

## Use Of Interdisciplinary Relationships In The Formation Of Competences In Biology Students

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**Annotation.** The article analyzes the ways and importance of interdisciplinary links in the teaching of biology in general secondary schools. There are also suggestions for using specific teaching methods.

**Keywords:** basic competencies, biological concepts, chemical concepts, physical concepts, ecological concepts, natural phenomena.

Modernization of the education system, as well as all spheres of our life, remains one of the most pressing issues today. Creating an innovative educational environment, ensuring its full compliance with international standards is an important factor in the successful socialization of our youth in today's rapidly changing social life.

The implementation of the "National Training Program" involves improving the structure and content of the system of continuing education on the basis of modern science and social experience. The Action Strategy for the further development of the Republic of Uzbekistan for 2017-2021 sets the task of "educating a highly educated and intellectually developed generation, creating a reserve of competent scientific and pedagogical personnel in higher education institutions." In order to do this, first of all, it is necessary to provide the teaching process in all educational institutions with advanced, scientifically based modern methods. The purpose of educating the younger generation, tasks and content of it are one of the most pressing issues facing the system. In order to bring up well-rounded young people, of course, we need qualified, well-trained teachers. That is why there are so many tasks for teachers today. Special attention should be paid to the introduction of new pedagogical technologies at all stages of education, in particular, the effective and rational use of information and communication technologies and the achievement of high efficiency. In order to train competitive, qualified personnel in line with world standards, to raise the next generation to a high level of spirituality, to respond to changes in social life, to bring up harmoniously developed individuals who deeply understand the essence of our national values, teachers should show examples of creativity, inquisitiveness, dedication. One of our main tasks today is to teach students to effectively use the different types of skills they have acquired in their personal, professional and social situations, to teach how to independently search for the necessary information about science, to increase the necessary knowledge as a result of analysis to distinguish relevant materials, to pay special attention to the skills that employ in the event of unforeseen uncertainties, that is, in problematic situations, and to cultivate the ability to apply the acquired knowledge in everyday life.

Objectives of teaching biology - to introduce the basic biological concepts, theories and laws, to provide information about the mechanisms of adaptation of living organisms to the environment, to introduce the main stages of individual and historical development of organisms, the current social to

ensure that life and science are connected with the achievements of technology, to teach students to maintain their own and others' health, to lead a healthy lifestyle, to treat nature and all its riches wisely. The basis of biological knowledge is the formation of competencies such as educating students in the spirit of national independence and patriotism by introducing them to the work of local plant and animal species, selection achievements, great scientists of ancient times and modern scientists in biology.

While teaching students the above knowledge of biology, it is useful to link it to other disciplines and explain it from a scientific point of view.

In the process of teaching biology, a teacher will inevitably face some problems. For example:

1. The problem of full involvement of all students in the classroom
2. In the lesson, the student can understand and answer the teacher's question, but in order to understand and imagine some biological processes, it is necessary to analyze other sciences, such as chemistry, physics, geography, ecology and other sciences.

The role of physics in the development and technical progress of modern natural sciences is invaluable. In recent years, advances in physics, including rocketry, nuclear energy, semiconductor technology, and quantum light generators, have had a significant impact on the development of other sciences and the creation of new discoveries in them. The development of biological science was greatly influenced by physics with the invention of the optical and electron microscope.

Of course, we also rely on physical knowledge in our laboratory work in biology. That is, the development of biology was greatly influenced by the discovery of the optical and electron microscopes of physics.

Microscopes have made it possible to study the cellular structure of living organisms and the complex processes that take place in the cell. Microscopy can determine the nature of heredity in living organisms, the role of DNA and RNA, the material basis of heredity, in the formation of specific properties, functions, and traits.

The development of biology, in particular, bioelectrical phenomena in living cells, the detection of biocurrents, the application of energy processes in living organisms, the methodology of physics to study the processes of absorption, diffusion, osmosis have played an important role. These methods were used to determine the synthesis of the protein insulin hormone, which regulates carbohydrate metabolism in the body, the structures of hemoglobin and myoglobin, the respiratory pigments of muscle and blood, and the enzymatic functions of proteins.

Chemistry has a significant contribution to the development of biological science, including the chemical composition of the cell, i.e. the determination of inorganic and organic substances, the specific properties, composition, molecular structure, nature of proteins, carbohydrates, lipids, the determination of their functions in the cell. and the law of conservation of energy provided the basis for the study of the exchange of matter and energy in the cell.

In the process of studying the chapters "Fundamentals of Genetics" in the upper grades, students learn not only all branches of biology, but also the basic genetic symbols and terms, the laws of hereditary traits, the basics of selection of genetics, medicine, the importance of evolutionary theory, also requires knowledge of sciences such as mathematics, laws of historical development, geography. A biology teacher also needs to have the skills and art to be able to engage students, make the lesson fun, and educate and nurture the student.

The emergence of border sciences played an important role in the development of the natural sciences. These include biological chemistry, biological physics, radiobiology, cosmobiology, physical chemistry, chemical physics. Table 1 below shows the relationship between the concepts on the topic of "Elemental Cell Composition".

**Table 1**

Biological concepts	Physical concepts	Chemical concepts
Biogenic elements	Atomic-molecular structure of substances, physical properties of substances	Chemical elements, Inorganic, organic substances, their chemical properties
Macronutrients	Physical properties of elements	Chemical properties of elements
Conductivity functions of sodium, potassium, chlorine	Osmosis, diffusion, active transport, Pascal's law	Anion, cation, concentration
Biogenic polymers	Atomic and molecular structure of substances, types of energy and changes in species	Types of organic compounds, chemical properties
Microelements	Physical properties of microelements	Microelements Chemical properties of iodine, zinc, cobalt
Atomic-molecular structure of substances	Atomic-molecular structure of substances	Chemical structure of substances, catalysts, chemical bonds
Gas exchange	Diffusion phenomenon	Oxygen, Carbon dioxide

The table above can be continued again. Teachers use their knowledge of biology and other sciences to inculcate in students the concepts of the topic being studied during the lesson.

Implementation of interdisciplinary links in the teaching of biological sciences is an important didactic condition of the educational process, which ensures the scientific and coherence of teaching materials, which are the main source of knowledge for students. interest in the acquisition of knowledge increases and mental development accelerates. For example, I give Table 2 below.

Practical work on ecology in the department of general biology

**Table 2**

Evolution doctrine	Heredity, the struggle for survival, variability, natural selection are the driving forces of evolution. Organization of practical work on these topics. Excursions in the woods or meadows to learn about the causes of species diversity in nature.	Excursion
Fundamentals of Ecology	Fundamentals of Ecology Natural biogeocenoses, observation of seasonal changes in them, acquaintance with natural biogeocenoses on the example of local species and populations. Demonstrate the relationship between the environment and natural biogeocenoses. Excursion, follow the rules of behavior in nature, organize practical activities for students to preserve natural objects.	Excursion
Fundamentals of cytology	A) Decomposition of hydrogen peroxide by the enzyme catalase; B) observation of plasmolysis and deplasmolysis in a living plant cell; V) microscopic examination of blue-green algae, observation of the structure of the nucleus, cells; G) to observe the movement of the cytoplasm in the elodea leaf cell. In such practical work, it is said that substances absorbed from the external environment affect the processes that take place inside the cell.	Inclass

Educating students in an aesthetic spirit is a continuation of environmental education.

As you know, aesthetics is the study of the elements, conditions, and laws of beauty.

### **“Smart Greenhouse” for students in grades 5-9**

What disciplines combine: computer science, mathematics, physics, chemistry, biology, technology (labor), engineering

Objective: To create a 100% automated greenhouse model

Duration: 1 year

Form groups of 4 students and suggest to each of them what plants to choose and grow in their greenhouses.

In biology classes, children learn all the information about the selected plant: the conditions under which the light falls, the irrigation regime. They know the information about its height and productivity.

Then encourage students to think about the condition of the irrigation system for each plant. The scheme is as follows: irrigation should be carried out only when the soil is dry. Students should know whether the soil is dry or wet before watering.

Once students have determined the soil moisture level in the greenhouse, they install a humidity sensor. They measure the resistance of the earth to changes in humidity. This requires sensor calibration. In chemistry classes, students learn about different soil composition and resistance changes depending on changes in soil composition. After gathering all the initial data, it is the turn of computer science: they program the work of sensors and print small parts of the greenhouse on a 3D printer.

They study the operation of humidity sensors for air and CO<sub>2</sub>, as well as artificial lighting.

For the harvest, students learn the basics of a robotic manipulator, which uses a color sensor to detect the ripeness of a crop.

In conclusion, it can be said that the field of biology can be taught not only in geography, chemistry, physics, but also in computer science, mathematics and engineering. These students have a high level of interdisciplinary coherence and mastery in the study of biology. Encourages students to take an interest in biology and pursue careers.

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