

§2.7. USE OF STEAM-EDUCATIONAL TECHNOLOGY IN PRIMARY SCHOOL AS A CURRENT PEDAGOGICAL PROBLEM

What is STEAM Education?

It all started with the term STEM, which appeared in the USA. The difference between STEM and STEAM is only one letter A- Art, but the difference in approach is huge! Recently, STEAM education has become a real trend in the USA and Europe, and many experts call it the education of the future.

Introduction of Art (art)

The need for a combination of science and art was written by such thinkers as the Chinese mathematicians-enlighteners of the XI century.

Almost all inventors and scientists were also musicians, artists, writers or poets: Galileo was a poet and literary critic, Einstein played the violin, Morse was a portrait painter, etc. Thus, creativity was stimulated and strengthened through the practice of disciplines related to the right half of the brain.

You can't do without art at school. This is the creativity of children.

STEAM is a new educational technology that combines several subject areas as a tool for developing critical thinking, research competencies and group work skills.

STEAM is a development of the well-known abbreviation STEM, except that art is included. S - science, or science. T - technology, that is, technology. E - engineering, which means engineering in English. M - maths, the queen of sciences - mathematics. Art, a new component of the abbreviation A - art, can be understood as completely different directions - painting, architecture, sculpture, music and poetry. The addition of art makes it possible to expand the contingent of students involved in the project, so children who do not have pronounced abilities in design and mathematics can help the group with the aesthetic implementation of the project.

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

STEM education allows you to use scientific methods, technical applications, mathematical modeling, engineering design. Which leads to the formation of innovative thinking of the student, skills, skills of the 21st century.

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

STEM learning is an innovative technique 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.

Advantages 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.
- Formation of 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 account the age and individual characteristics of each child.
- Early professional orientation.

SCIENTIST IN THE MODERN SCIENCE WORLD: NEW ASPECTS OF THE SCIENTIFIC SEARCH • monograph • B&M Publishing • 2022

- Preparing children for technological innovations of life.
- STEM, as an addition to the mandatory part of the basic educational program (OOP).

Scientific and technical orientation (STEM)

The rapid development of technology leads to the fact that in the future the most popular professions will be related to high technologies: IT specialists, big data engineers, programmers. The education system responds to such a social request with the appearance of a large number of robotics, programming, modeling (STEM) circles. However, more and more often the idea is heard that scientific and technical knowledge is not enough. In the future, the skills of the XXI century, which are often called 4K, will be in demand.

Skills of the Future (4K)

The skills of the XXI century are a special area that is being actively discussed at different levels. The essence of the concept is as follows: the key skills that determined literacy in the industrial era were reading, writing and arithmetic. In the XXI century, the emphasis is shifting towards the ability to think critically, the ability to interact and communicate, and a creative approach to business. Thus, the basic skills of the future 4K were formed:

- Communication
- Cooperation
- Critical thinking
- Creativity

These skills cannot be acquired only in laboratories or from knowledge of certain mathematical algorithms. That is why specialists have to learn STEAM disciplines more and more often.

The program "STEM-EDUCATION OF PRESCHOOL AND PRIMARY SCHOOL AGE CHILDREN"

The proposed program "STEM-EDUCATION OF PRESCHOOL AND PRIMARY SCHOOL AGE CHILDREN" is a partial modular program of preschool education aimed at developing intellectual abilities in the process of cognitive activity and involvement in scientific and technical creativity.

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

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, primarily aimed at working with rapidly changing information. The development of skills to receive, process and practically use the information received is the basis of the STEM education program.

The STEM approach gives children the opportunity to study the world systematically, delve into the logic of the phenomena happening around them, discover and understand their relationship, discover new, unusual and very interesting. The expectation of getting to know something new develops curiosity and cognitive activity; the need to determine an interesting task for yourself, choose ways and make 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 gives more opportunities in the future when choosing a profession.

WHAT IS INCLUDED IN THE PROGRAM AND WHAT EDUCATIONAL TASKS ARE BEING SOLVED:

SCIENTIST IN THE MODERN SCIENCE WORLD: NEW ASPECTS OF THE SCIENTIFIC SEARCH • monograph • B&M Publishing • 2022

The educational module "Didactic system of F. Froebel"

- Experimenting with objects of the surrounding world;
- Mastering mathematical reality through actions with geometric bodies and shapes;

- Mastering spatial relations;

- Construction in various angles and projections.

Educational module "Experimenting with living and inanimate nature"

- formation of ideas about the surrounding world in experimental activities;
- awareness of the unity of all living things in the process of visual-sensory perception;

- formation of ecological consciousness

"LEGO - construction"

- the ability to practical and mental experimentation, generalization, establishment of cause-and-effect relationships, speech planning and speech commenting on the process and result of their own activities;

- ability to group items;

- the ability to show awareness in different spheres of life;

- fluency in the native language (vocabulary, grammatical structure of speech, phonetic system, elementary ideas about semantic structure);

- the ability to create new images, to fantasize, to use analogy and synthesis.

The educational module "Mathematical development"

is a comprehensive solution to the problems of mathematical development, taking into account the age and individual characteristics of children in the following areas: size, shape, space, time, quantity and counting.

Educational module "Robotics"

- development of logic and algorithmic thinking;
- formation of the basics of programming;
- development of planning and modeling abilities;
- information processing;
- development of the ability to abstract and find patterns;
- ability to quickly solve practical problems;
- mastering the ability of accentuation, schematization, typing;
- knowledge and ability to use universal sign systems (symbols);
- development of the ability to evaluate the process and the results of their own activities.

Educational module "Cartoon Studio "I create the world"

- mastering ICT (information and communication technologies) and digital technologies;
- mastering media technologies;
- organization of productive activities based on the synthesis of artistic and technical creativity.

Each module is aimed at solving specific tasks that, with their complex solution, ensure the realization of the goals of STEM education: the development of intellectual abilities in the process of cognitive research activities and involvement of young children in scientific and technical creativity.

Each separate module includes a thematic selection of manuals that provide an integrated approach to the implementation of educational tasks for the development of intellectual abilities in the process of cognitive research activities and the involvement of young children in scientific and technical creativity.

Such education can, of course, only be creative, creating conditions for the child to find his own path of development in accordance with what he is interested in.

STEAM technologies in elementary school

What is it necessary to learn and teach in order to achieve the personal development of every child who will have to live in a highly technological world. It is important that every child understands in time what direction he is interested in, so that he gets carried away at school and continues to develop in this direction. Therefore, in the modern world, the teacher faces a responsible task: to teach children to develop intuition. Establish cause-and-effect relationships, look for patterns, solve open problems.

STEM education develops critical thinking, increases scientific preparedness and generates the origin of innovators and inventors. Innovation leads to the release of the latest products and actions that support our economy. These innovations and scientific preparedness rely on a strong base of knowledge in STEM fields. There is no doubt that robotics, design, programming, forecasting, 3D-construction and much more – that's what is now interested in advanced teenagers around the world. To realize these interests, the most sophisticated skills and competencies are needed. It is essential not only to know and be able, but also to study and create. To implement these necessities, it is necessary to simultaneously develop in such major academic fields as science, mathematics, technology and engineering, which can be combined in one word – STEM (science, technology, engineering and mathematics). In many countries, the list of professions, including those with higher education, is being revised, this is due to the widespread introduction of digital technologies into our lives. In the near future, many professions will "die out" and it is expected that their functions will be replaced by robotic machines, as well as new professions will appear that are now even difficult to imagine, they will all be associated with technology and high-tech production at the junction with natural sciences, especially bio- and nano-technology specialists will be in demand.

The disadvantages of STEM technology are the following:

- Weakening of communication skills. In STEM, engineers pay most attention to formulas, equations, textures of materials, in which, most likely, a dry book language will be used;

- Focusing on STEM can lead to a loss of creative skills.;

- Focusing on accurate data can make it difficult to solve the problems of the surrounding "everyday" world;

The narrow focus of teachers can cause students to assimilate fragmentary knowledge, which means that the teacher should also develop in the STEM direction.

STEM is an integrated learning approach, the purpose of which is to create sustainable links between school, society, work and the whole world, contributing to the development of STEM literacy and competitiveness in the global economy.

The use of STEM technologies transforms difficult-to-perceive school subjects into elementary and clear ones and more resembles an interesting scientific journey, the purpose of which is to study the surrounding world in all its manifestations: from construction technologies to the work of services salvation, from physical phenomena to the animal world of the planet Earth.

The introduction of STEM technologies in regular and extracurricular practice can be attributed to an innovative field in the field of children's technical creativity, which combines traditional approaches to the study of the basics of technology and innovative directions: information forecasting, programming, information and communication technologies, prepares education effective and productive for all participants in the process, and an advanced secondary educational institution competitive. In fact, almost every student has modern electronic devices that help him both in educational activities and in everyday life. But not all students understand how electrical novelties work and operate, managing them only at the user level.

In Russia, the active development of STEM education has begun, as evidenced by the opening of centers for technical support of education, which solve the problems of

attracting students to engineering and robotics in the context of STEM. For the implementation of a new educational It is also planned to include STEM elements in the curricula aimed at the development of new technologies, scientific innovations, and mathematical modeling.

With all the abundance of available approaches, virtually all researchers have a similarity in the opinion that STEM education is a modern educational paradox, which means raising the quality of students' comprehension and understanding of disciplines related to science, technology, engineering and mathematics, the purpose of which is to prepare students for the most effective application acquired knowledge to solve professional tasks and problems (including through the improvement of highly organized thinking skills) and the formation of competence in STEM (the result of which it is permissible to call STEM literacy).

In general, the meaning of education reform in STEM orientation can be shown through three main factors:

- the first one is connected with massive financial problems that any country faces;
- the second shows the changing needs of the workforce, which are urgently asking for the most comprehensive and flexible, knowledge, skills and skills that meet the needs of the XXI century;
- the third highlights the demand for STEM-readiness needed to solve massive scientific, technical and environmental problems.

Particular interest in STEM education is paid to interdisciplinary relationships. This allows the teacher to express a creative approach to classroom planning and the implementation of interdisciplinary connections in real pedagogical reality.

We are talking about the penetration of sciences into everyday human life and the development of knowledge in step with the times. After all, it is these sciences that determine the future humanity. A child from childhood should understand the importance of knowledge, the concept of information, how to get it and how to store it. This is what forms a new experience of cognition of the surrounding world and nature.