

Modern approaches to the study of the "STEAM model" in teaching biology

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Abstract

Biology teaching at school is constantly based on demonstration of experiments. However, for students with figurative memory, learning abstract, non-figurative processes is difficult. The STEAM education model is based on the idea of teaching students five specific fields: Science, Technology, Engineering, Art, and Math in a collaborative and integrated manner. The observations I made today give reason to say that precisely in order to solve these problems, to achieve active use of Internet resources in the educational process, the teaching of Biology will be further improved with the help of STEAM. Learning biology through STEAM will play an important role in education and in preparing children for future problems and opportunities. It will develop the rapid learning skills needed in educational institutions and today.

Key words : Biology subject, STEAM, teaching model, education technology

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Introduction

Knowledge , morality , and spirituality serve as a single, complete process in educational work at school, serving to form the individual's cognition and spirituality, which in turn conditions the formation and development of a scientific worldview in them .

Knowledge as a wealth is the result of a person's conscious activity, its reflection in concrete practical work, its fulfillment of worldview functions, and the guarantor of the internal resources of the personality. Humanistic, moral ideals and worldview functions are reflected in knowledge. Worldview knowledge plays a major role in the educational process. This knowledge is not limited to providing information about social phenomena, but also manifests a personal attitude to them. It is precisely to transform these relations into a form of high moral activity , to prepare students to fulfill their labor and civic duties that social - must be paid as a pedagogical requirement.

Man's efforts to understand himself and the world, the world around him raise many questions: Who am I in this world? What place do I occupy in this world? How is the world in relation to me and what is my relationship to it? etc. The answers to such questions help to reveal the essence of man in the world. The efforts to define and determine himself in the world, by connecting a person to a system of worldviews, - It also creates a stimulus for spiritual enrichment .

The concept of man and the world determines the essence of the worldview. Knowledge in this direction has social, moral, aesthetic, theoretical content and determines the inner and outer face of man. Knowledge becomes a worldview when its value, meaning is understood, and it is followed in activity and behavior.

One aspect that needs to be taken into account is that in the process of teaching biology, it is not enough to teach the basics of science to form a worldview. It is necessary to ensure that the knowledge students gain about nature is transformed into their morals and beliefs .

About the methodology of a new approach to teaching biology

The authors of the textbook "Scientific Foundations of Biology Teaching Methodology" believe that "the following pedagogical and dialectical principles should be taken as a basis to form a comprehensive worldview in the process of teaching biology:

1. generalization of biological concepts, processes, and evidence, the materiality of the world;
2. the principle that organic life develops based on the general laws of nature;
3. the principle that matter and living beings are constantly developing and moving;
4. the principle of historicity;

5. principle of specificity;
6. principle of comprehensiveness;
7. principle of generality.

In secondary schools , students learn the basics of science during the teaching of subjects, forming their views on the world, knowledge about the essence of social life and natural phenomena. The knowledge base acquired in the process of teaching the basics of science helps to form the student's worldview. Based on this, we should note that biology lessons as a science about life are of particular importance in school.

The implementation of modern learning strategies forms qualities such as independence, enterprise, active thinking, and responsibility in students. Since students better understand themselves in the process of communicating individually, in pairs, and in large and small groups, it leads to the formation of moral qualities that condition personality, such as activity in group and pair work, cooperation with each other in students' activities, creativity, mutual relations, independent decision-making, organizational and management skills, communication culture, tolerance, and competitiveness.

A person who does not have an idea of a number of laws of biology and ecological problems cannot understand life at the proper level. Therefore, in the process of teaching biology, students should be given a broad worldview. Only in this case, the basis is created for the perception of the world as a complete unit.

The biology curriculum emerged as one of the efforts made to implement the educational reform in our country. A student who understands the biological and social essence of the biology curriculum is prepared to protect his or her own health and that of his or her loved ones and to lead a healthy lifestyle. Or students, by understanding the need to protect the natural environment, are educated in the spirit of patriotism, humanity and humanism, and understand global ecological problems. They come to the conclusion that protecting humans is related to protecting the Earth as a whole. They enjoy the beauties of nature, have a more native attitude towards their homeland and the land. All this is important in terms of the intellectual development of students and their formation as mature individuals who love their homeland.

The Concept of General Education in the Republic of Azerbaijan (National Curriculum) responds to the interests and needs of students by proceeding from principles such as democracy and humanism . This document, which summarizes the educational experiences of the progressive countries of the world, is directly aimed at the formation of students as a personality and is distinguished by its humanistic, democratic and integrative character. Demand-oriented, result-

oriented, student-oriented form the didactic basis of the modern content of general education. In fact, student-orientedness appears as a clear example of the humanization of education, which is one of the main principles of state policy in the field of education ².

The use of scientific - popular and scientific - fiction literature in biology lessons and during extracurricular activities forms patriotic - civic motives in relation to nature in students. The complex emotional effects of nature, its beauty strengthen feelings of love for the Motherland in a person. It also contributes to the formation of a culture of personal behavior. This is also characterized as qualities of an ecological educational nature.

Scientific , popular, and scientific - fiction literature prepared in the direction of local history content awakens a sense of pride in children by informing them about their native land, which in turn helps students understand their moral duty to nature more deeply and influences them to show a responsible attitude towards the surrounding world and all living things .

Nature in biology lessons , When selecting additional literature about the living world, the following factors should be taken into account :

- it should correspond to the content of the biology lesson programs, be related to the information provided in the lesson, and be based on it;
- so that students can use the scientific information provided during their practical activities;
- The scientific information contained in additional reading literature should be simple and understandable, and the language of the work should be appropriate for the age characteristics of the students .

biology , whether botany, zoology, human, or general biology, is aimed at implementing a number of tasks. These tasks mainly consist of the following :

- Formation of a scientific worldview based on the acquisition of knowledge and skills;
- students' acquisition of ecological literacy, understanding all living things as the main value and blessing of our Mother Earth, and forming a correct, harmonious attitude towards nature;
- hygienic education, formation of a healthy lifestyle;
- creating conditions for students' self-development;
- Creating an effective educational background, understanding and assimilation of the spiritual culture of humanity, spiritual values by students , and strengthening their daily behavior with these values and norms;

² **Note 1.** The " State Strategy for the Development of Education in the Republic of Azerbaijan " was approved by the Decree of the President of the Republic of Azerbaijan dated October 24, 2013. According to the decree , the influence of a teacher on the formation of a student as an educated and competent person depends largely on the teacher's academic skills, teaching experience, and level of professionalism .

- helping students develop their cognitive interests;
- fostering aesthetic taste and feelings with high emotional impact;
- assisting in the formation of the foundations of communication culture, etc.

All of this is connected in one way or another with the moral education of students. The implementation of the idea of cooperation in the process of teaching biological knowledge, the creation of a fruitful moral and psychological climate, teacher-student There are ample opportunities for developing and strengthening relations.

Training - Achieving such positive results in the educational process should be considered a high achievement. At this time, both in the classroom and in the general school collective, good, high moral values take precedence, the level of education of students increases, their love and affection for their native school, teachers, and chosen subject increases. The increase in students' interest in studying plants , animals , and other living things becomes an expression of the completeness and richness of their moral development.

A teacher can achieve great success by making extensive use of the school's internal resources, his own inner world, creative abilities, knowledge, and various methods and tools. For example, in the "Zoology" section of biology, when talking about the lives of worms, insects, ants, pigeons, etc. animals, explaining the behavior and importance of each of them, the mind of a crow, a sparrow, the productive labor of an ant, how an ordinary caterpillar turns into a butterfly, and the inadmissibility of destroying them or causing them any harm, the teacher touches the feelings of the students, finds a way into their hearts, and can enrich their spiritual world. Honeybees are miraculous winged creatures distinguished by their hard work. Honeybees suck nectar (juice) from honey-producing flowers and live comfortably, and store honey in abundance for the winter. But if they do not have a sting and poison, other animals will eat them and kill them. Therefore, bees, which have sweet food like honey, also have stings and poison. No matter how kind a person is, he must be able to protect himself. Proverbs and sayings given during the lesson, citing literary works, have an impact on the spiritual world of the students. A honey bee also needs a sting.

Biology lessons have various opportunities in the education of students, especially in the formation of moral education. Independence of thought, development of cognitive interests, correct attitude to the biosphere, understanding the relationship between theory and practice, applying the acquired knowledge in work, getting aesthetic pleasure in connection with nature, caring attitude to ethical rules, nature, the collective - without which it is impossible to comprehend knowledge, form spirituality, beliefs, worldview. Organizing the lesson in this way directs students to observe

and think independently. Man is an integral part of nature. Man's negative, negative attitude to nature - His normal attitude has a destructive effect on him, both physically and morally.

Back in the second half of the last century, academician M. Mehdizadeh wrote with this problem in mind: "Forming the cognitive activity of students" - under the name of "activating cognitive activity", this problem has long occupied one of the central places in Soviet didactics.

Biology is intended to be taught at the general secondary and upper secondary education levels. At the general secondary education level, the student acquires more complete knowledge and skills by studying the world of living things. At the upper secondary education level, the student, who is already prepared for life, understands the world of living things, which is an integral part of nature, and himself. The goal of biology is to form ecological culture, aesthetic taste, humanistic and patriotic qualities in students by acquiring the necessary knowledge and skills about living things. To achieve this goal: the STEAM model should be used in biology lessons.

In active-interactive learning, the teacher assumes the role of a facilitator, not a transmitter of knowledge. The main goal of interactive learning is to activate students' thinking and encourage them to think in order to solve any problem. In a joint activity and cooperation environment, the thoughts of the teacher and students are discussed mutually. In this case, the learning is subject-subject in nature. Interactive learning also places high demands on the teacher. It is more difficult to involve students in research, discussion, and to teach them to think independently than to master a certain set of knowledge. The teacher should not make all decisions during the lesson himself, but should leave certain issues to the students' judgment. The knowledge gained in this way remains in the students' memory for a long time, and they have the ability to apply that knowledge in practice. As teachers, we must encourage students to engage in mental labor. It was not for nothing that the fathers said: "Work is the essence of man." Students will more quickly assimilate the knowledge they acquire thanks to their own intelligence, knowledge, and skills, and will use that knowledge effectively in their future lives.

The use of information technologies in biology lessons creates a number of opportunities for the teacher. These include organizing the conscious activity of students during the educational process, creating greater opportunities for the application of an individual approach in the educational process, and creating opportunities to sequentially monitor events and processes occurring in the micro and macro worlds in a short time. The most basic new model that combines all of these technological innovations is the STEAM teaching model.

The STEAM education model is based on the idea of teaching students five specific fields: Science, Technology, Engineering, Art, and Math in a collaborative and integrated manner.

It was coined by biologist Judith Ramili as STEM, and later the word "Art" was added to become the STEAM model. In STEM, scientific concepts are given more priority. In STEAM, scientific concepts are explored, but they do so through learning methods based on inquiry and problem-solving used in the creative process. In the modern education system, the STEAM model is the name given to the education system and method that involves integrated teaching of subjects, not separate ones.

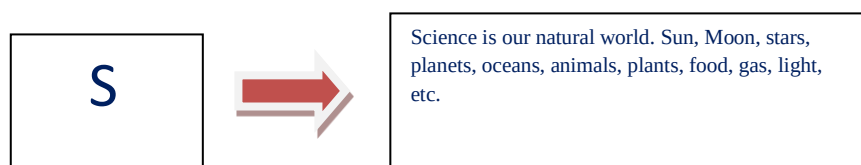


Figure 1. Explanation of the Steam model

When using STEAM in biology lessons, the stages of the lesson should be clarified in advance. In addition, it is necessary to consider that biological knowledge plays an important role in the lives and activities of students. It is thanks to biological education that, from an early age, students develop a careful and cautious approach to themselves, others, and all living things in general, as well as a love for nature. To some extent, the student understands how important it is to take care of his health, knows the structure and functions of his own body, and understands what ecology means, so he develops a feeling of sympathy for the plant and animal world. During my time working at school, I have come to the conclusion that in order to achieve good results, each teacher should increase interest in his subject, and for this, he should use modern pedagogical methods, including information and communication technologies, during the lesson. The use of ICT in biology lessons also helps to improve the quality of the subject being taught, and facilitates the demonstration of various objects. The teaching of biology at school is regularly based on the demonstration of experiments. However, conducting experiments in a modern school is difficult due to time constraints. Even in laboratory rooms equipped with all kinds of conditions and modern equipment, conducting real experiments requires some time. Many biological processes are distinguished by their complexity. It is difficult for students with a figurative memory to learn abstract, imageless processes. The observations I have made today give reason to say that it is precisely in order to solve these problems and to achieve active use of Internet resources in the

educational process that we are promoting the Biology teaching project with the help of STEAM. My goal in promoting the STEAM project is:

- Increasing the knowledge and skills of the school's pedagogical and administrative staff in the STEAM direction
- Improving the quality of education at school and shifting to a more visual, practical teaching method
- To form a new information culture,
- The aim is to help students prepare for local and international biology Olympiads, to prepare new 21st century Azerbaijani teachers, and to provide assistance and direction for their continuous development.

The process of engaging in STEM-related activities will lead to major technological innovations in the lives of STEAM teachers. The integration of STEAM learning technology into the new curriculum is to educate the republic's educators and learners about the importance of forming 21st century skills.

It will create great motivation for biology teachers to improve their knowledge and skills and to participate in international olympiads and competitions, including conferences.

While traditional literacy and digital literacy skills are important, society demands that students have a holistic set of skills to thrive in today's world. These include creative, technological, innovative, and interpersonal skills. Today, these skills and knowledge need to be acquired in a more accessible, personalized, and proactive way than ever before. These skills and opportunities will be provided by STEAM-oriented education.

They will learn about the rules for preparing international and republican level projects, active and interactive teaching methods and their application possibilities in biology lessons, stages of lessons with active teaching methods, use of game elements in biology lessons, intra- and interdisciplinary integration in biology lessons, assessment of student achievements, examples of active lessons in biology teaching for grades VI-XI, and finally, the introduction of opportunities and ways to implement educational tasks in biology lessons.

In the STEAM model approach to teaching biology in secondary schools, any products prepared as a result of the preparation of models, the implementation of thoughts and ideas, and the conduct of experts and experiments arouse enthusiasm in students and the lesson is engraved in the student's memory for life. This teaching method reveals creative students and stimulates their development.

The STEAM model is known to us as a foreign model. In order to implement the STEAM model, it is necessary to build a lesson based on international experiences. One of the advantages of the STEAM model is that a new model is developed as a result of the joint activities of both the teacher and the students. The STEAM model unites designers and technicians through lessons.

We consider it one of our main goals to use the opportunities of teachers with special abilities in the STEAM project. In the future, our main idea is to closely participate in organizing additional events through them, to increase the interest of the younger generation in biology. At the same time, the teachers who participated in the project and worked in schools in subsequent years will ensure the sustainability of the project by demonstrating their acquired intellectual capabilities on International and Republican tours.

Learning biology through STEAM will play an important role in education and in preparing children for future challenges and opportunities.

It will develop rapid learning skills that are needed in educational institutions and today.

While traditional literacy and digital literacy skills are important, society demands that students have a holistic set of skills to thrive in today's world. These include creative, technological, innovative, and interpersonal skills. Today, these skills and knowledge need to be acquired in a more accessible, personalized, and active way than ever before. These skills and opportunities will be provided by STEAM-oriented education.

Conclusion

In conclusion, let us show that the knowledge, skills and habits acquired by students in general education schools in the subjects they study are not limited to forming the mental level of the growing generation about understanding and regularities in various fields of science. Knowledge is not a collection of facts, events and figures. It forms a person's worldview, attitude towards the surrounding world, people, society and oneself within certain norms, and has the ability to interpret the moral image. Like other subjects taught at school, biology lessons also perform the function of forming the intellectual level and moral image of students. Such high content qualities - Revealing the pedagogical foundations of all branches of biology, which have the potential for knowledge and moral education, and using them in experimental work can significantly affect the goal of shaping the growing generation as a person and citizen.

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