

Section 2. Pedagogy

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APPLICABLE POSSIBILITIES OF PROJECT-BASED LEARNING IN BIOLOGY TEACHING

Abstract. The article emphasizes the general features and application of the project method in biology teaching and its rich values when used in education. It explains project-based learning opportunities that allow students to develop the ability in performing practical activities.

Keywords: project-based learning, student-oriented, problem-oriented, biology, project types, project characteristics.

One of the most important aims of education is to raise individuals who “learn to learn”. Today, science and technology develop very rapidly and as a result, radical changes are experienced in education within the world globalization process.

Project-based learning approaches become more relevant over the years. Project means imagination, design, development, planning. Project-based learning may be defined as a learning way, a learning strategy, and a way of mastering the curriculum. Project-based learning is based on constructivism [2, 47]. According to constructivist learning, the student is an active learner. Project-based learning also reflects Vygotsky’s ideas. It proposes that con-

cepts develop and understanding occurs when individuals engage in discussion and meaningful interaction with more skilled peers or teachers. These individuals can model problem solving, find solutions, and evaluate success [1, 66]. Project-based learning is an approach based on the idea of recognizing the problems encountered in life, understanding the importance of these problems and their causes, solving problems, and eliminating potential problems in advance which serves to think that learning should be comprehensive and competency-based. It has many features that distinguish it from traditional training. This responsibility consists of the stages of identifying the problems given, finding solutions, managing research, analyzing data, selecting data, integrating the data selected, and connecting old information with new information. Features of project-based learning include:

- Projects are student-oriented. Students have the autonomy to make decisions about all aspects of the project;
- Projects are problem-oriented. The problem plays a leading role in the organization of concepts and principles, then guides and directs activities;
- Expected results are cognitive and practical;
- Students interact with the real world through projects;
- Projects are carried out within the framework of cooperation. Projects require collaboration to achieve a goal;
- Projects usually involve multiple disciplines;
- Projects require a lot of time.

Project-based learning owes its origin to American philosophers who belonged to the pragmatic school of philosophy. The main supporter of this method was U. Kilpatrick [3, 161]. H. Kilpatrick's projects are divided into two parts, collective and individual. Collective projects are projects in which students work in groups. Individual projects are projects that students work on individually. Projects are

divided into four groups: game projects, story projects, excursion projects, and business projects. Researchers distinguish a number of project types and classify them in different ways. The time limit in class doesn't always allow for a more in-depth and detailed study of the subject, therefore, research projects are conducted both in the classroom and in extracurricular activities. Perspectively, the projects used in biology teaching can be divided into three groups: course projects, extracurricular projects, and research projects. Projects in the class are carried out within 1–2 academic hours. In the project called “Proper nutrition”, the most interesting of them, using food and its energy value – calorie and energy expenditure tables, students prepare an optimal individual menu, taking into account their needs and energy costs. Extracurricular projects are small research projects and the material can be used practically in the classroom. Research projects on “Energy drinks and their effects on the human body”, and “Benefits and harms of food supplements” are quite interesting. Research projects are not only theoretical research on the topic of the study, it also includes a practical experimental part, sociological surveys, analysis, and students' independent results. The best research studies and projects are submitted to city and republic competitions, also posted on the subject website.

Different types of projects can be used in biology classes. Students are particularly interested in research projects aimed at studying the functioning and regulation mechanisms of organs and organ systems, for example, “Taste Hallucinations”, “Health Formula”, etc. The research project “Plants and animals – bioindicators of the environment” can be linked to the solution of environmental protection and regional ecological problems.

Topics related to genetics make it possible to create interesting and innovative projects. For example, in the project “My Genealogy (Pedigree Chart)”, the aim is to familiarize with the method of ge-

neological research and to compile one's own family tree. Students first collect information about three generations from both sides of their parents, conduct an analysis of the characteristics of the signs, and hereditary character (recessive, dominant, autosomal). They determine the genotypes and phenotypes of the offspring. Students independently get knowledge from multiple sources of information while working on a project and as a result, communication skills are formed when applying knowledge in practice.

Designing creative projects requires maximum independence and a creative approach. However, the creative project has its own algorithm. Firstly, it is necessary to formulate ideas to define needs, put forward requirements for the design object, analyze them, and start planning and preparing the object. "Flower varnish", and "Creating crafts from waste materials" are examples of such projects.

In a role-playing project, problems and goals are definitely mentioned. In such projects, the result can't always be described at the beginning, it can only be determined at the end of the project. For example, the project "Acquaintance with the human body – organ system" is a role-playing game by its nature and content. Each student plays the role of a certain organ, talks about its functions and importance in the body, simulates different situations and their solutions.

Information projects are initially aimed at gathering information about any object and event, familiarizing the project participants with this information, analyzing it, and summarizing the facts. The structure of such a project can be shown as follows: the purpose of the project, sources of information, processing of information, result, and presentation. As an example of such projects carried out in biology classes, the creation of the film "Movement of single-celled animals (unicellular organism)" etc. may be shown. Such projects, and scientific-research projects, require a well-thought-out structure, the ability to make systematic adjustments during the

course of the project. Such projects are often integrated into research projects and become their organic part, module.

Practical projects are aimed at the participants' own social interests. Such a project requires a well-thought-out structure, even defining the scenario of all the activities of its participants, the function of each, and the precise results of joint activity. Practical projects carried out in biology classes and extracurricular activities are "Cultivation, use and preservation of tubers (fungus)", "cultivation of plant seedlings", etc. The topics of biology projects may cover a wide variety of problems and issues, up to global problems facing humanity. The evaluation criteria of biology projects may be attributed to the following:

- accuracy of the set goal and task;
- thematic relevance and volume of the literature used;
- justification of selected methods for conducting research;
- analysis of the data obtained;
- the presence of conclusions or practical recommendations in the study;
- quality of work arrangement.

Consequently, note that Project-Based Learning helps students to better master the learning material, increases interest in the subject, helps to develop habits of working independently, creative approach to problem-solving, then working habits are formed with various additional information sources, methodical resources are created to be used both when learning new topics and repeating, also for individual correction of knowledge.

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