

DEVELOPING STUDENTS' CREATIVE ACTIVITY IN BIOLOGY EDUCATION THROUGH A PROJECT-BASED APPROACH

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Abstract. *This article examines the development of students' creative activity in biology education through a project-based approach. It highlights the importance of the project-based approach in fostering students' independent thinking, observational skills, analytical abilities, and practical skills during biology lessons. The article substantiates that lessons organized around this approach increase student engagement in the learning process and develop their skills in problem-solving, teamwork, and presenting results.*

Keywords: *project-based approach, biology education, creative activity, student engagement, independent thinking, observational skills, analysis, practical skills, methodology, lesson process.*

РАЗВИТИЕ ТВОРЧЕСКОЙ АКТИВНОСТИ УЧАЩИХСЯ НА УРОКАХ БИОЛОГИИ ПОСРЕДСТВОМ ПРОЕКТНОГО ПОДХОДА

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Аннотация. *В данной статье освещаются вопросы развития творческой активности учащихся в процессе преподавания биологии посредством проектного подхода. Раскрывается значение проектного подхода в формировании у учащихся на уроках биологии самостоятельного мышления, наблюдательности, способности к анализу и практических навыков. Обосновывается, что уроки, организованные на основе данного подхода, повышают вовлеченность учащихся в процесс получения знаний, развивают у них навыки поиска решений проблемных ситуаций, работы в группе и презентации результатов.*

Ключевые слова: *проектный подход, преподавание биологии, творческая активность, активность учащихся, самостоятельное мышление, наблюдательность, анализ, практический навык, методика, учебный процесс.*

Main part. Biology education plays an important role in forming students' knowledge of living nature, as well as developing their observation, independent thinking, practical skills, and creative approach. The science of biology is inextricably linked to life in terms of content; it studies issues such as plants, animals, the human body, the ecological environment, health, heredity, metabolism, and the interconnectedness of nature. These topics are not only a source of theoretical knowledge for students but also an important educational tool that allows them to understand, observe, and analyze the surrounding reality.

In biology lessons, a student must not only master information from the textbook but also be able to connect it with events in daily life. Because every process in living nature is based on certain causes and laws. For example, the growth of plants, the adaptation of animals to their habitat, physiological processes in the human body, or the origin of environmental problems encourage the reader to think, ask questions, and conduct research. In this process, the student's creative activity is manifested. Creative activity is manifested in the student's new way of thinking, the independent use of existing knowledge, the ability to express their attitude toward the phenomenon being studied, and the search for unusual solutions to the problem. To foster such activity in biology lessons, it is important to direct students toward research rather than providing them with ready-made conclusions. The student observes, compares, draws up a table, analyzes biological objects, searches for answers to questions, and substantiates their opinion. As a result, he does not just memorize knowledge, but understands it and tries to apply it in practical situations.

The project approach is one of the effective directions in biology education that enhances such student activity. In this approach, the student works independently on a specific topic or problem, collects the necessary information, sorts it, makes observations, draws conclusions, and presents the final result. Such a process expands the student's horizons, increases their responsibility, teaches them to work independently, and increases their interest in the lesson. The application of a project-based approach is particularly convenient in biology, as this science deals with many practical observations, natural phenomena, environmental issues, and a healthy lifestyle. Students can study the plants in the schoolyard, observe the ecological situation in the local area, collect information about medicinal plants, and analyze the importance of water and soil in the life of living organisms. Through such tasks, they connect biological knowledge with real life.

During project activities, students not only acquire knowledge but also develop skills in interacting, working in a group, assigning tasks, defending their opinions, and expressing the final result. Each student actively participates in this process according to their abilities. One person searches for information, another prepares a drawing or

diagram, another conducts an observation, and another delivers a presentation. Thus, the lesson process becomes lively, meaningful, and creative.

In biology education, the development of students' creative activity not only increases their interest in science but also shapes their conscious attitude toward nature. The student begins to think more deeply about the life of living organisms, environmental problems, and human health. He is not indifferent to changes in the environment, strives to understand problems and find solutions to them. This further increases the educational significance of biology. In this regard, the use of a project-based approach in biology lessons creates broad opportunities for the development of students' creative activity. In such lessons, the student is formed not as a recipient of ready-made knowledge, but as an active person who seeks knowledge, analyzes it, and creates their own results. As a result, the educational process becomes more interesting, meaningful, and effective for students.

The issue of developing students' creative activity in biology education is directly linked to the content, form, and methods of organizing the educational process. The subject of biology, along with explaining the laws of living nature to students, develops their observation, thinking activity, independent research, and the ability to draw practical conclusions. Especially if a student participates in the lesson process not only as a listener but also as an active participant, their interest in the subject increases, they gain a deeper understanding of the topic, and they strive to express their thoughts freely. Creative activity in biology education is manifested through the student's questioning of natural phenomena, attempts to determine their causes, independent conclusions based on observations, and the promotion of new ideas. In this process, the student does not simply repeat existing knowledge, but processes it, compares it, generalizes it, and links it to real-life situations. The possession of vital content by biological knowledge creates favorable conditions for creative thinking.

The project approach helps to effectively organize this process. Because it directs the student to work independently on a specific issue, search for information, observe, analyze the result, and draw a final conclusion. Such an approach revitalizes biology lessons, changes students' attitudes toward acquiring knowledge, and encourages them to engage in active research. Therefore, studying the theoretical foundations of developing creative activity in biology education is inextricably linked to a deep understanding of the content of the project-based approach. In biology education, creative activity is characterized by the student's ability to think independently during the learning process, express interest in the topic, analyze the phenomenon under study, and draw unique conclusions. This process is broader than simply acquiring knowledge. Because in creative activity, the student is not limited to receiving ready-made information, but tries to understand it, connect it with other knowledge, and apply it in practical situations.

There are many opportunities for the formation of such activity within the content of biological science. Topics such as the structure of living organisms, their habitat, growth and development processes, environmental factors, human health, heredity, and variability prompt the reader to think directly. For example, the desire of plants for light or the withering of leaves due to a lack of water may seem like a simple phenomenon, but if the student begins to search for its cause, this process creates creative thinking.

One of the important features of creative activity is the ability to see the problem. In biology lessons, the student should observe a specific phenomenon and get into the habit of asking questions such as "Why did this happen?," "What factors influenced this process?," "What will happen if the conditions change?" Such questions lead the reader away from the ready-made answer and into a search. As a result, they strive to justify their opinion, provide evidence, and draw a logical conclusion.

Creative activity in biology education is also closely linked to observation. Observation develops the student's skills of attention, patience, precision, and analysis. While observing processes such as plant growth, seed germination, animal movement, and the adaptation of organisms to the environment, the student notices changes in nature and attempts to explain them. This makes his knowledge even more meaningful. Creative activity also develops the student's imagination and independent approach. For example, representing biological processes through a diagram, drawing, table, model, or presentation requires the student to rethink the topic. He better understands the connection between concepts in the process of expressing the knowledge he has learned in a different form. Such activity leads to a deep understanding of biological knowledge rather than a superficial memorization.

The role of the teacher in creative activity is also important. The teacher should ask questions that encourage the student to think, create favorable conditions for independent work, and create an environment where they are not afraid of the wrong answer. If a student can freely express their thoughts, ask questions, and is not afraid to make mistakes during research, creative activity will increase. Conversely, in lessons based solely on memorizing ready-made answers, such an opportunity is limited.

Creative activity in biology lessons can be developed in individual and collective forms. While individual assignments increase a student's independence, group work strengthens skills in communication, cooperation, and the exchange of ideas. During group work, students listen to each other's opinions, compare facts, and reach a common conclusion. This develops not only knowledge but also social activity. In this regard, creative activity in biology education is a complex process that unites the student's knowledge, thinking, practical action, and personal attitude. It transforms the student from a passive listener into an active seeker. As a result of such activities, the student gains a deeper understanding of natural phenomena, connects biological knowledge with daily life, and learns to express their thoughts independently.

Biology is one of the subjects with broad opportunities for developing students' creative potential. Its content is interesting and understandable for students, as it is related to living nature, human life, the ecological environment, and health. Many topics studied in the lesson can be observed in real life, compared, and linked to personal experience. This contributes to the lively and meaningful mastery of the subject. In biology lessons, creative potential is primarily formed through observation and analysis. Students learn to think independently by observing changes in nature, studying the structure of living organisms, and comparing their adaptation to living conditions. For example, comparing desert plants with moisture-loving plants helps the reader understand the relationship between the environment and the organism. Such tasks direct the student not only to find answers, but also to understand the reasons.

Another possibility of biology is its enrichment with practical exercises. Laboratory work, observation diaries, drawing up tables and diagrams, describing biological objects, and performing simple experiments ensure the active participation of students. During practical activity, the student feels, sees, verifies, and determines the result themselves. This serves to strengthen the knowledge. Biology also provides an important opportunity for the formation of ecological thinking in students. In the process of studying environmental problems, the student analyzes the relationship between nature and human activity. Topics such as water pollution, air pollution, the waste problem, and the decline of plants and animals strengthen children's sense of responsibility. If a student expresses their suggestions on such issues, they will not only gain knowledge but also develop as a socially active person.

Interdisciplinary connections in biology classes also play an important role in developing creative potential. For example, topics of ecology are linked to geography, metabolism to chemistry, light and heat to physics, and the expression of thought to one's native language. By combining the knowledge gained from various subjects, the student begins to understand complex processes as a whole. This expands his horizons. Problem-based questions play a special role in developing the creative potential of students. While simple "tell me the definition" questions require the reader to remember more, problem-based questions force them to reflect. For example, questions such as "If trees are cut down in an area, what changes will occur in the local fauna?," "Why is clean water necessary for the human body?," "What problems arise in plant life when soil fertility decreases?" stimulate creative thinking.

Biology is also inextricably linked to the students' personal experience. Topics such as the human body, nutrition, hygiene, sports, harmful habits, and disease prevention are relevant to the life of every student. Therefore, students participate more actively in studying such topics. They provide examples from their own lives, share observed situations, and express personal opinions. This turns the lesson into a natural dialogue.

To enhance creative potential in biology lessons, assignments should be presented in various forms. Some students are active in expressing their thoughts through drawings and diagrams, while others show good results in preparing oral presentations, written comments, tables, or models. If the teacher uses various types of activities, each student demonstrates their potential. This increases the efficiency of the lesson. Thus, the subject of biology possesses rich content for developing students' creative potential. Life topics, observational opportunities, practical exercises, environmental issues, interdisciplinary connections, and problematic questions encourage the reader to think actively. The effective use of these opportunities helps to organize biology lessons in an interesting, meaningful, and productive manner.

The project approach is one of the effective pedagogical directions in biology education that engages students in active research. This approach ensures the student's independent work during the lesson, collecting information on the topic, conducting observations, analyzing, and achieving the final result. In this case, the student participates not as a recipient of ready-made knowledge, but as a person who seeks and processes knowledge. This approach is particularly convenient in biology education, as the content of the subject is linked to many vital and practical issues. Students can conduct independent research on topics related to plants, animals, the human body, ecological conditions, medicinal plants, water, soil, air, and health. Such activity helps to connect the knowledge in the textbook with everyday life.

The project-based approach strengthens students' sense of responsibility. Because in the process of performing a specific task, they plan their task, allocate time, search for the necessary resources, and are responsible for the result. For example, students working on the topic "Plant Diversity in the School Area" can identify plant names, observe their growth conditions, take photographs, or create a table. This process teaches them to work in an orderly manner. The pedagogical significance of such an approach lies in the fact that it teaches students to think independently. Each project begins with a specific question or problem. To find the answer to this question, the student searches for evidence, compares it, and draws a conclusion. For example, questions such as "Why are some plants resistant to drought?" or "How do waste products affect the life of living organisms?" develop the student's analytical thinking.

Project activities also develop students' skills in collaborative work. In the process of group work, students divide tasks, exchange ideas, complement each other's work, and achieve a common result. This strengthens the culture of communication, mutual respect, and collective responsibility during the lesson. Each participant contributes to the common cause. In biology education, the project-based approach enhances creative activity, as the final result can be expressed in various forms. Students can prepare a poster, booklet, model, video, presentation, table, diagram, illustrated reference, or a

small research paper. Such freedom enriches their imagination and allows them to demonstrate their unique approach.

Conclusion. Through this approach, the teacher's role also changes. He acts not only as an informant but also as an organizer, guide, and advisor to the process. The teacher asks the right questions, demonstrates how to work with sources, and helps determine the direction of the research. But the final result is created by the students themselves. This increases their independence. The project approach brings vitality to biology lessons. The student sees the practical significance of the topic being studied. For example, knowledge is linked to real life through topics such as healthy eating, clean water, ecological balance, plant care, or disease prevention. Such lessons foster a positive attitude toward the subject in the student. The project approach is an important pedagogical tool that serves to develop the creative activity of students in biology education. It develops skills in independent research, analysis, group work, creating results, and defending one's opinion. Therefore, the purposeful use of this approach in biology lessons serves to improve the quality of education.

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