# COMPREHENSIVE INTERDISCIPLINARY APPROACH TO TEACHING BIOLOGY IN ACADEMIC LYCEUMS

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***Абстрактный.*** *Образование это длительный и сложный процесс, и его качество зависит от используемых на уроке методов, соответствующих современным потребностям и навыкам учителя. В статье отражены пути развития навыков критического и творческого мышления учащихся посредством междисциплинарной интеграции биологии в академических лицеях.*

***Ключевые слова:*** *Интеграция, урок-аукцион, инновационный урок, совместный урок, современный анализ урока, дидактика, зоология, технология, интерактив, эффективность.*

***Abstract.*** *Education is a long and complex process, and its quality depends on the methods used in the lesson, corresponding to the modern needs and skills of the teacher. The article reflects the ways of developing critical and creative thinking skills of students through interdisciplinary integration of biology in academic lyceums.*

***Key words:*** *Integration, auction lesson, innovative lesson, joint lesson, modern lesson analysis, didactics, zoology, technology, interactive, efficiency.*

**Introduction.** The modern education system is highly focused on teaching the fundamentals of science, developing students' thinking abilities on a broad scale, understanding and imagining the world as a whole, and nurturing individuals who can correctly comprehend the essence of events occurring around them. One

of the major goals of today's education is to gradually and effortlessly prepare students, from a young age, to become independent thinkers who are ready for real life. However, the fragmentation of subjects taught in schools provides students with only narrow theoretical knowledge, which is often forgotten over time and not applied in practice. According to scholars, integration is considered one of the didactic principles and holds a leading position among them [1; p. 250]. In biology lessons, integrated teaching plays an invaluable role in the comprehensive development of students' intellectual activity.

Currently,70% of developed countries use integrative curricula and textbooks in their education systems. For instance, the education system of the United Kingdom has mostly implemented integrated subjects, while in South Korea and Switzerland, integrated subjects are in use; in Hungary, subjects related to cultural orientation are emphasized, and in Ireland, all academic subjects are taught in a way that combines science and technology blocks. [2; p. 75]. It is not without reason that educator U. Musayev places importance on theme-based sequential integration. In this method, the principle of concentrism is followed when presenting learning materials, meaning that each new lesson builds upon and complements the previous one.

At the current modern stage of education and upbringing, the teacher's working system is undergoing significant transformation, with pedagogical technologies, integrated lessons, and innovations being widely implemented in practice. When interdisciplinary connections between academic subjects are ensured, not only does the effectiveness of student learning increase, but also their perception abilities, activeness, interest, and intellectual potential are enhanced. [3; p. 210]. T. T. Lakotsenina and S. V. Kulnevich, in their book *Modern Lesson Analysis*, provide the following definition:"Integration is the pro cess of deeply embedding and combining generalized knowledge from a specific field into a single learning material as much as possible." The word "integration" comes from the Latin *integratio*, meaning restoration or completion, and *integer*, meaning whole.

The concept of integration is interpreted in two ways:First, as the concept of interconnectedness between distinct, specialized parts and functions of a system or organism, and the process that leads to such a state, Second, as the process of bringing together subjects that have been differentiated through specialization. Genetically, integration represents interconnectedness, interdisciplinary relationships, mutual correlation, and ultimately, a comprehensive, mutually reinforcing and deepening synthesis of academic content. At its highest level, it forms a logically complete content structure that meets at least the standards of education.

While each lower level of interdisciplinary connection is established among specific didactic units within the boundaries of the studied subjects—aiming to coordinate the content and timing of instruction—integrated relationships go further. They require that the subject, phenomenon, or process being studied be interpreted as a holistic system from the standpoint of interrelatedness and interdependence. [4; p. 352].

Integration – the opposite of differentiation – is a reverse process. It can be implemented in the following directions:
a) studying the content within and across academic subjects through integration;
b) integrating the activities of individuals who provide education across various academic subjects;
c) integrating forms of organizing educational and instructional work or the school day itself.

Currently, in modern biology education pedagogy, the process of finding more effective methods of teaching is ongoing. Pedagogical integration is one of these methods, and one of its foundations is integrated lessons. Integrated lessons are a form of interactive teaching that aims to develop demonstrative mastery through deepening and expanding integrative knowledge. In biology lessons, developing various types of thinking skills in students forms the basis of integration. Integrated lessons help children naturally understand the interconnectedness of events and the unity of the world around them. Integrated

lessons are conducted collaboratively, with the participation of specialists and active involvement of students. [5; p. 126] There are five main objectives of integrated lessons, which are:

1. Developing students' intellectual and emotional abilities;
2. Developing students' willpower;
3. Developing students' individual character;
4. Increasing students' interest in other subjects;
5. Fostering research abilities in students.

Interdisciplinary integration becomes evident when the content of one academic subject is used to study another. This process of systematizing content helps students form a holistic perception of the object being studied. Currently, three types of integrated lessons are gaining popularity:

1. Auction lesson;
2. Innovative lesson;
3. Collaborative lesson.

One type of integrated lesson is the auction lesson, where short explanations are given on certain topics, students' opinions are gathered, and they are evaluated by a specialist. In such lessons, students are divided into four groups, and each group presents their views on the topics. The group that provides the most comprehensive explanation of the topic is considered the winner, and each member of the group receives equal evaluation. No homework is assigned at the end of the auction lesson. The collaborative lesson is based on conducting specific topics with the participation of specialists. The specialist explains the topic in a lecture format and answers students' questions at the end of the lesson. The teacher evaluates students' knowledge based on their participation in discussions.

The innovative lesson is often based on computer technology. According to this model, the topic and its content are entered into a computer program by the student. The lesson process is carried out using computer tools, and the invited specialist or other students observe the lesson remotely. At the end of the lesson, observers provide their feedback and evaluate the level of innovation.

Integrated lessons have several didactic principles:

- clearly stating a specific problem and reaching a solution by the end of the lesson;
- defining and giving examples for every piece of information and concept introduced in the lesson;
- checking students' learning progress through questions during the lesson;
- immediately assessing the knowledge and understanding of actively participating students;
- completing homework assignments in collaboration with students.

Requirements for integrated lessons include aligning lessons with state education standards. In biology lessons, integration can be made with chemistry, geography, mathematics, history, natural sciences, English, and reading subjects. The main goal of integration in education is to develop students' understanding of nature and society and guide them in expressing their opinions about the laws of development. [6; p. 32]. Therefore, it is appropriate for an integrated lesson to be consistent in terms of topic and to be developed based on a well-thought-out plan. To increase the effectiveness of education, it is necessary to create integrated curricula and textbooks. The main goal of integrating education is to help students develop a comprehensive understanding of nature and society and to guide them in expressing their attitudes towards the laws governing their development. The methodological basis of the integrated approach in education is to teach students the relationships within and between subjects, which facilitates the comprehension of core subjects and the laws governing the existence of the world. This can be achieved by revisiting key concepts multiple times, deepening and enriching them, and identifying important features that are understandable to students. Lessons that analyze concepts and refer to knowledge acquired in other lessons are considered integrated. Integrated lessons are not only creative and flexible but also holistic, logically sequenced, and have a distinctive methodology for transitions. At the same time, interdisciplinary connections should be taught at the lesson content

level and supported by the necessary teaching tools.

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