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Theoretical Foundations and Advantages of Teaching Natural Sciences Based on Steam Educational Technologies

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Abstract. *This article examines the theoretical foundations of teaching natural sciences based on STEAM education technologies, as well as the advantages of fostering students' creative thinking through this approach. It explores the methods, pedagogical value, and educational-technological aspects of implementing STEAM in science education, and highlights effective strategies for engaging students.*

Key words: *STEAM education, natural sciences, creative thinking, integration, pedagogical technology.*

On the basis of the decree of the president of the Republic of Uzbekistan dated April 29, 2019 "on approval of the concept of development of the public education system of the Republic of Uzbekistan until 2030", the introduction of modern innovative approaches to the educational system, in particular, elements of STEAM education, was established. In this concept, the formation of competencies of critical thinking, independent information seeking and analysis in students is promoted as the main task.

Scientific research and literature on the STEAM approach to teaching Natural Sciences is now widely developed. Within the framework of this analysis, important resources were studied that reveal the general aspects of STEAM education, ways to connect it with the natural sciences, as well as its contribution to the educational process.

A number of sources cover the theoretical foundations of STEAM education. In particular, research by Byers and his students argues that the STEAM approach is aimed at bridging the boundaries between traditional disciplines and developing interactive thinking skills in students. This approach demonstrates that the role of Natural Sciences in teaching is particularly important in developing students ' skills to solve problems and put scientific knowledge into practice.

In their research, Maxwell and Choppin discuss ways to integrate the scientific and technological aspects of the STEAM approach into the educational process. Their research has shown that through the use of innovative pedagogical techniques in teaching natural sciences using the STEAM approach, it is possible to increase students ' interest in the sciences and involve them in creative research.

The STEAM approach plays an important role in educational strategies and programs published at the state and international level. In particular, reports by the OECD (Organisation for Economic Co-operation and development) and UNESCO noted that the STEAM approach is relevant to the 21st

century education system, especially important in increasing global competitiveness in the natural sciences and technologies.

Also, Nardo and Matthews 'research argues that the use of the STEAM approach in natural science classes plays a large role in developing students' critical and creative thinking skills, encouraging them to create technologically advanced projects. These sources also show that practical projects related to the natural sciences are of greater interest among students and have a positive impact on their choice of profession.

Steam-benefits of Education:

1. Integrating teaching by subject rather than academic subjects. STEAM education combines an interdisciplinary communication and design method, on the basis of which lies the integration of natural sciences into technology, engineering, and mathematics. In this, training for engineering-related professions is carried out.

2. Application of scientific and technical knowledge in real life. In STEAM education, with the help of practical training, children are shown the use of their scientific and technical knowledge in real life. In each lesson, students develop, develop, build and model models of modern industry.

3. Critical thinking is the development of skills and solving problems. The STEAM program develops critical thinking problem-solving skills that will be necessary to overcome the difficulties that children face in their daily lives. For example, children assemble a model of a speeding machine, and then test it. After the first Test, they think about its causes and find out if an unexpected result is not achieved. Balkim, the size of the wheels, or aeridinamics may not be correct. After each test, they eliminate the shortcomings.

4. Increased sense of self-confidence. Children go closer to their goal every time they build a bridge, start a car and a model of samality. In the end, they achieve their goal by overcoming all problems with their own strength. It means inspiring, winning and rejoicing for children. After each victory, they believe in the ‘oz forces.

5. Active communication and work in groups. The STEAM program is distinguished by active communication and work in groups. During the period of communication, a free environment is created for the statement of one's own opinion and for the conduct of debate. They learn to speak and give presentations. Children interact with their regular ' streaming classmates. Children actively participate in the process well remember the training.

6. Interests in technical sciences in education. The mission of STEAM education is to provide a framework for developing students ' interests in the Natural Sciences. Since STEAM training is very dynamic and fun, children will not get bored during training and will not notice how the time has passed.

7. Creative and innovative approach to projects. STEAM education consists of six stages of question discussion, design, construction, testing and development. These stages are the basis of a systematic design approach.

8. The bridge between education and career according to various assessments it is precisely STEAM knowledge that will be necessary in 9 of the 10 professionals who are currently the most demanding. Such professions include; Engineer - Chemist: engineers in oil; computer systems analytics engineers-mechanics, engineers-builders; robotics; nuclear medicine.

9. Preparing children for a technological innovative life. STEAM education prepares children to live in a technologically advanced world. Over the next 60 years, technology has developed rapidly.

10. STEAM is applied as an adjunct to school programs. The organization of STEAM training to give direction to students it is advisable to organize seminars, because in order to further improve the quality efficiency of education for the rise of our country, it is important to abandon old-fashioned traditional methods and organize classes using international methods. For the rise in education, we must first use textbooks with modern design and content from their programs, which can meet the

requirements of today's international standard. In its place, it is advisable to use direct integration in teaching students the topics given in textbooks.

Today, when modern technologies are rapidly developing, the thinking of students is also taking shape in a new way. Accordingly, the enrichment of traditional educational methods with modern methodology is becoming an urgent issue. The STEAM (Science, Technology, Engineering, Art, Mathematics) approach embodies interdisciplinary integration in itself, aiming to reconcile students ' theoretical knowledge with practical activities.

This approach was originally formed as STEM in the United States, to which an art (Art) element was later added, giving rise to a STEAM model with a broad and creative approach. This educational model not only introduces students to modern technologies, but also serves to form them as highly qualified specialists.

STEAM education brings students from all walks of the world with decisive skills and knowledge in solving the problems of Twenty-First Century Society. By studying steam, you will open the door to many reliable, complete and well-paid professions.It is generally believed that American students must master science, technology, engineering, and math skills in order to be prepared for work on STEAM and compete with students from other parts of the world. But recent statistics have shown that the United States is overtaking many other countries in STEAM education. In addition, although a number of career STEAM professionals are in great demand, there are not enough students who show interest and excellence in STEAM fields to fill these jobs. To compensate for this, the U.S. education system has been focusing heavily on STEAM education in recent years. Due to the fact that in the STEAM educational environment, students immediately use their acquired knowledge in practice, when they grow up and come of age, face various problems encountered in real life, such as environmental pollution, climate change, to solve such complex problems, they understand that they only need to lean on their own knowledge, which they occupy in different fields of In this, it will not be enough to rely on knowledge within one discipline. Accordingly, the STEAM approach is also a way of thinking.

This model is also being introduced in the Uzbek educational system in stages. In particular, STEAM-based topics and assignments were included in the textbooks of Natural Sciences for grades 1-6 by the Republican educational center under the Ministry of public education. In the future, this approach will also be expanded in integration with other disciplines.

The role of Natural Sciences, in particular Zoology, is considered important in the STEAM approach. In classes, it is possible to organize the cognitive activity of students in individual and group forms, use collaborative teaching technologies, increase the effectiveness of the lesson through "saws", modular and problematic educational methods. For example, by forming a crossword, conducting experiments, preparing lectures and abstracts, students ' interest in science is increased.

In the course of the lesson, conscious assimilation of educational material is achieved by constant control of students ' knowledge, assessment, identification of errors and their elimination. It is especially important in this that a control mechanism is established through test assignments.

Conclusion: the STEAM approach to teaching Natural Sciences is seen in the modern educational system as an effective tool for deepening the scientific knowledge of students, developing their technological, creative and engineering skills. This approach enhances interdisciplinary integration, encouraging students to solve real-life problems, and participate in projects focused on creative thinking and practice. The STEAM approach not only increases interest in the natural sciences, but also helps to form 21st century skills in students. At the same time, for the successful introduction of this approach, it is determined that special training of teachers, a material and technical base, and constant support of the educational system are needed. The STEAM methodology makes the learning process innovative and interactive, encouraging students to pursue science and helping them adapt to future technological developments.

STEAM education is an effective methodological system that is not only modern, but also practice-oriented, developing the creative and logical thinking potential of students. Teaching the Natural

Sciences on the basis of this approach is of interest to students in relation to the sciences and strengthens their knowledge.

The STEAM approach is a powerful way to achieve effective results in Natural Science Education, and serves to prepare students to fit modern challenges and integrate interdisciplinary knowledge.

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