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Theoretical And Practical Foundations Of Steam Technology

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Abstract: *This article analyzes the theoretical and practical aspects of STEAM technology. STEAM (Science, Technology, Engineering, Arts, Mathematics) as an integrated approach is aimed at harmonizing practical activities with theoretical knowledge in the educational process. The article reveals its theoretical foundations in areas such as interdisciplinary integration, project approach, research — based teaching; and its practical aspects — the development of creativity in students, problem solving, experimentation, and the formation of practical skills through project implementation.*

Key words: *STEAM, STEM, STREAM, science, technology, engineering, art, maths, integration, creativity, innovation.*

Introduction

According to the decree of the president of the Republic of Uzbekistan “on approval of the concept of development of the public education system of the Republic of Uzbekistan until 2030” dated April 29, 2019, issues such as the transition to the innovative educational process, the study of new methods of intensive language, ICT and education, mastering the basics of steam pedagogy, the formation of the necessary[1]

In the modern educational process, great attention is paid to the formation of independent thinking, creative approach and practical skills of students. Of particular importance in this are innovative pedagogical technologies, in particular STEAM technology. STEAM (Science – Natural Sciences, Technology – Technology, Engineering – Engineering, Arts – Art and Design, Mathematics – Mathematics) is an integrated approach that is not only theoretical knowledge[2]

Methodology.

Today, a large-scale study and implementation of the theoretical foundations of steam technology is also being carried out in the educational system of Uzbekistan.[3] The theoretical aspects of this technology are significant in that they are based on interdisciplinary integration, project and research approaches, while the practical aspects are important in that they allow students to analyze life situations, develop a creative idea and test it in practice.[4]

STEAM is a technology that connects education with real life. Steam was developed in America. The most famous example of the STEAM approach is the Massachusetts Institute of Technology (MIT). The motto of this famous university is "mind and hand" – "mind and hand". The Massachusetts Institute of technology has developed STEAM courses and even created STEAM education centers in some educational institutions.[5]

Result and discussion.

The term STEM was first introduced into the school curriculum in the United States, aiming to develop students' competencies in scientific and technical fields. Later, this direction was expanded and additional letters were added to the term.

In particular, it began to be called STREM by adding" R "–robotics – robotics, or STEAM by adding" a " - art –ART. [6]
If the word STEAM is explained by letter:
S-science (science
T-technology (Technology[7]
E-engineering (Engineering
A-art(ART
M-mathematics (Mathematics).[8]
STEAM helps students develop the following important features and skills:

- A comprehensive understanding of problems;
- Creative thinking;
- Engineering approach;
- Critical thinking;
- Understanding and application of scientific methods;
- Understand the basics of design of the clock.[9]

STEAM-education technology relies on the design method, on the basis of which lies knowledge and artistic research. STEAM-education directly connects the development of the child with the external world. The STEAM approach allows children to systematically explore the world, logically observe the processes taking place around them, realize the interaction in them, open up something new, unusual and interesting for themselves. [10]
STEAM-based education is not integrated in academic subjects, but in " subjects". [11]
STEAM education combines an interdisciplinary communication and design method, on the basis of which lies the integration of natural sciences into technology, engineering creativity and mathematics. In this, training for engineering-related professions is carried out. [12]
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 are modern. [13]
The STEAM program develops critical thinking and problem-solving skills that children will need to overcome the challenges they 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 the expected result is not achieved. Balkim, the size or aerodynamics of his wheels may not have been correct. After each test, they eliminate the shortcomings.
Children go closer to their goal every time they build a bridge, start a car and an aircraft model. After each test, the model is improved. In the end, they overcome all the problems with their own strength and achieve their goal. It means encouragement, victory and joy for children. After each victory, they become more confident in their strength.
STEAM-software is distinguished by active communication and group work. 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 are always in contact with teachers and classmates. Children will remember training well if they actively participate in the process.
In primary education, the mission of STEAM-education is to develop students ' interests in the natural and technical sciences. Falling in love with the work they do serves as the basis for developing their interests.
Since STEAM training is very dynamic and fun, children do not get bored during training and do not notice how the time has passed.
STEAM education consists of six phases: question(task), discussion, design, construction, testing, and development. These stages are the basis of a systematic design approach.[14]
Theoretical foundations of STEAM technology:

- Interdisciplinary integration – brings together the knowledge of students from different disciplines and directs them to apply them to real-life problems;
- Project approach-teaches students to create and implement independent projects based on problem situations;

- Research-based education-forms the ability of students to independently research and think analytically;
- Creative thinking and Design Thinking-helps to harmonize theoretical knowledge with practical activities;
- In theory, STEAM saws serve to form a high level of knowledge, skills and competencies in readers, as well as to develop the requirements of the XXI century – critical thinking, communicativity and cooperation.

Practical fundamentals of TEAM technology:
The application of STEAM technology in practice revitalizes the learning process and increases its productivity. Its practical aspects are manifested in;
Practical projects-strengthening knowledge by preparing small projects, experiments, constructions in classes;
Interactive methods-the use of methods such as" role-playing"," mental attack"," cluster"," Insert";
Technological tools-the use of modern tools such as 3D printers, robotics kits, virtual laboratories, animations, interactive whiteboards;
Art and design elements-teaching students to approach creatively, develop beautiful visual solutions;
Teamwork and leadership skills-the development of social competencies through the implementation of projects together with small groups or communities, the protection of results.
The effective use of practical aspects of STEAM technology forms in students the skills of independent and creative thinking, problem solving, research, promotion of innovative ideas.[15]

Conclusion

STEAM technology is one of the most relevant areas of modern education and serves to harmonize theoretical knowledge with practical activities in the educational process. It develops independent thinking, problem solving, creative approach and project performance competencies in students through integration of Natural Sciences, Technology, Engineering, Arts and mathematics.
In theory, STEAM embodies interdisciplinary integration, research-based education, a project approach, and creative thinking. In practical terms, the ESA helps to strengthen students ' knowledge and skills through the use of innovative technologies, interactive techniques, experiments, projects, robotics, design and art elements in classes.
Thus, the effective use of STEAM technology makes it possible to form the intellectual potential of students in primary and general secondary education, creativity, critical thinking and competencies that are important in future professional activities.

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