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IMPLEMENTATION OF THE STEAM APPROACH IN THE TRAINING PROCESS OF FUTURE MATHEMATICS TEACHERS

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Abstract
This article analyzes the importance of the STEAM (Science, Technology, Engineering, Art, Mathematics) approach in the training process of future mathematics teachers, its pedagogical potential, and its role in improving the quality of education. It also highlights teaching methods based on STEAM and the mechanisms for their implementation in practice.

Keywords: STEAM, mathematics education, innovative approach, integration, pedagogical technologies, creative thinking.

Introduction

The modern education system is developing in close connection with global changes, technological progress, and the increasing demands of the labor market. In this regard, it is important to use innovative methods alongside traditional approaches in training future mathematics teachers. The STEAM approach is one of such modern pedagogical concepts, which serves to develop deep knowledge and skills in students through interdisciplinary integration.

In recent years, large-scale reforms have been implemented in the education sector of Uzbekistan. In particular, the new Law “On Education” was adopted on September 23, 2020. The law consists of 11 chapters and 75 articles. Educational reforms are not limited to this. The Resolution No. 187 of the Cabinet of Ministers dated April 6, 2017, aimed at restructuring the continuous education system and organizing public education at the level of international standards. On May 11, 2022, the Presidential Decree approved the “National Program for the Development of Public Education for 2022–2026.” Based on international experience, a National Curriculum was developed in Uzbekistan.

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The National Curriculum is a set of documents aimed at defining the expected learning outcomes at the end of each grade level, ensuring smooth transition between grades, and explaining the assessment process. One of the significant innovations in education is the STEAM approach. According to the Presidential Decree No. PF-5712 dated April 29, 2019, "On approval of the Concept for the Development of the Public Education System of the Republic of Uzbekistan until 2030," the transition to innovative education, implementation of ICT and modern teaching methods, and organization of lessons based on STEAM technologies are defined as priority tasks.

The acronym STEAM stands for Science, Technology, Engineering, Arts, and Mathematics. It is an extended version of STEM (STEM + ART = STEAM). STEM develops the functions of the left hemisphere of the brain, such as analytical, inductive, deductive, and critical thinking, as well as language and writing skills. ART, on the other hand, develops the right hemisphere, including creativity, imagination, and emotional intelligence.

This leads to the question: why do we need STEAM? One of the key advantages of STEAM is interdisciplinary learning, where education is organized not by separate subjects but through integrated themes. While traditional lessons followed a linear model, STEAM promotes a spiral approach. Another advantage is the application of scientific and technical knowledge in real life.

The new National Curriculum is being developed based on international assessments such as PISA, PIRLS, TIMSS, and EGRA, as well as the education systems of countries like Finland, Japan, and the USA. The principle of practical application in STEAM aligns with Finland's education system.

Additional advantages of STEAM include:

- Development of critical thinking and problem-solving skills
- Increased self-confidence
- Enhancement of communication and teamwork
- Preparation for technological advancements
- Increased interest in technical fields
- Promotion of creative and innovative approaches
- Bridging education and career

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Stages of STEAM Implementation:

- Creating a relevant problem situation
- Developing a problem-solving plan
- Designing prototypes and models
- Eliminating shortcomings and presenting results
- Evaluating the completed work

Teaching mathematics through STEAM helps:

- Develop real-life problem-solving skills
- Enhance analytical and logical thinking
- Increase interest in learning
- Foster creative thinking

Importance of STEAM in Teacher Training:

1. Interdisciplinary integration
2. Development of practical skills
3. Promotion of innovative thinking
4. Use of information technologies

Effective Teaching Methods:

- Project-based learning
- Problem-based learning
- Inquiry-based learning
- Interactive methods

Challenges and Solutions:

Challenges:

- Lack of teacher preparedness
- Insufficient technical resources
- Incompatibility of curricula

Solutions:

- Organizing professional development courses
- Providing modern laboratories
- Updating curricula based on STEAM

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Today, educating a well-rounded generation is a key priority. This responsibility largely depends on teachers. As emphasized by the President, it is necessary to encourage independent thinking and prepare youth for life. STEAM technology plays an important role in achieving this goal.

STEAM integrates science, technology, engineering, art, and mathematics, focusing on the balance between theoretical and practical knowledge. In a STEAM environment, students acquire knowledge and immediately apply it.

Mathematics lessons can be organized based on STEAM using real-life problems such as solar panels, robotics, bridge design, water containers, statistics, rockets, 3D printing, weather observation, drones, and budgeting.

These problems encourage students to think critically, work independently, and develop creativity. STEAM should be applied not only in classrooms but also in extracurricular activities. Inviting professionals to demonstrate practical applications can further motivate students and help them choose future careers.

Conclusion

In conclusion, one of the priority directions in training modern mathematics teachers is the development of well-rounded individuals based on national values. Implementing the STEAM approach improves education quality, develops modern competencies, and prepares students for real life. It also enhances teachers' professional skills and contributes to the innovative development of the education system.

This article is recommended for students, researchers, and mathematics teachers studying the role of modern education. The future of Uzbekistan's youth depends on the quality of modern education.

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