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# STEAM Education: Student Learning and Transferable Skills

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**Abstract:** The digital transformation of society taking place today entails radical changes not only in the economic but also in the social sphere, including education. The disappearance of a number of professions and the emergence of new ones is the main problem of the formation of professional skills in people, as well as the skills of self-education, self-development, intellectual mobility and teamwork. Under these conditions, it is necessary to search for innovative approaches to training personnel for the digital society. The article describes peculiarities of STEAM education and its benefits in the process teaching.

**Keywords:** STEAM education, STEM, approach, educational standards.

## INTRODUCTION

The STEM approach is one of the breakthrough tools for transforming education. Many public and private educational institutions are adopting this concept, and it itself meets the educational standards. STEAM is a natural evolution of the STEM approach, combining technology and the humanities. The pedagogical philosophy of LEGO Education is based on these ideas, and so that these abbreviations, which can often be found in our materials, are clear to every reader, we talk in detail about the history, principles and solutions of STEM and STEAM education. For the first time, the idea and abbreviation STEM were proposed in 2001 by scientists from the US National Science Foundation as a guideline for updating the training system for modern engineers and researchers in universities. The idea was supported by the government, public organizations and many US corporations, including technology leaders such as Intel and Xerox. As a result, STEM principles have been actively applied to the formation of educational programs of many American universities.

Today, in the US higher education system, there are hundreds of engineering and scientific specialties, training programs for which are built in accordance with the STEM concept. At the same time, the student's thesis is combined with an internship in a technology company and participation in complex technology projects side by side with professionals. Due to this, technology companies receive qualified specialists immediately after graduation from the university.

Subsequently, the STEM approach was picked up by many countries around the world. Currently, STEM specialists are being trained in universities in France, Great Britain, Australia, Israel, China, Canada, Turkey and a number of other countries.

## DISCUSSIONS

The addition of art broadens the pool of students involved in the project, so that students who are less proficient in design and math can help the group achieve the aesthetics of the project.

The STEAM education is based on the idea of teaching students through an interdisciplinary and applied approach. Instead of studying each of the five disciplines separately, STEAM integrates them into a single curriculum.

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STEM education allows you to use scientific methods, technical applications, mathematical modeling, engineering design.

According to teachers, integration allows you to be successful in most professions. Almost all experts note that progressive technologies increase motivation for learning and expand basic knowledge in the field of design and programming.

STEM education is an innovative methodology that allows us to reach a new level of improving the skills of our children. With its help, we will be able to form a progressive personnel base that will allow us to become an economically independent and competitive country.

Benefits of STEM education:

- ✓ Integrated learning by topic, not by subject.
- ✓ Application of scientific and technical knowledge in real life.
- ✓ Development of critical thinking and problem solving skills.
- ✓ Building self-confidence.
- ✓ Active communication and teamwork.
- ✓ Development of interest in technical disciplines.
- ✓ Creative and innovative approaches to projects.
- ✓ Development of motivation for technical creativity through children's activities, taking into accounts the age and individual characteristics of each child.
- ✓ Early professional orientation.
- ✓ Preparing children for the technological innovations of life.
- ✓ STEM, as an addition to the mandatory part of the main educational program.

The rapid development of technology leads to the fact that in the future the professions associated with high technologies will become the most in demand: IT specialists, big data engineers, programmers. The education system responds to such a social demand with the emergence of a large number of circles of robotics, programming, and modeling. However, the idea that scientific and technical knowledge is not enough is heard more and more often. In the future, the skills of the XXI century are often referred to as 4C, will be in demand.

Thus, the main skills of the future 4C were formed:

- ➢ Communication
- ➢ Cooperation
- ➢ Critical thinking
- ➢ Creativity

The program can also be successfully used in extracurricular activities within the framework of the main educational program of primary general education, and each of its sections - an educational module - can be independently used both in the above educational organizations and in the system of additional education.

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The modern world poses difficult tasks for education: to prepare a child for life in a society of the future, which requires special intellectual abilities from him, aimed primarily at working with rapidly changing information. The development of skills to receive, process and practically use the information received is at the heart of the STEM education program.

The STEM approach gives children the opportunity to study the world systematically, to delve into the logic of the phenomena occurring around them, to discover and understand their interconnection, to discover new, unusual and very interesting things. The expectation of meeting something new develops curiosity and cognitive activity; the need to determine an interesting task for themselves, choose methods and draw up an algorithm for solving it, the ability to critically evaluate the results - develop an engineering style of thinking; Collective activity develops the skill of teamwork. All this provides a radically new, higher level of development of the child and provides more opportunities in the future when choosing a profession.

These skills cannot be obtained only in laboratories or from the knowledge of certain mathematical algorithms. That is why specialists have to study STEAM disciplines more and more often. Simultaneously with the expansion of the geography of STEM, elements of the STEM approach were spreading down the educational pyramid, both to school and preschool education. In many countries, training courses and manuals for interdisciplinary research and construction in children's groups have begun to be actively created. Feeling the real results of the STEM approach in higher education, the US government, through educational standards, approved STEM education as the basic method of teaching in schools. Australia, Canada and Singapore have done this even earlier. Within the framework of children's STEM education, robotics turned out to be the area where the economic demands for the development of high-tech industries and the natural interest of children in design most successfully intersected. As a result, today educators and teachers around the world are actively using construction kits in their work and programming of robots.

In the United States, where over 30 million jobs have been created within the creative industries, this need has led to the transformation of the STEM concept: a fifth component, Arts, has been added to the synthesis of science, technology, engineering and mathematics. The result was a new abbreviation and concept - STEAM.

This abbreviation is deciphered as follows: science, technology, engineering and mathematics (STEM, formerly used as SMET). The abbreviation means a term related to academic disciplines: natural sciences, technology, engineering and mathematics.

Usually this term is used to define directions, teaching methods, and the choice of specialties at the university. Now it is also actively used in determining the type of work, in matters of national security and immigration policy.

The term is most widely used in the United States, has been approved by the National Science Center and is used by many organizations to define scholarship and development in the fields of new technologies, computer science, chemistry, geology, natural and mathematical sciences, physics and astronomy.

Today, the term is common in many countries that claim to be the best in education: Australia, Canada, Great Britain, China, Hong Kong, Singapore, Turkey and many others. Funds are created specifically to support STEM areas, state money is allocated, and public and private STEM training centers are opened.

In most developed countries, STEM education is used starting from secondary education. As a rule, this field of directions has a large financial support from the state, which contributes to the development of a competitive environment in high school so that more and more students choose STEM directions for their future profession. In the USA, depending on the state, there is always a specialization within STEM

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education, for example, in California, aerospace programs are most supported, while in Colorado, programs in geology are more common.

The STEAM approach retains a focus on project activities, practical orientation and inter subjectivity, but changes the arrangement of key disciplines. At the level of curriculum formation, for example, at a university, STEAM involves the inclusion of not only engineering and natural science STEM subjects, but also humanitarian and creative disciplines: literature, design, architecture, music, fine arts. STEM subjects and technologies provide clear solutions for applied problems, and humanitarian Arts disciplines develop the ability to find a way out in a state of uncertainty, ambiguity and ambiguity. So students learn to harmoniously combine scientific rigor and creative freedom in their work.

The ideologists of the STEAM approach are inspired by the examples of great scientists who combined scientific pursuits with creativity, and thanks to the developed non-linear thinking and imagination, were able to give the world revolutionary discoveries: the writer Galileo, the artist Leonardo Da Vinci, the musician Einstein, the philosopher Heisenberg.

At the methodological level, the STEAM approach assumes that, in addition to solving technological issues, students in project activities:

- ✓ acquire teamwork skills;
- ✓ learn to constructively criticize and defend their opinion;
- ✓ develop presentation skills;
- ✓ learn to generate ideas in conditions of uncertainty;
- ✓ apply the principles of design and marketing to create and promote a product;
- ✓ realize the creative potential of applying technologies in various fields of activity.

## CONCLUSION

To summarize, we want to note that, compared to traditional teaching methods, the STEAM approach at school encourages children to experiment, build models, create music and films on their own, turn their ideas into reality and create the final product. This educational approach allows children to effectively combine theory and practical skills and facilitates admission and further study at the university.

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