

THE CURRENT IMPORTANCE AND ADVANTAGES OF FORMING SCIENTIFIC LITERACY IN STUDENTS BASED ON STEAM EDUCATION TECHNOLOGY

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Abstract

This article discusses the current importance of STEAM technologies, their opportunities and achievements, and their advantages in the education system. The article can be used by students, independent researchers, and educators.

Keywords

STEAM technologies, quality of education, abilities, foreign education, integration, science, technology, engineering, art, mathematics, development center, integration.

The development of education worldwide is recognized as one of the most urgent tasks. Education serves as the foundation that determines the spiritual-cultural life and socio-economic progress of every country. In the modern education paradigm, special attention is paid to forming subject-specific competencies in students based on STEAM education technology, taking into account each student's individual development opportunities. This includes fostering qualities such as independent thinking, creativity, innovation, initiative, and the ability to quickly engage in communication. In turn, this creates the need to improve the methodological foundations of forming scientific literacy in students during technology lessons in general education schools through a comprehensive approach.

Today, in our country, the development of the technology field, its role in our lives, and the increasing demand for training qualified specialists who thoroughly know the subject are driving factors. There is a perceived need to develop new

innovative approaches in teaching that enhance creative thinking and practical activity in general education school students, allow integrative approaches linking acquired scientific knowledge to daily life, increase interest in lessons, and incorporate project-based, demonstrative, and practical activities.

Globally, great attention is being paid to enhancing students' scientific worldview in subjects, particularly aligning students' knowledge levels in technology education with international standards and determining the effectiveness indicators of modern educational programs. Therefore, special focus is placed on STEAM education technology as an effective tool for forming scientific literacy in students. This education technology serves to develop scientific, technological, constructive, artistic-aesthetic, and mathematical competencies in students. This requires the application of STEAM education technology in technology subject lessons to form a scientific worldview in students.

STEAM education technology manifests in interpreting (from Latin: explaining, interpreting) a special educational environment that directs students toward scientific research, technical creativity, and project activities based on an integrative approach. Sciences and technologies are interpreted through engineering and art, all understood via mathematical elements.

S - Sciences – A collection of sciences related to the living and non-living nature, phenomena, and laws of the surrounding external world. It reflects precise knowledge about everything that truly exists in society. It involves expanding and deepening connections between sciences, society, and production, and strengthening attention to the human factor in solving modern societal problems.

T - Technology – The creation of something new in the environment or changing existing conditions by humans to satisfy needs and desires. As known, throughout history, people have created new technologies to meet their needs and wants. Most modern technologies are products of natural sciences and engineering fields, with technological tools actively used in both major areas.

E - Engineering – The knowledge of designing objects, processes, and systems used to meet human needs, integrating parts into a whole. It views the world as an integrated system, involving the design of its parts and problem-solving processes. Engineering is the art of applying scientific, economic, and social knowledge to practice in constructing structures, machines, devices, systems, and materials. Engineers, as practitioners, use knowledge from sciences, mathematics, technological tools, and art as the basis of design activity.

A - Art – Humans' interpretation and mastery of the surrounding world through music and visual arts, developing their existing creative abilities. As shown in the image above, "A - Art" was later added to STEM education, reflecting

the fields within each subject and their activity directions in implementing this education technology.

M - Mathematics – The science of spatial forms and quantitative relations of reality. It involves enhancing students' mathematical concepts, operations and their properties, quantitative and qualitative changes, calculations, and using knowledge from sciences, engineering, technology, and art in studying geometric shapes.

The main difference between STEM and STEAM is that STEM represents a modern approach focused on critical thinking and analysis in problem-solving, forming relevant scientific literacy competencies, while STEAM education technology serves to develop creative thinking and competencies in linking art to real-life situations. The learning process is based on the integration of subject essence – harmonious study of mathematics, physics, informatics, natural sciences, technology, and robotics. When STEAM technologies are applied, students' critical thinking and interest in technical subjects develop, preparing them to accept innovations in life and teaching creative approaches to problematic situations. The addition of the "R" letter to STEM for robotics expresses educational robotics, emphasizing the importance of design and simulation (external appearance of objects) for science and innovation development. Educational robotics is an interdisciplinary field of teaching school students. Compared to other fields, robotics provides a more effective opportunity to implement STEAM education principles. By designing and building robots, students integrate knowledge from physics, technology, mathematics, cybernetics, ICT, and other subjects, engaging in innovative scientific-technical creativity. Depending on the application method and characteristics of developing competencies, STEM uses PBL (Problem-based learning) – based on studying and analyzing problems. PhBL (Phenomenon-based learning) manifests as understanding world laws based on studying phenomena. The above reflections show that although these education technologies appear in several forms and are similar in content, they enable identifying ways to unite around specific practical activities for solving researched problems or needs.

REFERENCES:

- 1.Sh.M.Mirziyoyev 2018-yil 5-sentabrdagi «2018- 2021-yillarda O‘zbekiston Respublikasi Xalq ta’limi tizimini yanada takomillashtirish bo‘yicha chora-tadbirlar dasturi to‘g‘risidagi» gi PQ – 3931 – son Qarori.
- 2.Турсунова, Ш. Б. (2021). Педагогик компетентлик ва уни самарали ривожлантириш. *Science and Education*, 2(3), 377-381.

3.R.A.Mavlonova , N.H.Raxmonqulova , K.O.Matanazarova , M.K.Shirinov , S.Hafizov «Umumiy pedagogika» . «Fan va texnologiya» nashriyoti T:2018.

4.Tursunova, S. B. (2025). TEXNOLOGIK TA'LIM YO'NALISHIDA "4+ 2" INNOVATSION O 'QUV DASTURI ASOSIDA O 'QUV JARAYONINI TASHKIL QILISH. *Экономика и социум*, (5-1 (132)), 890-898.

5. O'tkir Tolipov , Dilnoz Ro'zieva «Pedagogik texnologiyalar va pedagogik mahorat » » Toshkent innavatsiya – Ziyo » T: 2019.

6.Tursunova, S. B. T. S. B., & Abdurazzaqova, G. (2024). TEXNOLOGIYA DARSLARI ORQALI OQUVCHILARDA TEXNIK FIKRLASH QOBILYATLARINI RIVOJLANTIRISH. *Universal xalqaro ilmiy jurnal*, 1(12), 535-537.

7. Z. Ashurova » Maktabgacha ta'limda STEAM texnologiyasidan foydalanish » Metodik qo'llanma . Buxoro:2020.

8.Tursunova, S. (2025). O 'zbekistonda ESG tamoyillarining ta'limga integratsiyasi: yutuqlar, muammolar va istiqbollari. *MAKTABGACHA VA MAKTAB TA'LIMI JURNALI*, 3(10).

9. Z. M. Ashurova » Maktabgacha ta'limda STEM texnologiyasining ahamiyati «. T:1:1 (2022)

10. Tursunova, S. T. S. (2024). O'QUVCHILARDA TADBIRKORLIK KO'NIKMALARI VA INNOVATSIYALARNI RIVOJLANTIRISH TEXNOLOGIYA FANINING O'RNI VA AHAMIYATI. *Universal xalqaro ilmiy jurnal*, 1(12), 219-222.

11. Abdurasulovna, K. G. (2022). Opportunities for the formation of students' creative thinking in technology classes. *Galaxy International Interdisciplinary Research Journal*, 10(5), 187-191.

12. Bakhromovna, T. S. Characteristics of the Teacher of the Future Technological Education. *JournalNX*, 7(05), 170-173.

13. Ruslanovna, M. J. (2025). DEVELOPMENT OF TECHNOLOGICAL COMPETENCIES OF TECHNOLOGICAL EDUCATION STUDENTS. *Modern American Journal of Linguistics, Education, and Pedagogy*, 1(2), 424-432.