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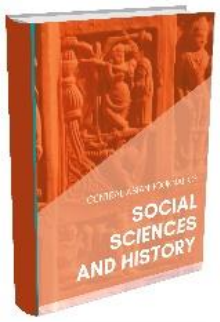

The Formation of STEAM-Competencies in Teaching of Natural Sciences at Primary Schools

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ABSTRACT
The article discusses applying STEAM-approach, to fulfill certain organizational-pedagogical, psychological-pedagogical and didactic conditions for the successful integration of the content of natural sciences, the organization of the educational process with good efficiency in the framework of STEAM education in teaching natural sciences in primary schools.

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Introduction

How to teach and what to teach in primary schools is one of the main issues in today's modern education. In the context of the rapid process of globalization and informatization, completely new professions related to revolutionary scientific and technological achievements will appear in the labor market, and existing professions will undergo significant changes in terms of their content and requirements for training and work experiences and skills. As technology is shaping the future and transforming virtually every industry, so an interdisciplinary approach is critical. We need to teach students to have the following interdisciplinary skills:

1) Creativity;

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2) Problem solving;
3) Innovation;
4) Communication skills;
5) Time management;
6) Setting for career growth;
7) Emotional intelligence;
8) Ability to work in a team;
9) Adaptability;
10) Leadership.

STEAM education as an interdisciplinary concept, intensively integrated into the world educational systems, is one of the effective technologies for the formation and development of the above skills.

Materials and Methods

STEAM education aims to apply cutting-edge interdisciplinary education methods across subject areas, business and society for lifelong learning. Integrated learning integrates diverse disciplines in a comprehensive way, allowing students to expand their education, develop higher-level thinking skills, and gain a better understanding of complex interactions with each other, society and the environment. The relationship of subject areas to each other, as well as to the world of business and social development, is presented in the research-based theoretical model "Pyramid of STEAM" which was first proposed by Georgette Yakman in 2006 [1]. The aim of the research was to create a matrix through which scientists, specialists and teachers could exchange information in order to keep education as up-to-date as possible, based on the methodology. The study is based on an analysis of the total resources in various fields and the use of well-established classification systems in S-T-E-M to map and compare the rest of the fields of the social sciences.

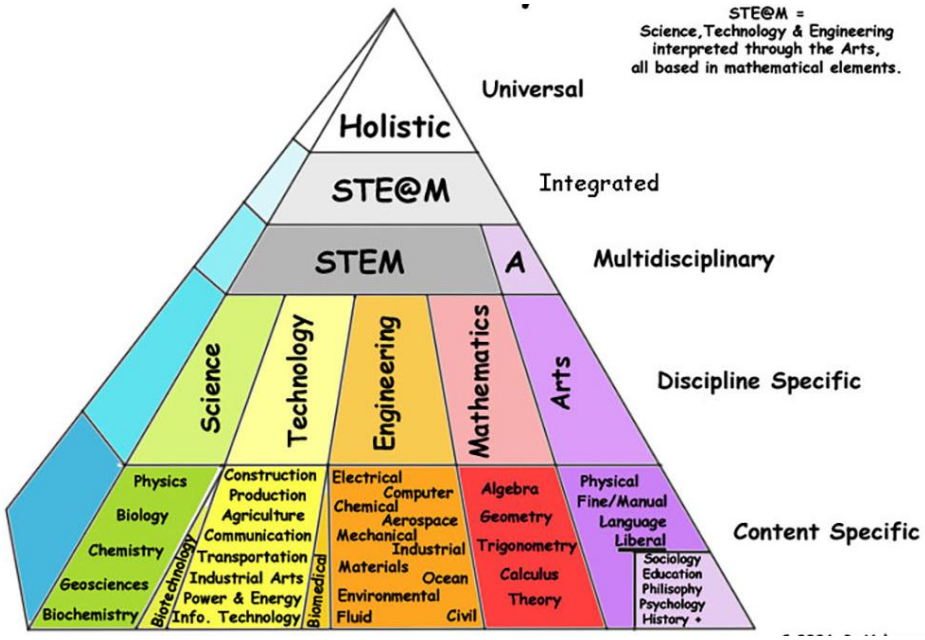

Figure 1 - Pyramid STEAM (retrieved from https://steamedu.com/pyramidhistory)

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The top of the pyramid is focused on lifelong learning, is a holistic and long-term educational goal. In the context of a constantly changing process of social development, education should not be limited to the transfer of specific subject knowledge and methods of its application, but through the training of teaching thinking and awareness of the need for lifelong learning, it should be adapted to changing social needs.

The Integrative level aims to encourage participants to apply intra-disciplinary and interdisciplinary knowledge in an integrated manner to solve problems that arise in projects, using practical, project-oriented teamwork methods.

Multidisciplinary level (Multidisciplinary) (the meaning of art refers not only to narrow concepts such as aesthetics and crafts, but also includes music, humanities, language arts, etc.) - the application of multidisciplinary knowledge. Thus, with the joint design of team work, interest in the lesson increases, as well as teamwork abilities, communication skills and a comprehensive applied ability of participants develop.

Discipline Specific – Enrichment studying subjects by the topic of another specific subject. This theme should have rich connotations and diverse forms.

Specific content level (Content Specific) is the design of the specific content of educational activities, aimed at creating knowledge links between disciplines.

STEAM education does not include part of education, but refers to the general paradigm from vocational training to lifelong learning, which is organized with the addition of art to existing education, especially in the integrated education of science, technology, engineering, mathematics and art in elementary school. STEAM education will be a practical and realistic education that can predict the future in a systematic way based on scientific technology and engineering, as well as connections to politics, the environment, society, the economy and the pursuit of values with integrative thoughts and creativity [2].

STEAM education helps students develop basic skills such as exploring art objects, collaboration, communication, problem solving, and critical thinking [3]. It also increases student flexibility, cognitive productivity, responsibility for learning, and innovation. These skills play an important role in shaping any learning competence. It should be noted that without such a modern approach to teaching, it is impossible to ensure the formation of interest in technical creativity and mathematics among students.

The main difference between STEM and STEAM is that STEM refers to a modern approach to the formation of learning competencies that are focused on and relevant to solving problems related to the ability to think critically and analytically. STEM educational technologies forms in students the competence to connect both creative thinking and art to life situations. The educational process is based not on the topic, but on the integration of the essence of the subject - a combination of mathematics, physics, computer science, natural sciences, technology and robotics. In mastering STEM technologies, critical thinking skills are developed, interest in technical sciences is developed. Using stationary technologies in the learning process, the teacher prepares children for the technological innovations of life, teaches them to find creative and innovative approaches to projects. Designing and organizing the learning process based on the development of STEM learning technologies requires special training of primary education teachers, which ensures that they master this technology at a high professional level [5].

For the effective implementation of STEAM education, specific pedagogical conditions are needed, since it is necessary to manage pedagogically subject content of natural sciences. When formulating

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pedagogical conditions, it is necessary to take into account the influence of the chosen teaching method; content of training; organizational forms of education; other factors that qualitatively or quantitatively affect the learning outcome.

There are the following conditions that affect the educational process:

- organizational and pedagogical conditions;
- psychological and pedagogical conditions;
- Didactic conditions.

Organizational and pedagogical conditions are a set of factors that allow solving educational problems [4]. For the successful integration of the content of the studied disciplines and natural sciences and the organization of the educational process with good efficiency, it is necessary to fulfill the following organizational and pedagogical conditions:

1) focus on the provision of content by the teacher and the acquisition of knowledge about the content by students;
2) an integrated curriculum with equal focus on two or more disciplines;
3) the relationship between the goals, principles, concepts and skills of learning in various areas related to a particular discipline;
4) the use of real problems associated with an interesting and motivating context;
5) focusing on big ideas, concepts, topics;
6) focus on defining, formulating, evaluating and solving problems;
7) the ability to learn from mistakes and rebuild based on this learning;
8) Teaching social skills in small groups, encouraging students to evaluate the functioning of the group in order to increase the level of participation and academic performance. Working in groups, students carry out practice for the study of natural sciences.

Psychological and pedagogical conditions are "the conditions that provide pedagogical measures of influence of the teacher on the student and are designed to increase the effectiveness of the educational process". To ensure the effectiveness of STEAM education, the following psychological and pedagogical conditions must be implemented:

1) scaffolding - support provided to learners to ensure their success in the learning environment, including conceptual, strategic, metacognitive and motivational scaffolding;
2) the use of alternative learning paths, focused on learners, promoting active learning: engaging learners to science and engineering practices, providing the opportunity to actively participate in tasks that are usually performed by experts in the field of science and technology. These methods include:

- ✓ the opportunity to ask questions and identify problems;
- ✓ development and use of models;
- ✓ planning and conducting investigations;
- ✓ analysis and interpretation of data;

- ✓ construction of explanations and design of solutions;
- ✓ participation in argumentation based on evidence;
- ✓ receiving, evaluating and transmitting information.

Didactic conditions are "a purposeful selection of the content, methods and organizational forms of learning to achieve educational goals".

An effective educational process of integrating the content of the studied disciplines and natural sciences in organizing the educational process with good efficiency requires the following didactic conditions:

1) learning based on previous knowledge and experience of students, establishing links with purposeful and skills already learned by students;
2) STEAM tools, considered as a set of equipment, ideas, phenomena and methods of action that ensure the implementation of experimental, project and research activities in education, must perform information, practical, creative and control functions;
3) the use of authentic educational material: printed methodological materials (textbooks, electronic textbooks, teaching aids, teaching instructions and algorithms);
4) the use of visual aids of various types, which include:

- ➢ natural (equipment, tools, samples);
- ➢ pictorial (photos, posters, reproductions of paintings);
- ➢ sign-symbolic (models of signs, graphs, diagrams, tables);
- ➢ Technical: information (computers, multimedia, projectors, copy boards, interactive whiteboards, document cameras, video conferencing systems, projection tables, etc.) and control (simulators, devices for diagnosing processes).

Conclusion

To conclude, taking into account and fulfilling the presented pedagogical conditions contributes to the effective organization of STEAM education, makes it possible to go beyond the traditional curriculum, allows us to expand horizons of the individuals, improve the quality of education and subject content of natural sciences in primary schools, accelerate the development of students' professional skills, and also opens up new opportunities for continuing education and further professional activities.

References:

1. Kastriti, E., Kalogiannakis, M., Psycharis, S., & Vavougios, D. (2022). The teaching of Natural Sciences in kindergarten based on the principles of STEM and STEAM approach. *Advances in Mobile Learning Educational Research*, *2*(1), 268-277.
2. Anggraeni, R. E. (2021, March). The analysis of the development of the 5E-STEAM learning model to improve critical thinking skills in natural science lesson. In *Journal of Physics: Conference Series* (Vol. 1832, No. 1, p. 012050). IOP Publishing.
3. Anisimova, T., Sabirova, F., & Shatunova, O. (2020). Formation of design and research competencies in future teachers in the framework of STEAM education. *International Journal of Emerging Technologies in Learning (iJET)*, *15*(2), 204-217.

E-mail address: editor@centralasianstudies.org
(ISSN: 2660-6836). Hosting by Central Asian Studies.

4. Xo'jamiyorov, I. (2021). PERCULARITIES OF ORGANIZATION OF LEARNING PROCESS IN THE CONTEXT OF STEAM EDUCATION TECHNOLOGY. *Журнал математики и информатики*, *1*(2).
5. Atmojo, I. R. W., Ardiansyah, R., Saputri, D. Y., & Adi, F. P. (2021). The Effectiveness of STEAM-Based Augmented Reality Media in Improving the Quality of Natural Science Learning in Elementary School. *AL-ISHLAH: Jurnal Pendidikan*, *13*(2), 821-828.
6. Hoi, H. T. (2021). Applying STEAM Teaching Method to Primary Schools to Improve the Quality of Teaching and Learning for Children. *International Journal of Early Childhood Special Education*, *13*(2).
7. Toshbekova M.X. The role of STEAM technologies in shaping students' learning competencies. // Scientific-methodical journal of continuing education. Special issue, 2021 22-25
8. https://steamedu.com/pyramidhistory
9. https://steamedu.com/research/

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(ISSN: 2660-6836). Hosting by Central Asian Studies.