequately integrated with practice.

### **2. Low level of integration.**

Interdisciplinary project activities and the STEAM approach are often not fully reflected in curricula. This limits students' ability to develop interdisciplinary integration and creative problem-solving skills. For example, educational programs are not sufficiently adapted to implement STEAM projects that combine mathematics, physics, and computer science.

### **3. Insufficient digital resources.**

Many pedagogical faculties lack adequate electronic resources, laboratories, interactive platforms, and digital learning tools. This restricts the development of technological competencies and the application of innovative teaching methods. Consequently, students' participation in STEAM and other interdisciplinary approaches remains limited.

Methodological manuals on STEAM and innovative pedagogy are being published in Uzbekistan. These materials provide teachers with practical guidelines, lesson plans, and recommendations for interdisciplinary projects. However, several challenges remain in their effective implementation:

- **Lack of standardization.** In some universities, these manuals are not systematically integrated into educational programs.
- **Limited connection with practice.** Many manuals provide theoretical explanations but insufficient guidance for practical classroom application.



- **Insufficient recommendations on innovative methods.** Manuals related to STEAM projects and interdisciplinary integration are not sufficiently developed.

As a result, the lack of standardized methodological support and its incomplete integration with curricula hinder the development of methodological preparedness among future teachers. Analysis of the educational programs and methodological support systems of pedagogical faculties in Uzbekistan shows that while theoretical knowledge is sufficient, its integration with practice remains limited. STEAM and interdisciplinary projects are not fully reflected in curricula, electronic resources and laboratories are insufficient, and although methodological manuals exist, their systematic implementation is lacking. Therefore, improving pedagogical preparation requires integrating curricula with practical components, digital resources, and the STEAM approach, as well as systematically implementing methodological guidelines.

Successful examples of STEAM methodology include interdisciplinary project activities such as:

- **Robotics and coding training**, where students program robots by integrating mathematics, engineering, and computer science.
- **Interactive laboratories**, where digital sensor tools are used in biology and chemistry experiments.
- **Creative design projects**, where artistic and design elements are combined with mathematics and technology to create innovative products.

These projects help transfer students' knowledge from theory to practice and develop critical thinking, collaboration, and problem-solving skills. Scientific research indicates that students trained through the STEAM approach demonstrate higher innovative competencies compared to those trained through traditional approaches. For example, students educated using STEAM methods achieve better results in critical thinking, problem solving, and teamwork skills.

The methodological preparedness of future teachers currently faces several challenges in the education system. The dominance of theoretical knowledge limits the development of practical skills. The STEAM approach can serve as an effective tool for addressing these issues; however, it is effective only under the following conditions:

- Integration of STEAM methodology into educational programs.
- Establishment of practical laboratories and resource centers within teacher training programs.
- Modernization of methodological manuals and assessment systems.
- Continuous professional development of teachers.

At the same time, higher education institutions and educational policy should implement strategic measures to strengthen STEAM-based teacher preparation. This will not only prepare teachers for modern educational methodologies but also enable them to apply innovative approaches in their daily pedagogical practice.



### Adabiyotlar

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