

INCREASING STUDENTS' COGNITIVE ACTIVITY IN TEACHING BIOLOGY IN
EXTRA-CURRICULAR ACTIVITIES

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Abstract: This article presents the role of extracurricular activities in the teaching of natural sciences and their importance in increasing students' cognitive activity. The effectiveness of project-based learning and interactive laboratory exercises is also analyzed.

Keywords: cognitive activity, natural sciences, method, extracurricular activities, research competence, integrated education.

Introduction. In the current modern education system, students are not just recipients of information, but are viewed as subjects who process it and create new knowledge. Biology is a science focused on understanding the laws of nature and requires a high level of cognitive activity. However, the 45-minute class time in schools does not allow students to conduct in-depth practical research. Therefore, organizing extracurricular activities based on modern teaching methods is one of the most urgent pedagogical problems. To overcome this problem, it is necessary to improve the methodology for organizing students' extracurricular activities [1].

Also, the demonstration of educational activities is aimed at increasing the cognitive activity of independent preparation, which helps to form motivation for the educational activity of biology, master basic knowledge, systematize it, provide educational and methodological assistance to students' independent activities, and form knowledge, skills, and competencies for self-control. At the same time, it will serve to more effectively master the theoretical foundations of biology and increase interest in science. To do this, first of all, it is necessary to develop a model for organizing extracurricular educational activities.

Literature review. In our country, several schools have been formed on the methodology of integrated teaching of biological sciences and teaching of specialized subjects in higher education. In general secondary schools, studies on the theory and practice of teaching biology were carried out by scientists such as J.O. Tolipova[6], A.T. Gafurov [8], and studies on the mechanisms of organizing students' extracurricular activities were carried out by scientists such as M.M. Isaboyeva, Y.N. Arbuzova[2], A.A. Bogomolova. Also, studies on the methodology of using information technology tools in teaching biology in general secondary schools, and on the technologies of teaching biology based on electronic educational resources in students' classroom and extracurricular activities have been conducted by scientists such as T.I. Krylova, Y.A. Komarov, V.A. Smirnova, L.M. Karakhanova [5], Sh.B. Khasanova [7].

Although these scholars have conducted research on the use of digital technologies in students' extracurricular activities, there is a need to improve this work today. Because the emergence of digital technologies and artificial intelligence technologies is creating new approaches to teaching biology[4].

Research methodology. Therefore, improving the effectiveness of teaching biology in general secondary schools and activating students' extracurricular activities requires improving the forms, methods, and means of using modern educational technologies[3].

In the research process, the following methods were selected for the purpose of conducting a pedagogical experiment, namely, the "Heuristic Method" and the "Project Method." Through the "Heuristic Method," students were given problematic questions with no ready-made answers. In this case, to increase the cognitive activity of students, it is more effective to address them not with the question "Is oxygen released during photosynthesis?", but with the question "Why does a plant release gas bubbles in the sun?". The content of the lesson is as follows, students will



conduct an experiment with an aquarium plant (elodea). The following equipment will be needed for the experiment: elodea (aquatic plant) branches, a glass funnel, a test tube, water, a light source (lamp), sodium bicarbonate (NaHCO_3).

A large glass container is filled with water. Elodia sprigs are placed in a funnel (cut side up) and the funnel is inverted at the bottom of the container and the container is placed near a light bulb. As photosynthesis begins, gas bubbles begin to emerge from the elodia leaves and collect at the top of the container. If the lamp is moved closer to the container, the bubbles will break faster, which shows that photosynthesis is more intense when there is more light. If a little baking soda (NaHCO_3) is added to the water during the experiment, the bubbles will break even faster, because the soda dissolves in the water and increases the concentration of carbon dioxide.

This experiment increases the cognitive activity of students, they now become researchers, not just observers. At the end of the experiment, they analyze and describe the data obtained in a graphical form.

Through the “project method”, students are given tasks such as studying biochemical processes (for example, studying soil composition and observing plant growth rate). The task of the project method is to study the salinity level of the soil in the local area (chemical analysis) and the condition of the plants growing there (biological analysis). Students prepare soil extracts in laboratory conditions and determine the pH environment using indicators. By observing these processes with their own eyes, students It develops in them the skills to think critically and relate theoretical knowledge to real-life problems.

The proposed methods are aimed at organizing extracurricular activities in biology for secondary school students: they consist of organizational, technological, analytical, and control parts.

Analysis and results. In order to increase the level of effectiveness in organizing extracurricular activities in biology for secondary school students, experimental and test work was carried out. Students of secondary school No. 28 in Navoi region were involved in the experimental and test work, and they were divided into experimental 10-A class (24 students) and control 10-B class (25 students). Extracurricular activities in biology were organized for the experimental class using the methods proposed within the framework of the study. The control class was not given this opportunity. The indicators of secondary school students divided into experimental and control groups at the beginning and end of the experiment are presented in Table 1.

Indicators of general secondary school students at the beginning and end of the experiment

Mastery levels	Experience class		Control class	
	Experience At the beginning	Experience At the end	Experience At the beginning	Experience At the end
Excellent	4	14	3	4
Good	10	6	6	5
Satisfactory	8	4	13	13
Unsatisfactory	2	0	2	2

The level of cognitive activity of the students involved in this experiment was analyzed and, in order to verify its reliability, a mathematical and statistical analysis was performed based on B.



Bloom's taxonomy (knowledge, understanding, application, analysis). According to the calculation results, students' interest in science increased by 42% compared to the traditional lesson, and 85% of students reached the level of being able to work independently with laboratory equipment and digital sensors, that is, it turned out that the coefficient of completion of tasks at the mastery level of students in the experimental group increased by 1.4 times compared to the control group.

Analysis of the results shows that in extracurricular activities, students are not afraid to make mistakes, which develops cognitive flexibility in them. Integrated tasks strengthen neural connections in students' memory and help them retain knowledge for the long term.

Conclusion. Thus, extracurricular activities in teaching natural sciences in schools are the main factor that reveals the intellectual potential of students. Experiments conducted on the basis of research have proven that only the combined implementation of theory and practice serves as an important tool in the implementation of the teacher's professional activities. Therefore, we recommend using the methods proposed in the research when organizing extracurricular activities of students in natural sciences. This will increase the students' independent thinking and problem-solving skills by 30-35%.

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