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STEM EDUCATION: ORIGINS AND PROSPECTS OF APPLICATION

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Abstract
The article is devoted to the STEM concept, the purpose of which is to study the exact sciences, technologies and engineering. Particular attention is paid to the background and historical events that contributed to the development of STEM education.

Keywords: stem education, educational concept, science, mathematics, engineering, technology, experiment, applied science, theoretical science, educational process**.**

Interest in STEM education is a natural response to the changing conditions of modern society. The main task of education today is to educate competitive professionals who will be in demand in the labor market. In the 21st century, the need for IT specialists, engineers and specialists in high-tech industries is growing. And these profiles, in turn, require meta-subject training from the graduate, which is a guarantee that a person is prepared for a further career, ready for the changing challenges of the modern world. Among other tasks of modern education is to increase the attractiveness of engineering specialties and the introduction of comprehensive training. This is evidenced by the updated GEF. The essence of STEM education.The problem of the quality of engineering education does not lose its relevance. One approach to the solution is the implementation of the training program of the Worldwide CDIO Initiative (think, implement, develop, manage). The first standard of education, the backbone one, sets the main goal of engineering education: the preparation of a graduate who is able to carry out the full cycle of the implementation of an engineering product. To achieve this goal, it is possible to introduce STEM education.

Данная концепция подразумевает интеграцию научных областей. STEM технологии также позволяют решать задачу выполнения обновленных ФГОС в части планируемых метапредметных результатов.

The main provisions of STEM education:

• Combines several disciplines (science, technology, engineering, mathematics and natural sciences).

• Links the theory of one object to the practice of another (eg, applying the properties of geometric shapes to engineering design).

• Can combine two practices: scientific research and engineering design.
• One of the subjects may play a key role depending on the bias of the school.

The meta-subject skills that students learn in the course of training can be divided into two groups:

Regulatory:

• the ability to determine the necessary actions in accordance with the task and draw up an algorithm for their implementation;
• compare your actions with the goal and, if necessary, correct mistakes yourself;
• Evaluate the product of your activity according to the specified criteria.

Communicative:

• ability to work in a group (communicate, assign roles);
• ability to express and defend one's opinion;
• the ability to organize educational cooperation and joint activities with peers and the teacher;
• find a common solution based on the coordination of positions and common interests;
• formulate, argue and defend your opinion.

In 2011, Moscow schools were among the first to introduce the concept of STEM education. Below is an example of the structure and form of organization of STEM education, which includes five subjects (physics, chemistry, biology, physical geography, astronomy).

The “Natural Science Cluster” is implemented as follows:

• 5th-6th grades - familiarization with concepts and phenomena, the formation of basic laboratory skills and abilities within the framework of studying the integrated subject "Natural Science";
• Grades 7–8 — study of each subject of the educational area "Natural Sciences" in the format of immersion modules and in the logic of interdisciplinary connections;
• 9th-11th grades - study under the International Baccalaureate program with the possibility of choosing an individual educational track.
• An individual learning path is provided with a choice of additional courses to prepare for specialized Olympiads with a focus on further professional activities.

Schoolchildren, united in groups of two to four people, devote the main study time to solving various practical problems with the help of laboratory experiments. Students receive learning tasks through the school information environment.

The STEM strategy was developed in the United States after the country's leadership expressed concern that American students were lagging behind other countries in science and mathematics. In 2010, the American education system underwent

changes related to the reorientation of the program. The specifics of STEM education were defined: teaching and learning in the field of natural sciences, technology, engineering and mathematics, including educational activities at all levels - from preschool to postgraduate education, both in formal (lessons) and non-formal (after school) conditions.

In Russia, the impetus for the development of STEM education in 2014 was given by the President of the Russian Federation. In his Message to the Federal Assembly, he set out the need to bring engineering education in Russia to the world level. After that, the National Center for the Development of Technologies and Basic Elements of Robotics was created in the country.

In 2018, Russia ranked 30th in math literacy, according to the Program for International Student Assessment and the International Mathematics and Science Knowledge Survey, and 33rd in science literacy.

- Ideally, compatriots should occupy key positions in the field of high technologies. Programs of school, secondary vocational education, and after - bachelor's degree should be aimed at the gradual formation of simple qualifications with subsequent complication.
- Retraining of teachers
- A group of researchers from the Higher School of Economics assessed the overall level of technological training of teachers as moderate with a positive bias. Most importantly, experts noted the lowest possible level of technophobia among teachers, which makes it possible to introduce new technologies into the educational process.
- Among the difficulties that teachers talk about the introduction of STEM technology, the following can be distinguished:
- Lack of skills to work with modern technological solutions and equipment;
- Insufficiency of the material and technical base, which does not allow the use of certain tools in the educational process;
- Psychological barriers, fear of new technologies and risks;
- Weak methodological support: lack of recommendations, examples of tasks and tools, regulations for their application.
- We provide a complete package for STEM education: our models are suitable for integrated learning and accompanying materials come with them: manuals, lesson plans, presentations and sample assignments. More details can be found in our catalog.
- For the development of a STEM teacher, the previous training programs are not relevant. Doctor of Pedagogical Sciences Marina Mikhailovna Shalashova in her

research summarized the elements necessary for a teacher to work in the STEM format:

• Immersion in the context (modern technologies, updating the content of natural sciences, technological education, familiarity with nanotechnologies);

• Workshops on independent acquisition of new experience, immersion in work with technological cases from real enterprises and businesses;

• Supervision as expert advice and support;

Post-program support in the first year after graduation, assistance and advice in the implementation of children's projects, rethinking the practice of work in the field of project and research activities of students.

STEM education allows schoolchildren and then students to form a holistic vision of reality in the relationship of the studied branches of knowledge and develop not only special, highly professional skills, but also universal ways of activity.

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