



DEVELOPING SCIENTIFIC LITERACY IN PRIMARY SCHOOL STUDENTS

Ergasheva G.A.

Acting Associate Professor at the
Samarkand Regional Center for Pedagogical Excellence

Abstract

Today, STEAM education is developing as one of the leading global trends and is based on integrating five fields into a unified learning framework through the application of a practice-oriented approach. This article analyzes the conditions of such education, including its continuity and the development of children's ability to interact in groups, where they collect ideas and exchange opinions. Owing to the STEAM approach, children gain an understanding of nature and the world, while the rapid development of modern technologies is expected to lead in the future to the growing popularity of high-technology-related professions such as IT specialists, big data engineers, and programmers.

Keywords: Innovative education, professional competencies, foundation for an innovative economy, musical literacy, practical and concrete tasks, creativity, conducting experiments.

Introduction

Annotatsiya:

Bugungi kunda STEAM–ta'lim dunyodagi asosiy tendensiyalardan biri sifatida rivojlanmoqda va amaliyot yondashuvni qo'llashda beshta sohani yagona o'quv sxemasiga integratsiyalashga asoslangan. Ushbu maqolada bunday ta'limning shartlari uning uzluksizligi va bolalarning guruhlarda o'zaro muloqot qilish qobiliyatini rivojlantirish bo'lib, bunda ular fikrlarni to'plashi va fikrlar almashish, STEAM yondashuvi tufayli bolalar tabiatni tushunib, dunyoni muntazam texnologiyaning jadal rivojlanishi kelajakda yuqori texnologiyalar bilan bog'liq eng mashhur kasblar: IT mutaxassislari, katta ma'lumot muhandislari, dasturchilar bo'lishiga olib kelishi haqida tahlil qilinadi.



Kalit so‘zlar: Innovatsion ta’lim, kasbiy kompetensiyalar, innovatsion iqtisod uchun poydevor, musiqa savodxonligi, amaliy va konkret masalalar, ijodkorlik, tajribalar o‘tkazish.

Аннотация

В настоящее время STEAM-образование развивается как одна из ведущих мировых тенденций и основывается на интеграции пяти областей в единую образовательную модель с применением практико-ориентированного подхода. В данной статье анализируются условия такого образования, включая его непрерывность и развитие у детей способности к взаимодействию в группах, в рамках которого они собирают идеи и обмениваются мнениями. Благодаря STEAM-подходу дети познают природу и окружающий мир, а стремительное развитие современных технологий в будущем приведёт к росту популярности профессий, связанных с высокими технологиями, таких как IT-специалисты, инженеры по большому данным и программисты.

Ключевые слова: инновационное образование, профессиональные компетенции, основа инновационной экономики, музыкальная грамотность, практические и конкретные задачи, креативность, проведение экспериментов.

According to the Concept for the Development of the Public Education System of the Republic of Uzbekistan until 2030, approved by Presidential Decree No. PF-5712 dated April 29, 2019, the priority directions and key measures for the development of the education sector are clearly defined. The effective implementation of these goals and objectives, the formation of students’ critical and creative thinking skills, and the development of their ability to apply acquired knowledge and skills in real life through the introduction of modern approaches and methodologies into the educational process constitute the main goal of an education system that meets international standards. Achieving these objectives is ensured through reforming the quality of continuous education, increasing the effectiveness of teaching methodologies, and introducing new innovative projects.



Failure to develop students' literacy skills in natural sciences, as well as in other academic subjects, leads to their lagging behind rapidly changing global educational processes, being unaware of innovative and integrative developments, and insufficient formation of their intellectual potential.

Scientific literacy is understood as an individual's knowledge of scientific ideas and their ability to solve science-related problems as an active citizen. A scientifically literate person can participate in discussions of science- and technology-related issues based on scientific evidence.

Developing literacy skills through international assessment programs is currently one of the main prerequisites for nurturing creative youth.

Studying information and communication technologies (ICT), mastering new teaching methods, learning the foundations of STEAM pedagogy, and forming a knowledge base necessary for acquiring new professional competencies have been set as key objectives. Today, under the general abbreviation STEM (Science, Technology, Engineering, Mathematics), a complex of academic and applied disciplines aimed at training specialists with innovative thinking is understood, and without such personnel, the development of an innovative economy and culture is impossible.

Sometimes, the component "A" (Art) is added to this general term, forming STEAM. STEAM education emerged based on three main demands of modern society:

- Seeking new impulses to enhance the competitiveness of the economy and achieve leadership in innovation at the global level.
- New requirements imposed on education by the labor market, business sector, and high-tech production.
- Modern technologies, which form the foundation of an innovative economy, impose new requirements on specialists in all fields. These requirements necessitate not only improving the quality of education but also adopting new approaches to training professionals who are ready to find innovative solutions to real-world problems.

Solving social problems. Each student must be provided with innovative thinking tools and practical experience to apply mathematics, engineering, and scientific achievements in solving various problems. In this context, it is important to demonstrate in lessons that the most interesting projects emerge at



the intersection of different disciplines. This refers to expanding human understanding of the surrounding world and improving life within it.

The proposed approach emphasizes three key principles. Based on these principles, several distinctive features of such curricula and lessons can be identified:

- Offering “open-ended” problems that allow the use of various resources (the Internet, books, personal experience, experiments, research, etc.) to find solutions and acquire necessary knowledge;
- Proposing problems that have multiple solutions and more than one “correct” answer;
- Enabling students to learn scientific laws through their own research;
- Moving from practical and concrete problems toward general conclusions, concepts, ideas, and higher levels of abstraction and theory;
- Using science and mathematics in problem-solving, with attention to logic and evidence;
- Approaching problem-solving and discussion from perspectives of economics, culture, history, ethics, ecology, and other fields;
- Incorporating elements of games and competitions;
- Providing opportunities for experimentation, hands-on creation, and testing tools and devices used in real life;
- Implementing low-cost projects using available raw materials to develop construction skills, imagination, creativity, and activate knowledge in economics, management, and culture;
- Organizing teamwork, finding collective solutions, negotiation, and collaboration;
- Including presentations in education (organizing public presentations of results), establishing feedback with experts and participants, discussion, and peer assessment.

STEAM education enables the use of scientific methods, technical tools, mathematical modeling, and engineering design. This contributes to the development of students’ innovative thinking and 21st-century skills and competencies.



According to teachers, integration enables success in many professions. Almost all specialists emphasize that advanced technologies increase motivation for learning and expand fundamental knowledge in design and programming.

There is no doubt that the challenges facing humanity in the 21st century require innovative solutions based on scientific thinking and discoveries. Society needs knowledgeable individuals and scientists who conduct research and develop innovations necessary to solve economic, social, and environmental problems. It can be stated that scientific literacy is a core competency and the primary goal of teaching natural sciences. Knowledge and skills based on natural sciences play a crucial role in an individual's personal, social, and professional life, while understanding science and science-based technologies occupies a central place in "preparing young people for life."

Scientific literacy refers to an individual's knowledge of scientific concepts and their ability to solve science-related problems as an active citizen. A scientifically literate person can participate in evidence-based discussions of issues related to science and technology. In shaping students' future professional qualities, practical experience is as important as theoretical knowledge.

Scientific knowledge has been accumulated over many years through activity. Scientific experiments and practical knowledge have played and continue to play a crucial role in understanding and interpreting the environment. Natural science studies the diverse properties of the material world and various natural phenomena and is formed on the basis of scientific experimentation, while practice serves as its foundation. Humanity's practical activity based on knowledge of natural laws determines scientific and technological progress. Practice is the criterion of truth. The need for knowledge arises in practice, and its correctness is tested and confirmed through practice.

Knowledge does not arise spontaneously in the human mind but is formed through specific activities. Practice is the main factor in humanity's interaction with nature and plays an important role in social relations and social production. The main forms of practice are material production and scientific experimentation. Scientific practice performs the following functions:

Practice is a driving force in the development of cognition, generalizing theoretical knowledge and preventing its separation from real life.

Practice is the demand, application, and goal of cognition.

Practice is the criterion that verifies the truth of cognition.

In natural sciences, practice has long been the main factor of scientific production. Practice leads to the emergence, formation, and development of theory. The accuracy of knowledge is confirmed by the truth of information about a specific object. However, under different conditions, truth may also differ. For example, under normal conditions and pressure, water boils at 100°C, but if pressure changes or if heavy water is used, this value changes and becomes context-specific.

Truth within a given system may completely change under different conditions. The confirmation of an idea through practice is the main factor of truth. Teaching practical activities should begin in primary grades. Practical methods demonstrate the complex interconnection of verbal instruction, visual aids, and hands-on activities organized and guided by the teacher to develop students' thinking.

The application of practical methods is associated with active engagement of students' sensory receptors and motor skills. These methods enable deeper understanding of learning material and the formation of skills and competencies. In practical methods, students' own activities serve as the source of knowledge. Such methods include oral and written exercises, laboratory work, activities in school gardens, nature corners, and extracurricular activities.

Types of practical work include:

- Creating various objects using distributed didactic materials;
- Drawing;
- Identifying and recognizing natural objects;
- Observing and recording phenomena;
- Conducting experiments (solving problems through experimentation).

References:

1. Mirziyoyev Sh.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. – T.: “O‘zbekiston”, 2017. – 488 b.
2. O‘zbekiston Respublikasi Prezidentining 2019-yil 29-apreldagi “O‘zbekiston respublikasi xalq ta’limi tizimini 2030-yilgacha rivojlantirish konsepsiyasini tasdiqlash to‘g‘risida” PF-5712-sonli Farmoni.
3. M. Pardayeva, M.Ergasheva. Milliy o‘quv dasturini amaliyotga joriy etish: Biologiya fani



4. M. Ergasheva, Q.A.Niyozov. O‘quvchilarning tabiiy-ilmiy savodxonligi monitoringida baholash dasturlari va topshiriqlaridan foydalanish metodikasi. O‘quv qo‘llanma.- Toshkent, 2023 – 160 b.
5. “Ta’limda STEAM yondashuv: maqsad, jarayon va istiqbolli rejalar” xalqaro onlayn ilmiy-amaliy seminar materiallari, Samarand, 2020-yil 30-sentabr, <https://t.me/STEAMprogram>
6. “Fan, texnologiya, muhandislik va matematika (STEM) bo‘yicha O‘zbekiston uchun seminar” materiallari, 2020-yil, 24-sentabr.
7. Фролов А.В. Роль STEM образования в “новой экономике” США // Вопросы новой экономики.- 2010.- №4 (16).- С. 80-90.