СЕКЦІЯ: STEM-ОСВІТА: ШЛЯХИ ВПРОВАДЖЕННЯ, АКТУАЛЬНІ ПИТАННЯ ТА ПЕРСПЕКТИВИ

EDUCATIONAL PRACTICE OF IMPLEMENTING THE STEAM EDUCATION CONCEPT

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Contemporary transformations in the educational sphere necessitate the implementation of innovative approaches to learning that promote the formation of flexible, interdisciplinary knowledge and skills. One such approach is STEAM education – an integrative model that combines science, technology, engineering, art, and mathematics. Below, we will examine the fundamentals of STEAM education as a conceptual platform for developing creative and critical thinking, solving complex problems, and preparing students for the realities of the modern world.

The STEM educational approach focuses on the integration of these four key disciplines in the natural sciences, mathematics, and technology. The main goal of this approach is to develop critical thinking, improve problem-solving skills, and prepare students for relevant professions in the fields of science, technology, and engineering.

STEAM is an expanded version of STEM, in which the letter «A» complements the traditional natural sciences and mathematics disciplines with art and design. At the same time, «A» can be interpreted more broadly as «All», meaning it covers all other academic disciplines, including social sciences and humanities: history, philosophy, political science, social studies, law, economics, economic geography, languages, literature, art history, etc. [4].

The STEAM method in education is being implemented as an integrated pedagogical technology that combines curricula in natural sciences, technology, engineering, mathematics, as well as arts and social sciences and humanities for the purpose of effective organization of the educational process (fig. 1).

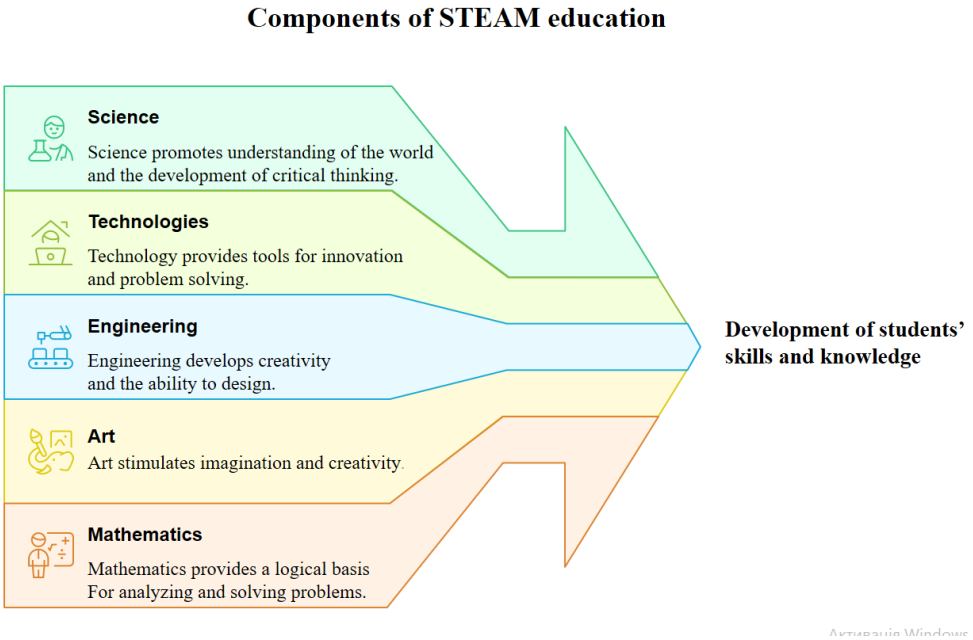

Fig. 1. Components of STEAM education

STEAM is seen as a multifunctional and large-scale integrated approach to education that can be applied at all levels of learning: from preschool and general secondary education to extracurricular education, vocational and technical education, higher education, and postgraduate education. This approach can be adapted to various forms of learning, such as institutional (full-time or part-time, distance learning), online, and individual learning. STEAM is used as a basis for developing educational programs and creating appropriate technologies, methods, forms, and means of learning [2].

In accordance with the definition of «education system» in the Law of Ukraine «On Education», STEAM education can be recognized as a new direction that is currently in the stage of formation and development of a promising didactic system. Ahead lies the development of STEAM standards, educational programs, licensing requirements, a regulatory framework, and other components of this process.

The founder of the STEAM educational movement, Georgette Yakimen, defines this approach as an integrated interdisciplinary study of natural sciences and technologies through engineering activities (technical creativity) combined with liberal arts, based on the principles of mathematics. She emphasizes that STEAM is not simply the addition of visual arts and design to traditional STEM fields. The humanities, or liberal arts, answer the questions «who?» and «why?», while the natural and technical sciences address the aspects of «what exactly?» and «how?». Thus, the humanities provide context and depth of meaning for STEM disciplines [3].

The director of the Institute for the Integration of Arts and STEAM, interprets STEAM as an educational approach that integrates the disciplines of science, technology, engineering, and mathematics with the arts, creating opportunities for inquiry-based learning and problem solving. This approach promotes dialogue, creativity, and critical thinking.

According to Ukrainian researchers in the field of design education, STEAM is an interdisciplinary approach to modern educational content based on the integration of art disciplines (humanities and arts) with natural sciences, technology, engineering, and

mathematics. This approach promotes interaction between scientists, engineers, entrepreneurs, artists, and designers, opening up broad opportunities for the exchange of ideas in both academic and social contexts. STEAM also creates conditions for experimentation, development, and design of innovative solutions [1].

From the perspective of educational convergence, STEAM is a multi-, inter-, and transdisciplinary approach that combines STEM academic knowledge with real-world problems using art, technical creativity, and technology. This helps build connections between schools and communities, other educational institutions, industry, business, and other sectors.

STEAM is also seen as an approach to education aimed at fostering sustainability with an emphasis on altruistic goals that promote the development of humanity. The artistic component in STEAM is associated with aspects such as expressiveness, evoking emotions, developing empathy, and stimulating imagination, which can break down stereotypes. It also promotes openness and awareness of both oneself and the surrounding world.

The simplest and most universal definition is this: STEAM education is an approach that supports interdisciplinary teaching of STEAM subjects through a set of appropriate practices [4].

STEAM education practices are essentially no different from STEM and are closely linked to science education practices. They combine natural sciences, technology, engineering, art, and mathematics, emphasizing the importance of comprehensive learning and the use of interdisciplinary and applied approaches. This approach allows students to demonstrate their learning achievements through various forms, such as speeches, presentations, debates, reports, models, projects, and startups.

STEAM education is based on project-based learning, research, experimentation, and design, which allows students to apply their knowledge in real-life situations and promotes creativity, innovation, and collaboration among participants in the educational process. Another important aspect is the integration of natural sciences, mathematics, and art with modern technologies and digital tools [4].

STEAM places particular emphasis on developing both hard skills, such as the ability to think and act as an engineer or inventor, engineers, or inventors, as well as soft skills, including creativity, critical thinking, communication, collaboration, flexibility, adaptability, and other skills necessary for success in facilitators, supporting learners and students on their way to achieving their goals.

Thus, STEAM education is an innovative approach to learning, the essence of which lies in combining academic knowledge with real-world problems, which promotes critical thinking, improves the ability to solve complex tasks, and solves problems in a practical context. Thanks to the art included in this approach, students have the opportunity to develop creative and design skills, which increases their motivation and interest in learning.

In general, the STEAM concept not only focuses on the integration of different disciplines, but also creates a favorable environment for active student interaction, encouraging them to work independently, conduct research, and experiment. It emphasizes the development of both hard and soft skills that are necessary for success in the modern world. The implementation of STEAM in education has significant potential to improve the quality of learning, adapt to the current demands and needs of society, and prepare students for the professional challenges of the digital society.

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ІННОВАЦІЙНІ ПІДХОДИ ДО ФОРМУВАННЯ STEM-КОМПЕТЕНТНОСТЕЙ МОЛОДШИХ ШКОЛЯРІВ ЗАСОБАМИ ОСВІТНЬОЇ РОБОТОТЕХНІКИ

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Важливим завданням Нової української школи є формування в учнів критичного мислення, креативності та здатності до самостійного розв’язання проблем. У цьому контексті особливого значення набуває STEM-освіта, яка інтегрує природничо-математичні дисципліни на основі практичної діяльності, сприяючи розвитку інтелектуального потенціалу та цифрової компетентності молодших школярів. Водночас початкова школа дедалі активніше впроваджує цифрові та інтерактивні технології навчання, що суттєво змінюють підходи до опанування знань і розвитку практичних умінь учнів. Саме у молодшому шкільному віці закладаються основи інформаційної культури, формується здатність критично сприймати інформацію, аналізувати дані, узагальнювати та робити висновки. Цей період є сенситивним для розвитку пізнавальної активності, логічного мислення та цифрової компетентності, які виступають фундаментом подальшої успішності освітньої діяльності та самореалізації учня в цифровому середовищі.

Погоджуємося з позицією науковців з думкою науковців Б. Волощук, Н. Лалак, Ю. Новгородської, Н. Хараджян, А. Чорей, які зазначають, що одним із інструментів формування STEM-компетентностей молодших школярів є освітня робототехніка. Освітня робототехніка виступає не лише сучасним технічним засобом навчання, а й інноваційною педагогічною технологією, спрямованою на формування в молодших школярів технічного та алгоритмічного мислення, розвиток цифрової компетентності, аналітичних здібностей, STEM-компетентностей і навичок