

Improving the Biology Teaching Process Based on The Integration of Natural Sciences Use of STEA M Curriculum as A Current Pedagogical Problem

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Received: 28 March 2026; **Accepted:** 24 April 2026; **Published:** 14 May 2026

Abstract: The article highlights the essence of the 21st century educational paradigm and the STEAM program based on an integrative approach. The pedagogical and psychological foundations of interdisciplinary integration, international assessment programs (PISA, PIRLS) are analyzed. The relevance of using the STEAM program in teaching 7th grade biology and its importance in forming students' natural and scientific literacy are substantiated.

Keywords: STEAM curriculum, interdisciplinary integration, scientific literacy, critical thinking, creativity, biology teaching methodology, integrative approach, international assessment programs (PISA, PIRLS), cognitive and moral qualities, educational paradigm.

Introduction: The current era of human society's development is characterized by the rapid pace of information and technological progress. is described. As a result, the development of information and ideas represents the constant competition between people. The success of people in the 21st century depends on their personal and professional qualities, the most important of which are critical thinking, creativity, independence, and the ability to organize their own activities.

Therefore, today's educational paradigm requires, from the lowest stage of education, the integration of cognitive and moral qualities, the study of man and nature as integral processes, the provision of conscious analysis, and the organization of natural-scientific and social knowledge on the basis of mutual integration. This, in turn, creates the need for students to independently study the necessary knowledge, engage in creative activities, as well as to arouse personal

motivation for learning, and apply the learned theoretical knowledge in real life practice . Such approaches to education and upbringing can be seen in our country's political reforms, which state that "Education should be aimed at ensuring the connection between everyday life and practice, at forming the ability to apply the acquired knowledge in practice, and at ensuring its integral connection with other academic subjects." In a number of other normative documents aimed at the development of education and upbringing, we can explain the issue of educating students from school age as follows: " Starting from the first grade, it creates a foundation for the formation of a healthy, strong and effective motivation to study and the development of the ability to choose a profession, independently plan professional growth, and master modern professions." In any country where the issue of education and upbringing has risen to the level of state policy, the growth, development, and spiritual and

moral development of the population of that country
The literacy rate will be high.

STEAM education program involves the interpretation (from Latin, interpretation, explanation) of a special educational environment that guides students to scientific research, creativity and project activities

based on an integrative approach. Science and technology are interpreted through engineering and art, all of which are understood through mathematical concepts . An analysis of the literature on the topic shows that STEAM education program is being used today in a number of forms. This of forms comparative The description is given in Table 1 .

Table 1

STEAM education of the program main forms

Name	Full text in English naming	Definition (classification)
S T E M	Science, Technology, Engineering, Mathematics	An educational program designed to understand the laws studied within the natural sciences, technology, engineering, and mathematics.
S T E M M	Science, Technology, Engineering, Mathematics , Music	natural integration of science , technology , engineering , mathematics , and music
S T E A M	Science, Technology, Engineering, Arts and Mathematics	natural An educational program designed to integrate learning with science , technology , engineering, arts, and mathematics .
S E R E A M	Science, Technology, Reading + Writing Engineering, Arts, and Mathematics	natural sciences , technology , robotics , engineering, art and mathematics of sciences in reading and writing to know An educational program designed to learn scientific principles through hands - on skills .

From the table apparently As you can see , the STEAM program main idea interdisciplinary integration expanding STEM is the main four to the component STEAM is based on art , and SEREAM is winter and to write also adds skills .

The main difference between STEM and STEAM is that STEM represents a modern approach to the formation of scientific literacy competencies that are focused on solving problems related to the ability to think critically and analyze [30; pp. 108-111, 32].

STEAM education and interdisciplinary integration based on scientific research on the topic We turned to scientific research to clarify the pedagogical psychological content of the concept. In particular, the views of Ya.A. Comenius [24; 576-b], D. Locke, M. Pestalozzi, K.D. Shinsky [28; 527-b], NK Chapaev [31; 372-b] substantiated the fact that educational effectiveness can be achieved through interdisciplinary communication.

In her research, VN Fedorova demonstrates the didactic potential of interdisciplinary connections to increase

the effectiveness of the educational process, emphasizing that educational interdisciplinary connections are manifested as a didactic condition for the interconnectedness and coherence of natural sciences and environmental phenomena [29; 207-b].

According to the famous Russian psychologist GSKostyuk, "Stratification leads to differentiation - an increase in mental processes and states (properties), while integration leads to ordering, subordination and placing its results in a certain sequence. Through integration, a new psychological process, a new structure of activity is formed. This new structure is formed by synthesizing previously separate elements" [25 ; 376-b].

In the process of interpreting the study of our research by scientists of our country, we found that there are very few studies related to the STEAM educational program. However, in the studies on the issues of the integrative approach, international assessment programs, and natural sciences, which are the main problems characterizing the content of the research,

RAMavlonova, NXRakhmonkulova, problems of integration of primary education [11; p. 192, 12; p. 530], N.Abdullaeva and NN Dzhamilova revealed the specific features of using integrated education to increase the effectiveness of primary education [1; p. 164, 5; p. 124], while Kh.Yulbarsova, expressing the interrelationship of integration - theory and practice, justified the fact that it ensures a further increase in the social, pedagogical and psychological significance of the process [21; p. 45]. N. Ahmedova discusses the problem of an integrative approach to improving the future professional training of teachers [2; 161-b], O. Abdukhalilov discusses the didactic foundations of using interdisciplinary communication as a means of ensuring the professional training of students of secondary specialized educational institutions [22; 185-b], and M.I. Makhmutov and A.Z. It can also be seen in the works of Shakerzyanov [26; 207-p]. MN.Irisbayeva studied the integration of historical-national and modern pedagogical ideas in educational processes [7; 131-p].

In our country, the problems of organizing an integrative approach from the lowest levels of education have been studied by a number of researchers. In particular, FR Kadirova has studied the integrative ways of teaching Uzbek and Russian to children of preschool age [13; 116-b], BR Djurayeva the pedagogical necessity of integrating the content of preschool education [4; 160-b., 23; 43-b], N.Sh. Mamatkulova and D. O'. Khidirova have studied the integration of subjects in primary grades [10; 77-78-b], MQ . Asadova has studied the establishment of interdisciplinary connections in teaching general education subjects through the integration of education [3; 806-809-b], GA Kamalova has studied the socio-pedagogical possibilities of developing students' professional competence based on an integrative approach [8; 100-103-b], O'. Tolipov and D. Ruziyeva also conducted fruitful research on the design of the pedagogical process, interactive methods and the effectiveness of their application in the educational process [20; 276-b], and M. Lutfillayev on the integration of information technologies in improving the educational process in higher education [9; 211-b].

At the same time , a number of studies have been conducted on international assessment programs that

demonstrate the effectiveness of a number of STEA M education. In particular, JT Olipova developed methodological support for the STEAM approach in teaching natural sciences [16; 64-66-p., 17; 16-p., 18; 128-p., 19; 128-p .], EOTurdikulov studied the problem of integrated teaching of natural sciences as a separate research problem and studied educational integration as a process that allows creating a single integrated knowledge [27; 192-b]. MFKurbanova studied the problem of forming educational and cognitive competencies of primary school students in the process of independent work (based on the requirements of the PIRLS international assessment program) [14; 12-b], MTErgasheva and UE Rakhmatov studied the problem of forming students' skills in assessing their acquired knowledge in natural and scientific literacy (based on the requirements of the PISA international assessment program) [6; 31-33-b., 15; 17-21-b] and implemented international assessment programs in our national education system.

As stated in the Concept of Development of the Public Education System of the Republic of Uzbekistan until 2030, the main goal is to equip students with modern knowledge, to form a set of competencies and fundamental knowledge and skills in them. In implementing such tasks, we can only increase the quality of education by applying modern educational programs to students of school age.

As a result of our observations, it became clear that today's educational practice is in great need of the achievements of the education system of developed countries in equipping students with theoretical and practical knowledge, and in this regard, it involves not only improving the professional knowledge of the teacher, but also forming and developing the skills to use new forms of education, educational ideas. It is from this perspective that the formation of natural and scientific literacy of 7th grade students, improving the process of teaching biology based on the integration of natural sciences , and studying the use of STEAM educational programs based on an integrative approach are relevant.

Below is an example of using STEAM software on the topic of "Plant Anatomy" (cell structure, tissues, organs) in 7th grade biology (see Table 2) .

Table 2

An example of using STEAM software on the topic "Plant Cell" in 7th grade biology

STEAM component	Method of application	Example of a specific assignment
Science	Study of the structure and functions of plant cells	Observing onion peel or elodea leaf cells under a microscope
Technology	Using a digital microscope or mobile app (e.g. PlantNet)	Taking a picture of a cell and labeling its parts
Engineering	Creating a 3D model of a cell	Model of cell organelles using plasticine, wood, paper or a 3D printer
Arts	An artistic drawing or collage of a cell	Colorize cell parts in watercolor or colored pencils; glue organelles together from various materials
Mathematics	Calculating dimensions, scale, and proportions	Calculating the actual size of a cell in a microscope based on scale (using an ocular micrometer or formula)

As shown in Table 2, each component of the STEAM program is demonstrated through specific and practical tasks on the topic of "Plant Cell". In this, the student not only studies the structure of the cell scientifically, but also applies the disciplines of technology (digital microscope, mobile application), engineering (creating 3D models), art (artistic drawing), and mathematics (calculating dimensions) in an interconnected way.

At the end of the experiment, control work was conducted to determine the effectiveness of the STEAM

program. In the experimental group (n=100), the average mastery index of students increased from 3.2 to 3.8 points, and in the control group (n=97) from 3.2 to 3.4 points. In the experimental group, the number of students who received grades of "5" and "4" increased from 31 to 60, and the number of students who received grades of "2" decreased from 21 to 3. These results confirm the effectiveness of the STEAM program in increasing the level of knowledge of students. The experiment in Table 3 below at the beginning and final mastery indicators in detail cited .

Table 3

Students' mastery indicators at the beginning and end of the experimental test

Experience stages	Classes	Students number	Ratings				Average price
			5	4	3	2	
Experience at the beginning	Experience	100	9	22	48	21	3, 2
	Control	97	9	19	46	21	3, 2
Experience at the end	Experience	100	21	39	37	3	3, 8
	Control	93	12	23	46	12	3, 4

In the table record as it is said , experience at the beginning experience and control groups in the middle almost difference (average grade 3.2) . Experience at the end and experience in the group noticeable changes

observed .

Experience at the beginning mastery indicators groups in the section distribution as shown in Figure 1 below delivered .

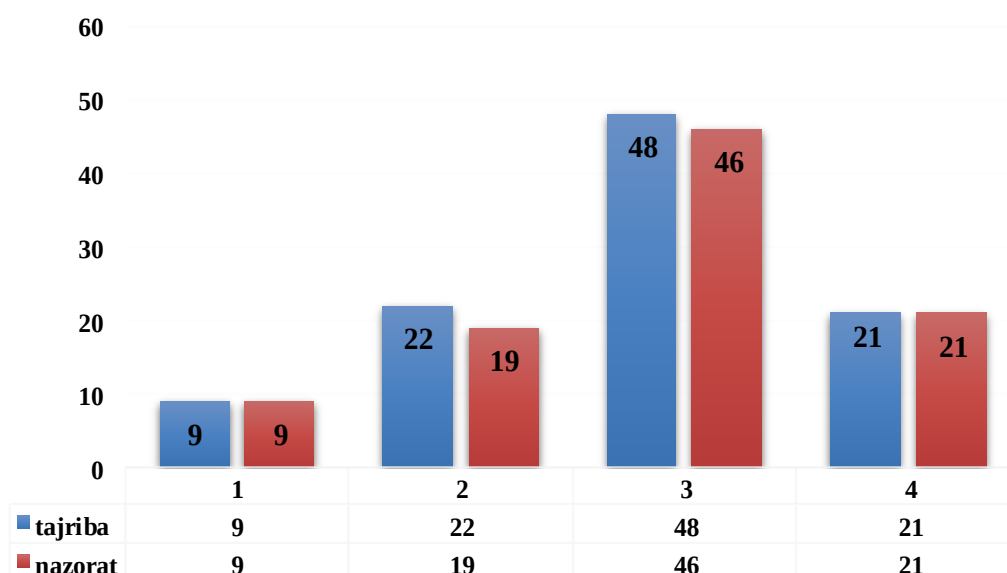


Figure 1. Students' mastery indicators at the beginning of the experiment.

As seen from Figure 1 as it stands , experience at the beginning both learn in a group level approximately one kind mainly " 3" and " 2 " grades advantage did .

Experience at the end mastery indicators and shown in Figure 2 below .

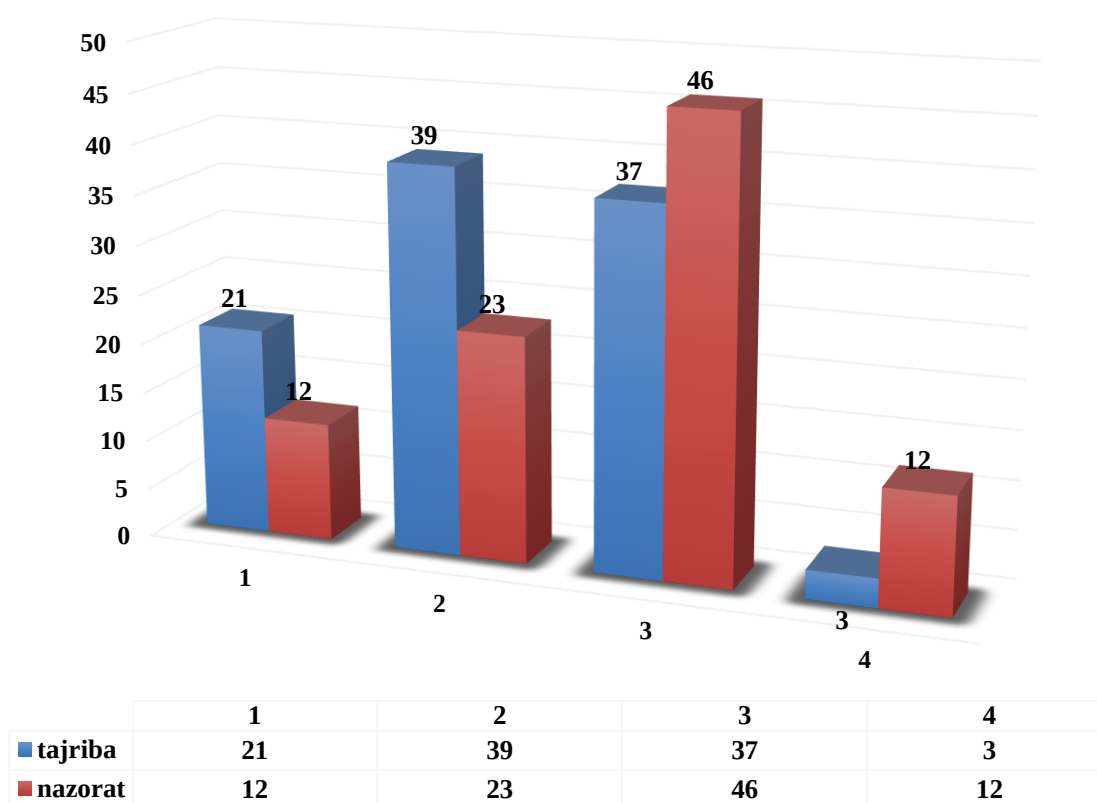


Figure 2. Students' mastery scores at the end of the experiment.

As shown in Figure 2 , the experiment Grades "5" and "4" in the group share noticeable at the level increased , "2" grades and almost not encountered . Control positive in the group as well shift observed although , experience in the group from indicators low the rest .

This results of the STEAM program students knowledge level in progress efficiency confirms .

Indeed, the use of new integrated education - STEAM educational programs - in improving the biology teaching process is one of the global problems of

society. STEAM educational programs help students develop basic cognitive skills such as learning objects, cooperation, communication, problem solving and critical thinking. They also increase the student's flexibility, cognitive efficiency, responsibility for learning and desire for innovation. These skills are of great importance in the formation of competence in any subject or subject. Without such a modern integrative approach to teaching, it is impossible to ensure the formation of technical creativity, creative thinking and interest in natural sciences among students.

of our research, among a number of innovative programs that can be used in the educational process of 7th grade students, the STEAM educational program is the most suitable for today's modern educational conditions, strengthens the interdisciplinary knowledge of students, and has the opportunity to achieve the expected results, which further increases the interest, aspirations, and motivation of researchers and teachers, and most importantly, students, in learning sciences. From this, we can conclude that this educational program is suitable for general secondary schools. It is extremely necessary for the practice of teaching natural sciences, and the development and improvement of the methodology for its application shows the urgency of the problem.

Students will learn biology based on the integration of natural sciences. In order to improve the teaching process, it is first of all advisable to develop their interest in learning, creative and creative approach skills, independent thinking, and systematic self-improvement. It follows that, first of all, we need to develop creative abilities in students in order to implement the STEAM educational program in the 7th grade.

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