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IMPROVING THE METHODOLOGY OF TEACHING BIOLOGY BASED ON A CREATIVE APPROACH (ON THE EXAMPLE OF ACADEMIC LYCEUMS)

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Abstract: This article examines the improvement of biology teaching methodology in academic lyceums through the implementation of a creative approach. Modern educational reforms emphasize the transition from traditional reproductive teaching methods to learner-centered and competence-based education. In this context, creative pedagogical approaches play a crucial role in enhancing students' cognitive activity, critical thinking, problem-solving skills, and motivation to learn biology. The study analyzes theoretical and methodological foundations of creative teaching, examines interactive methods, project-based learning, problem-based instruction, and STEAM integration in biology education. Based on the analysis of scientific and pedagogical literature, the article identifies the effectiveness of creative methodologies in improving learning outcomes and developing scientific thinking among academic lyceum students.

Keywords: creative approach, biology education, academic lyceum, teaching methodology, innovative pedagogy, problem-based learning, interactive methods

Introduction

In recent years, the modernization of secondary specialized education has become a priority in many countries, including Uzbekistan. Academic lyceums, as institutions providing in-depth subject education, are expected to prepare students for higher education and scientific research. Biology, as a fundamental natural science, requires not only the transmission of theoretical knowledge but also the development of analytical thinking, experimental skills, and an understanding of real-life biological processes [1].

Traditional biology teaching methods, which mainly rely on lectures and memorization, are insufficient to meet contemporary educational demands. According to educational research, passive learning reduces students' interest and limits their ability to apply biological knowledge in practical contexts [2]. Therefore, improving biology teaching methodology through creative approaches has become an urgent pedagogical task.

Creative teaching in biology encourages students to actively participate in the learning process, formulate hypotheses, analyze biological phenomena, and conduct independent research. Academic lyceums provide a favorable environment for implementing such approaches due to their advanced curriculum and focus on academic competence [3].

Methodology

The methodological basis of this study is a qualitative analysis of scientific literature on creative pedagogy and biology education. The research relies on comparative, analytical, and systematic methods to evaluate existing teaching models and innovative practices applied in biology lessons at academic lyceums.

Creative approaches in biology teaching are grounded in constructivist learning theory, which emphasizes learners' active role in knowledge construction [4]. The methodology includes the use of interactive teaching methods such as brainstorming, case studies, debates, laboratory simulations, and project-based learning. Problem-based learning is also considered a core component, as it engages students in solving biologically relevant problems through inquiry and experimentation [5].

Additionally, the integration of STEAM (Science, Technology, Engineering, Arts, and

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Mathematics) education into biology teaching is analyzed. STEAM-based instruction allows students to connect biological concepts with technology and real-world applications, fostering interdisciplinary thinking [6].

Results

The analysis of pedagogical studies demonstrates that the use of creative teaching methods significantly improves students' academic performance and engagement in biology lessons. Research findings indicate that students taught through interactive and problem-based methods show higher levels of conceptual understanding and retention compared to those taught through traditional methods [7].

Project-based learning in biology enables students to conduct mini-research projects, such as studying ecological issues, genetic inheritance, or human health topics. This approach enhances students' research skills and scientific literacy [8]. Furthermore, creative tasks such as model construction, role-playing biological processes, and digital simulations contribute to deeper comprehension of complex biological systems.

The implementation of creative approaches also positively affects students' motivation. Studies reveal that learners are more interested in biology when lessons involve real-life problems and collaborative activities [9]. In academic lyceums, where students are oriented toward higher education, such motivation is particularly important for developing future biologists, medical professionals, and researchers.

Analysis and Discussion

The creative approach to teaching biology fundamentally redefines the structure and dynamics of the educational process in academic lyceums. Unlike traditional teacher-centered instruction, creative methodology emphasizes learner autonomy, inquiry-based learning, and active cognitive engagement. This transformation aligns with contemporary pedagogical paradigms that view knowledge not as a fixed body of information transmitted by the teacher, but as a construct actively developed by learners through interaction, experimentation, and reflection [10].

One of the central features of creative biology teaching is the shift in the teacher's role from a knowledge transmitter to a facilitator and organizer of learning activities. Research in pedagogy indicates that when teachers guide students through questioning, discussion, and exploration rather than direct instruction, learners demonstrate deeper conceptual understanding and improved analytical skills [7]. In academic lyceums, where students are expected to engage with complex biological concepts, such as cellular processes, genetics, and ecology, this facilitative role becomes particularly important.

Problem-based learning (PBL) represents one of the most effective creative strategies in biology education. PBL mirrors the logic of scientific research by presenting students with real or simulated biological problems that require investigation and evidence-based reasoning. According to Savery [5], problem-based learning enhances students' ability to apply theoretical knowledge to practical situations, thereby fostering scientific thinking and problem-solving competence. For example, analyzing issues such as antibiotic resistance, environmental pollution, or ecosystem degradation enables students to integrate biological theory with real-world contexts, increasing both relevance and motivation.

Another significant aspect of creative methodology is the use of interactive learning techniques. Methods such as debates, case studies, brainstorming sessions, and collaborative group work promote active participation and social interaction among students. Educational studies demonstrate that collaborative learning environments improve communication skills and support the development of higher-order thinking abilities [2]. In biology classes at academic lyceums, group-based laboratory work and discussion of experimental results encourage students to articulate scientific arguments and critically evaluate alternative explanations.

Project-based learning also plays a crucial role in creative biology education. Through long-term projects, students engage in independent or group research activities, such as conducting ecological observations, designing biological models, or analyzing health-related data. Bell [8]

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notes that project-based learning increases learners' responsibility for their own learning outcomes and strengthens research skills. In the context of academic lyceums, such projects prepare students for future academic research by familiarizing them with scientific methods, data analysis, and presentation of findings.

The integration of STEAM education further enhances the effectiveness of creative approaches in biology teaching. STEAM-based instruction promotes interdisciplinary connections between biology, technology, mathematics, and engineering, enabling students to view biological phenomena from multiple perspectives [6]. For instance, the use of digital simulations to model physiological processes or population dynamics allows learners to visualize complex systems that are difficult to observe directly. Empirical evidence suggests that technology-enhanced learning environments improve conceptual understanding and student engagement when used purposefully [12].

Despite its pedagogical advantages, the implementation of creative methodology in biology education is not without challenges. One of the primary obstacles identified in the literature is insufficient teacher preparedness. Studies indicate that some teachers lack methodological training in interactive and problem-based instruction, which may limit the effectiveness of creative approaches [11]. Without adequate professional development, educators may revert to traditional teaching methods due to time constraints or uncertainty about innovative strategies.

Material and technical resources also significantly influence the successful application of creative teaching. Biology education often requires laboratory equipment, digital tools, and access to scientific information. Limited resources may restrict the use of experimental and project-based activities, particularly in institutions with insufficient funding. However, research emphasizes that even low-cost strategies, such as discussion-based learning and case analysis, can effectively support creative instruction when implemented thoughtfully [9].

From a pedagogical perspective, creative methodology contributes to the development of key competencies outlined in modern education standards. These include critical thinking, scientific literacy, communication skills, and the ability to work collaboratively. OECD research highlights that students educated through active and inquiry-based methods are better prepared to adapt to rapidly changing scientific and technological environments [1]. In academic lyceums, where the goal is to prepare students for higher education, such competencies are essential.

Furthermore, creative approaches positively influence students' motivation and attitude toward biology. Motivation is a critical factor in learning outcomes, particularly in complex scientific disciplines. Deci and Ryan [9] argue that autonomy-supportive learning environments increase intrinsic motivation and academic persistence. By involving students in decision-making, research activities, and problem-solving tasks, creative biology teaching fosters a sense of ownership and interest in learning.

Conclusion

The study concludes that improving the methodology of teaching biology based on a creative approach is a crucial factor in enhancing educational quality in academic lyceums. Creative pedagogical methods contribute to the development of students' scientific thinking, research skills, and motivation for learning biology. The integration of interactive, problem-based, and project-oriented teaching strategies ensures deeper understanding of biological concepts and prepares students for future academic and professional challenges.

To achieve sustainable results, it is necessary to provide systematic teacher training, update curricula, and support innovative teaching practices. The findings of this study confirm that creative methodology is not only an effective educational tool but also a strategic direction for the modernization of biology education.

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