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METHODOLOGICAL FOUNDATIONS FOR DEVELOPING RESEARCH SKILLS AND SCIENTIFIC POTENTIAL OF LYCEUM STUDENTS THROUGH SUBJECT CLUBS (ON THE EXAMPLE OF A BIOCHEMISTRY CLUB)

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Abstract: This article thoroughly explores the role, scientific-practical significance, and organization of biology clubs operating in academic lyceums within the educational and upbringing process, especially when implemented through innovative teaching technologies. Research findings indicate that biology clubs serve as an effective tool in developing students' skills in independent thinking, scientific research, observation, and analysis. During experimental training sessions, the lessons conducted in biology clubs clearly demonstrated their impact on increasing students' interest in the subject, applying biological knowledge in practice, and enhancing ecological thinking. In particular, the use of interactive methods, laboratory work, field activities, and project-based approaches further intensified students' interest in biology and began to reveal their creative potential.

Keywords: biology club, interactive methods, independent thinking, educational effectiveness, pedagogical approach, innovative technologies.

Introduction. Traditional teaching methods are instructional approaches that have been widely used in schools over the years. In the context of teaching biology, these methods mainly include classical formats such as lectures, question-and-answer sessions, textbook-based learning, and laboratory activities. The primary advantage of traditional methods lies in their ability to maintain classroom discipline, provide theoretical clarity on topics, and reinforce core concepts [6].

In biology subject circles, traditional methods tend to be teacher-centered, which may limit students' independent thinking, analytical skills, and ability to express personal ideas. Moreover, when the approach is restricted to theory alone, students' practical skills may not develop adequately. Traditional methods primarily focus on the transmission of knowledge from teacher to student. In biology clubs, these methods manifest in the following ways: Although there are various pedagogical approaches in the teaching of biology, traditional methods have historically shaped instruction and remain relevant today. They serve as a fundamental methodological basis in extracurricular science activities, particularly for consolidating theoretical knowledge and internalizing key concepts of the subject [4].

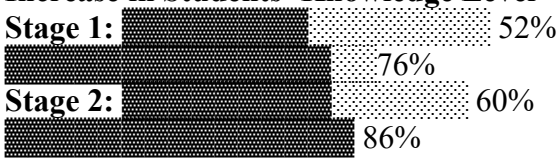
Through science clubs, gifted and curious students studying in academic lyceums are identified, and their engagement in scientific research is encouraged. Based on selected topics, students carry out independent research activities, which not only prepare them for higher education but also foster a responsible and conscious attitude toward science. In the course of this work, methodological recommendations for the effective organization of biology clubs are developed. These can serve as practical guidelines for teachers [2,1].

Moreover, the application of modern methodological approaches such as interactive methods, experimental activities, fieldwork, and project-based learning in biology clubs has contributed to the development of essential skills in students, including independent thinking, observation, scientific hypothesis formulation, analytical thinking, and drawing conclusions. Based on the

statistical analysis presented above, it can be concluded that biology clubs serve as an effective educational tool in the academic lyceum context. These clubs not only enhance students' interest in science but also significantly strengthen their preparedness for future higher education.

Results. Therefore, improving the scientific and methodological framework of science clubs, strengthening their material and technical resources, and supporting each talented student remains one of the key priorities of modern educational policy [3]. Within the biology club established at the academic lyceum, pilot experimental activities were conducted involving first- and second-year students. The study was carried out over a period of three months. To assess the effectiveness of the club sessions, the following results were obtained using diagnostic tests, questionnaires, observational data, and interviews.

Increase in Students' Knowledge Level



These data indicate that as a result of participation in the science club, the knowledge level of first-stage students increased by an average of 24%, and for second-stage students, it increased by 26% [5].

Conclusion. The results of the monitoring confirmed that science clubs have a positive impact on students' academic performance. Based on this, scientific and practical recommendations were made to improve the effectiveness of education. The monitoring yielded the following key indicators:

- The average rating in biology increased by 18.2% in the experimental group (while in the control group, this increase was only 4.7%).
- Based on survey data, 85% of students in the experimental group reported an increased interest in biology (in the control group, this indicator was 41%).
- The proportion of students interested in scientific research reached 73% (compared to 38% before the experiment).

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