

## The Role and Importance of Interdisciplinary Relationship in Teaching Biology

*I. Sh. Nosirov, A. M. Gapparov*

*Kokand State Pedagogical Institute named after Mukimi, Kokand*

### ABSTRACT

*The article analyzes the role and importance of interdisciplinary links in the teaching of biology in secondary schools. There is also a lesson plan on interdisciplinary communication in the teaching of biology.*

**KEYWORDS:** *integration, nature, society and methods of scientific research.*

The teaching of biology in connection with physics involves the acquisition by students of certain knowledge, skills and competencies standardized by biology curricula and the State Educational Standard, their education and the correct use and interdisciplinary communication in the educational process.

Indeed, the natural sciences in school education reveal to students the current scientific landscape of the world. Therefore, the natural sciences form the natural-scientific basis of the student's worldview. Interdisciplinary connections should be aimed at shaping students' generalized scientific understanding. The integration of knowledge requires a unique approach to education. For example, the description of the training material in a generalized system shows the need to use problem-based, modular, person-centered technologies in the educational process.

Biology is one of the leading sciences - biology has a much more responsible role in shaping students' scientific worldviews. For this reason, the content of school biology has great potential in shaping the scientific worldview of students.

In teaching biology, first of all, to acquaint students with the basic concepts of biology, ideas, theories, laws, their role in various sectors of the economy, the importance of mastering biological knowledge, students use their knowledge of physics in problematic situations. An educational system has been created, which is inextricably linked with the formation of a scientific worldview in students and the formation of a conscious attitude of man to nature and society.

This system incorporates the issues of spiritual and moral, patriotic, ecological, aesthetic, economic, physical, hygienic, labor and inter-ethnic education of students, as well as a solid mastery of the basics of science.

The process of connecting biology with physics leads students to understand the laws of structure, development, and life activity of biological objects using the laws of physics. This knowledge forms the system of students' scientific worldviews and beliefs. The scientific worldview of students is based on the understanding of biological laws in terms of the historical development of the "nature-human-society" relationship.

In the methodology of teaching biology, the concepts that form the basis of the scientific worldview of students are divided into the following groups:

1. Similarities in the chemical composition of inanimate and animate nature, generality and continuity of events.

2. To understand the life processes and variables that occur in living organisms, to implement interdisciplinary communication through the use of physicochemical laws, as well as biological laws in solving problematic learning tasks.
3. The need to study the phenomena and events in the material world, the causes of environmental tragedies and measures to eliminate them.
4. Ways to study the laws of nature by man and use them effectively and rationally.
5. Cause-and-effect relationships in the interdependence and development of natural phenomena.
6. Man is a social being.
7. Nature conservation is the basis for conserving life on our planet.

Based on the above considerations, the curriculum of general secondary schools, with a view to linking biology with physics, provides a purposeful analysis of the content of both curricula, identifying the links between them, i.e. asynchronous (horizontal) and synchronous (vertical), and the formation of theoretical knowledge, practical skills and abilities of students through the development of environmental problems and tasks, taking into account their psychological characteristics, the application of environmental problems and tasks in the educational process.

Integration between disciplines is divided into the following components:

- integration of the object
- the symbols of one object in different disciplines are included in one subject, section or course;
- Conceptual integration includes topics or courses that reveal the content of general concepts;
- In the integration of theories, the theories of physics and biology are studied in general;
- Methodological integration involves the implementation of integration of specific methods of scientific knowledge;
- Problem-based integration covers interdisciplinary problems and develops solutions;
- Integration of activities provides for discussion of problem solving, work in small groups, development of interdisciplinary action plans, preparation of projects, etc.;
- Creation of technical products on the basis of processes that are important in practical integration. In the interdisciplinary teaching of biology, asynchronous (horizontal) and synchronous (vertical) forms of connection, content, object, concept, problem-solving and practical connections were used.

Also, the following principles were used in the synchronous (vertical) teaching of biology in connection with physics:

The principle of science is that in the context of the development of ecological thinking through the acquisition of certain knowledge, skills and abilities in biology in connection with the knowledge acquired by students in physics, this knowledge is important for future life and career choices.

Given the principle of continuity - the interdependence of knowledge, skills and abilities in the content of biology and physics, it was found that there is a difference in the place of these disciplines in the curriculum.

The principle of consistency - on the basis of this principle, the selection of teaching materials that prepare the ground for interdisciplinary communication in synchronous form, while maintaining the knowledge, skills and abilities in the content of biology and physics, as well as the sequence of

introduced educational materials.

The principle of continuity of education - the content of educational materials is aimed at developing students' environmental thinking through education.

Ergonomic principle - teaching materials were selected taking into account the mental, youth physiological, psychological and physical development of students, the energy expended by students in education. Based on this principle, students' mental strain is prevented.

The principle of comprehensibility - in the teaching of biology in connection with physics, the selected teaching materials corresponded to the previously acquired knowledge resources, which allowed them to be used in the performance of environmental tasks.

The principle of logic - knowledge, skills and abilities in the content of biology and physics, as well as logically complemented teaching materials, allow students to develop the acquired knowledge, to make interdisciplinary and intra-scientific connections based on the student's knowledge resources. When this principle is followed, students have the opportunity to imagine the integrity of the universe and to fully understand the socio-economic relations in our society, to integrate natural sciences, to make intra-scientific and interdisciplinary connections horizontally and vertically, as well as periodically, asynchronously, synchronously.

In the educational process, interdisciplinary communication can be effective not only by itself, but also through the professional, scientific-theoretical and scientific-methodological training of the teacher and on the basis of a deep understanding of its essence. To do this, the teacher must not only have a deep and thorough knowledge of the subject he teaches, but also be aware of the interdisciplinary knowledge close to it. This is aided by the acquisition of specific types of knowledge and the forms of connection between them.

Synchronous (vertical) connection is an inter-class connection through the use of knowledge acquired in previous classes on the basis of the curriculum and syllabus of the subjects of the subject. This includes interdisciplinary links between 7th grade Zoology, Single Cells, Simple Animals, Ildam Lizard, 6th Grade Physics, Molecules, Mechanical Motion, or Grade 8 Human and Human Health. "Structure and function of the human body", "Blood movement", "Structure of the musculoskeletal system" in the textbook "Potential and kinetic energy", "Friction" in the textbook "Physics", 7th grade In the textbook "Biology (basics of cytology and genetics)" "The structure and function of the cell. Mitochondria", "Metabolism" in the 8th grade textbook "Physics" "Current sources. An example is the interrelationship with the topics "Batteries", "Electric current".

These types of connections can be used mainly in the organization and conduct of extracurricular activities (various clubs, Olympiads, conferences, etc.).

A lesson plan on synchronous (vertical) communication in biology classes has been developed. In order to test it in practice, analytical tests were carried out in secondary schools No. 5, 67, 26 of Uzbekistan district of Fergana region, and the hypotheses were scientifically and theoretically proven.

Below is the project of interdisciplinary synchronous (vertical) connection in the teaching of "Man and his health" (8th grade), "Physics" (7th grade) subjects taught in secondary schools.

Course Title: The structure of the musculoskeletal system (Man and his health, grade 8).

The educational purpose of the course is to expand the scientific worldview by explaining the biological knowledge of bone structure and function in relation to physical concepts.

The educational purpose of the course: to provide students with knowledge about the peculiarities of

the skeletal system, its place and role in human life, as well as environmental education. The developmental goal of the course is to form students' general and specific biological, physical, environmental concepts, skills and competencies in teaching biology in conjunction with physics.

Lesson equipment: visual aids reflecting biological and physical concepts, didactic and handout materials, technical aids. Technology used in the lesson: didactic game technology (conference method).

### **Course:**

Organizational part. Greeting, determining attendance, focusing on classroom cleanliness.

Introduce students to the topic, purpose, and course of the lesson and guide their activities to complete the learning tasks. The teacher first briefly briefs the students on the goals and objectives of didactic game technology. In it, the use of didactic game technologies in biology lessons allows to increase the cognitive efficiency of students. Lessons where students' learning activities are combined with play activities are called didactic game lessons. The teacher then divides the students into three groups and gives them the status of biologist, physicist, ecologist. In addition to the students of the class, other students of the class can participate in the conference lesson at will.

Learning a new topic. On the recommendation of the teacher, a group of students prepares a report on the following topics related to their status:

1. The skeletal system.
2. Shapes of bones.
3. The structure and function of bones.
4. Features of the interaction of biological and physical concepts.
5. Processes of interrelationship between motion activity and friction force.

In order to make an interdisciplinary connection between teaching biology and physics in an ecological context, the topic "Structure of the musculoskeletal system" in the 8th grade textbook "Man and his health" is explained in conjunction with the 7th grade textbook "Physics" in the textbook "Friction". the force that occurs and is directed against the motion creates a frictional force. For example, you have to force it to push books lying on the table. There is also a frictional force between moving the hockey puck on the ice or between the tire and the asphalt.

The first reason for the formation of friction is the roughness of objects that touch each other. The second reason is the mutual attraction of the molecules of the bodies that touch each other.

This means that when a person moves, the interaction of his feet with the surface of the earth creates a frictional force. Students will understand the processes of interaction between such biological concepts and physical concepts in a conference lesson. Such interdisciplinary communication serves as an important tool for further development of students' interest in science, as well as the activation of cognitive abilities, independent thinking.

Monitor, evaluate and encourage the winning groups of students' knowledge on the conference topic.

Concluding the conference lesson on the basis of questions and answers.

The school, which is the backbone of the system of continuing education, was the basis for the following conclusions on the results of the correct use and effective use of synchronous (vertical) communication in biology lessons:

- serves as an important tool for students to acquire scientific knowledge about the integrity of

nature, the relationship between society and nature, to improve the knowledge, skills and abilities that form the basis of a conscious attitude to nature;

- Understands the importance of nature and its components in the broadest sense, guarantees the intended result in the process of distinguishing between renewable and non-renewable resources;
- Establishment and effective use of interdisciplinary communication in the classroom is important not only for the economical use of natural resources, but also for the protection of the environment, landscaping and reproduction of natural resources, the formation of motives for active participation in socially useful work. In this regard, the following recommendations can be made:
- If the interdisciplinary synchronous (vertical) connection in school biology lessons was widely established and skillfully used, it would serve as an important tool for improving students' scientific outlook, increasing interest in academic subjects;
- Integrating interdisciplinary communication in biology lessons on the basis of non-traditional methods, ie modern pedagogical and information technologies, increases the effectiveness of education.

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