

Section 2. Pedagogy

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USING PROJECT-BASED LEARNING TO BUILD SKILLS IN BIOLOGY LESSONS

Abstract. The article emphasizes the advantages of Project-based learning in building skills in biology teaching. Working on projects not only contributes to the development of students' critical thinking and creative abilities but also increases their motivation to learn.

Keywords: project, extracurricular activity, research, biology, problem-orientated.

The article emphasizes the advantages of Project-based learning in building skills in biology teaching. Working on projects not only contributes to the development of students' critical thinking and creative abilities but also increases their motivation to learn. One of the most important conditions for increasing the effectiveness of the educational process is the organization of project-research activities and the development of research skills, which are its main component. However, currently, most secondary school teachers don't use the project method in biology teaching. Knowledge is given to students ready-made, it isn't got independently, and no search for additional information is required.

The main task of the modern school is to raise people who "learn to learn". Perspectively, the student should solve the problem, search for information, look for ways to solve the problem, analyze the solution results and improve the research activity. Project-based learning makes the educational process more efficient because the learner better assimilates the knowledge acquired and can choose the optimal set of knowledge required in life. Project-based learning is based on constructivism [1, 66].

Project-based learning owes its origin to the American philosophers who belonged to the pragmatic school of philosophy. The main supporter of this method was U. Kilpatrick [2, 161]. He was influenced by John Dewey's principle of pragmatism. Kilpatrick defined the project as a "purposeful activity" by using these ideas. According to Kilpatrick, projects had four phases: goal setting, planning, implementation, and evaluation. Ideal progress occurs when all four phases begin and end with the students, not the teacher. In his opinion, when students use "freedom of action", they can get independence, judgment, and ability to act.

Features of project-based learning include the followings:

- 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, guides and directs activities;
- The results expected are cognitive and practical;
- Students interact with the real world through projects.

- Projects are implemented within the framework of cooperation. Projects require working together to achieve a goal;
- Projects usually involve multiple disciplines;
- Projects take a lot of time.

Below is a list of a few skills developed through project-based learning.

Information-seeking skills:

- create independently ideas based on knowledge from different fields;
- create independent ideas, learn from different fields;
- independently find missing information in the knowledge area;
- find several options to solve the problem;
- hypothesize;
- establish cause-effect relationships.

Collaboration Skills:

- collective planning;
- interact with partners;
- help each other as a group in solving common problems;
- business partnership communication skills;
- the ability to find and correct errors in the work of other members of the group.

Communication capabilities:

- participate in discussions;
- defend your point of view;
- find a compromise;
- interview, query.

Presentation skills:

- monologic speech skills;
- act confidently;
- the ability to use different visual aids during a speech;
- ability to answer unplanned questions.

Management Skills:

- planning activities, time, resources;
- make decisions and predict their consequences;
- analyze their performance;

Different types of projects can be used in biology lessons. The implementation of the research project can be implemented both in the classroom and in extracurricular activities. The research project can be linked to environmental protection and the solution of regional ecological problems. The subject of the project called “Restoration of the area you live in” is of a research nature.

In a role-playing project, the conclusion is unknown until the end. For example, when the 8th-grade project “Our organ systems work regularly”, each student plays the role of a certain organ, talks about its functions and importance in the body, and models different situations and their solutions.

Practical projects are aimed at the interests of students and in most cases, the solution to social problems. 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 the joint activities. Practical projects are mostly group projects where students participate in nature conservation actions and thematic competitions. This can be cleaning the school area of plastic containers, paper, and other waste.

The information project aims for teaching students to independently obtain the necessary information. The use of ICT tools allows to significantly reduce the time of information collection and, consequently, working time on the project. “Biodiversity in Ecosystems”, “Genome Modified Organisms”, “Cloning” are information-oriented projects in terms of content.

Designing creative projects requires maximum independence and a creative approach. “Creating crafts from waste materials”, “Preparing a stress-fighting video” are examples of such projects.

While preparing a design project on “Modeling the structure of the protein molecule”, students build the model using different materials based on the knowledge of the primary, secondary, tertiary, and quaternary structure of the protein molecule.

In the “Mutations” research project, students study mutagenic factors, their origin, the role of

mutations in modern human life, and hypothesize that mutations cause many hereditary diseases and birth defects in humans. Consequently, the students concluded that mutations can occur spontaneously and under the influence of various mutagenic agents, and that mutations are the cause of many hereditary diseases and birth defects in humans.

The research project “Effect of food additives on health” reviews information about food additives and their role in modern food production, food indices, and types of food flavorings. Students determine the classification of food additives, which food additives are prohibited and the effect of food additives on human health. Consequently, concluded that all food products contain food additives. Most teens consume foods that contain food additives. Food additives in chips, crackers, chewing gum have a harmful effect on students’ health. Canned foods and semi-finished products should not be given to children of preschool and primary school age.

In the research project “The effect of mobile phones on the human body”, the author studies the impact of mobile phones on human health, conducts sociological research, analyzes scientific materials, explains the harm caused by mobile phones to human health, analyzes the problems experienced during mobile phone use. Pursuant to the results of sociological research, the majority of mobile users believe that phones affect their health, but they continue to use them because they are very convenient. So far, there are no reliable facts proven about the harmful effects of using phones, but they were not proven to be completely safe either.

The project “Pandemics of the Past Compared to the COVID-19 Pandemic” is a current research project. Students study the historical aspect of the pandemic, define this concept, learn about pandemics humanity faced before, and the conditions of a real pandemic. Students conduct a comparative analysis of statistics on deaths from the coronavirus with other diseases causing a pandemic, they research all aspects of the new disease, whether COVID-19

disease is as dangerous as it is portrayed in all the media and whether humanity will be destroyed by COVID-19.

It is impossible to apply the project method without the teacher’s organizational and creative, non-standard approach. Teachers act more as a guide, adviser, motivator, facilitator and evaluator [3, 254]. In practice, this leads to a change in the teacher’s position. The teacher turns from the carrier of ready knowledge to the organizer of the cognitive activity of the students. That is why the teacher should build the activity pursuant to the followings:

- involving the student in the process of solving important, integrative, and creative problems;
- cognitive and practical significance of the expected results;
- sharing information that will motivate students’ creative activities and encourage them to be creative;
- developing the skills to work in a team, to show tolerance and respect, which will help to solve problems and get out of conflict situations;
- teaching to think independently, find and solve problems, attract integrative knowledge, predict the conclusions and possible consequences of various solutions, find cause-effect relationships;
- forming the skills of collecting and processing information, materials;
- establishing the ability to prepare a written report;
- building the ability to analyze, including creativity and critical thinking;
- forming the ability to prepare and conduct a presentation of study results.

Thus, the integrity of the pedagogical process is ensured during the application of the project-based learning model, which is person-oriented, conditions are created for independent knowledge acquisition, interdisciplinary integration is ensured, a transition

from the school of memory to the school of thought formed, directed to the future profession and higher
is formed, positive motivations for self-education are education.

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