ADVANTAGES AND DISADVANTAGES OF PROJECT ACTIVITIES IN TEACHING PHYSICS

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Abstract*. The paper considers in detail the method of project activity in teaching in general and teaching physics in schools in particular. A brief historical background and prerequisites for the emergence of the method are given. The application of the method in teaching physics in secondary schools is considered. The formation of internal motivation of students in the process of project development on the subject of physics is shown.*
Keywords*: project activity, internal motivation of students, project assignment.*

INTRODUCTION

In modern pedagogical educational technologies, the project method occupies a central place. Currently, the project-based learning method is increasingly used in many educational processes. Let's take a closer look at what the project-based learning method is. This is a form of educational process in which the student conducts deep and thorough and fundamental research on a specific problem, followed by a defense and presentation. The history of the method dates back to the 20s of the last century. The method originated in the United States and is based on the humanistic principles of education of the teacher J. Dewey. In parallel, at the same time, the same teaching method was developing in Russia. However, due to the fact that the method was not very thoughtfully introduced into the education system, the introduction of this method into the educational process in Russia was suspended. But after some time, thanks to the works of such scientists as A. N. Berenchugin-Romanova, B. Valasek, V. A. Kalney, T. M. Matveeva, E. A. Mishchenko, G. V. Narykova, V.S. Rokhlov, I. A. Trukhin, S. E. Shitov and others, it was studied and developed. In the process of studying the history of the method, it was found that even the ancient Romans used the basics of the project method when teaching. They were called *propti*, that is, projects [1].

METHODOLOGY. Let's consider the essence of the method. The project method has also been used since ancient times in the countries of ancient Asia. Historically, the master - student method has also been widely used in Asian countries in teaching. In this method, the teacher gave his student a difficult task, which the student had to complete independently and develop the technology of this project himself. This method of teaching was especially popular with our great ancestor Abu Rayhon Beruni, who gave his apprentices complex, demanding application of ingenuity, project tasks. As an example, here is one of the tasks of the great master. It is required to pull a rope on the arch of the window without using nails or glue. When solving this project task, it was allowed to use only short rails in the amount of 4 pieces and an unlimited amount of rope. Such a task develops both abstract and creative thinking. The project methodology is based on knowledge of the laws of physics. The main characteristic of the Beruni method is: orientation to the student as an independent researcher; orientation to real needs; orientation to the final result. The project method was based on a combination of theoretical knowledge and research skills. As a result, drawings, experimental data, processing of experimental results and generalized

conclusions appeared. Such projects can be useful for both the teacher and the student, because the project includes practical knowledge and craft skills. The result of such work is a real product created by the masters and their students. The motivation was the commercial component, as the products were in demand. As you can see, the project method is not the latest achievement of pedagogical science, but a well-proven method that has been successfully used since ancient times and in many countries.

To implement this method, students must have a certain amount of knowledge and information on the subject [2]. Additional knowledge and competencies are acquired through project activities. In modern pedagogy, the project method is part of learning technologies for personal development, including methods such as problem-based approach, group work methods, research, search, reflection, etc. A huge variety of interesting topics can be selected for project work. It is advisable to start project work from the very beginning of studying the subject of physics [3].

RESULTS. Creativity and the result of creativity always inspires the student. The result of the project is the motivation to complete the next project. So, for example, when studying the basics of electrostatics at school, there may not be such equipment as an electroscope and an electrometer, an electrophoretic machine, a Leiden jar. Currently, there are a lot of videos on the subject of physics on the Internet. By showing students a video clip with the principle of operation of an electroscope and other devices, you can offer them a design assignment for the manufacture of an electroscope, a Leiden jar. So, we gave the task to the students to make an electroscope from improvised materials. They studied the theory, thought out the design and made their own electroscopes for the school, which can be used in physics lessons as educational material. Photo 1 shows a photo of electroscopes made by students themselves.

Photo.1. Electroscopes made by students in a physics class (project assignments)

Thus, as a result of project activities, the following competencies are formed:

- reflexive skills;
- research skills;
- skills of working in collaboration;
- methods and skills of the manager;
- communication skills;
- the ability to create presentations and reports.

The project method can be used as part of the education system.

The pedagogical effectiveness of this method can be clearly shown in the form of a diagram [4]:

The pedagogical effectiveness of design technologies is achieved by a didactic goal through the development of a problem	50 %
Research and search skills are being formed	50 %
Enhances the independent nature of educational activities	50 %
Develops initiative, responsibility for the results of activities	50 %
Helps to increase internal motivation for learning	50 %
Promotes the formation of constructive creative thinking;	80 %
Develops an activity-based approach to learning	70 %
Communication improves	70 %

DISCUSSION. Thus, we see all the advantages of the project-based teaching method as a new pedagogical technology. Therefore, the old teaching methods, in which the student is the object of study, lose their relevance and significance. Such teaching methods have been replaced by new ones in which the student is already a subject of education and has the opportunity to choose, develop and show his personal qualities, his creative potential, as well as learn to make decisions. Thus, today the project method is understood not only as one of the ways to organize interaction between a teacher and a student (a teaching method), but also as an integral pedagogical technology that includes the following elements:

• Diagnostic goal setting, planning and design of the learning process, step-by-step diagnostics, the ability to choose tools and methods of work in order to adjust the results;

• A well-founded system of methods and forms of teacher and student work at various stages of the project, clear criteria for evaluating the results of this work;

• Application in the study of not only physics, but also other school subjects in various forms of education.

Studying the literature on the project learning method, we come to the conclusion that there is no single author who created the project method. This method is dictated by life itself, by vital necessity. It is only through work, especially independent work, that one can learn and acquire the necessary competencies [5].

It can also be concluded that today there is also no single definition of the term project. There are so many authors, so many opinions, among which there are the following: "a project is a joint educational, cognitive, creative or playful activity of students that has a common goal, agreed methods, methods of activity, and is aimed at achieving a common result of activity"

As Abu Rayhon Beruni said about learning: "If you tell me, I'm unlikely to remember, if you show me, maybe I'll remember, but if we work together, then I'll master it beyond doubt"

To master this method, you need to know the typology of projects. This knowledge will greatly help teachers develop projects, their structure, and coordinate student activities in groups and individually. There are several approaches to classifying projects:

• According to the dominant activity of students: research, creative, practice-oriented, informative;

• By subject-content area: subject, interdisciplinary and meta-subject; • By the nature of the interaction of students (participants): intra-classroom, school, regional, interregional, 15

internationals, etc. Interregional and international projects require participants to communicate via the Internet. Therefore, these are most often telecommunications projects.;

• By the number of participants: individual, couple, group;

• By duration: short-term, long-term, episodic. Speaking about the duration of projects, teachers categorize them as follows: • Short-term (mini-projects) - projects carried out within the framework of an academic subject. These projects are used to continuously study the problem and develop basic project skills. Research and information processing, formulation of results and preparation of presentations are carried out outside working hours. For example, at home or in additional classes.

• Weekly Projects - This type of project is usually used during scientific weeks. The implementation of this project takes from 30 to 40 hours under the guidance of a teacher. The processing of the results and the preparation of the protection are carried out outside working hours.

• Annual projects (long-term) are a type of projects that can be carried out both in groups and individually. Work on the project itself takes place outside school hours. The results are presented at scientific and practical conferences of students of different levels. The project can be used as a final event, when the knowledge and skills acquired by the student can be evaluated based on the results of the project. Then part of the educational material is directed to self-education and the implementation of project activities. The main goal of the school project is to gain new knowledge both within the curriculum and beyond, as well as to establish interdisciplinary connections.

In school projects, the teacher is mainly assigned the role of project coordinator. He comes up with topics, controls the progress of work so that students do not turn off the right path, promotes informal communication between project participants, which forms the foundation of success for solving educational tasks. Students do the project work entirely on their own.

After analyzing the sources, the following positive and negative aspects of project activities can be identified

Advantages of project activities:

• Diverse and in-depth study of individual subjects;

• Independence in the choice of forms and types of activities;

• Social activity;

• Organization of cognitive activity based on the internal motivation of the student;

The experimental and research nature of the work. Informal communication with classmates and teachers allows the child to successfully complete the project, as well as reveals the creative potential of the child, which leads to the social significance of the project. But despite all these advantages, there are a number of disadvantages to this activity. Disadvantages of project activities:

• Division of groups into "hard workers" and "ballast";

• Overestimation of their capabilities and, as a result, a stressful situation;

• Loss of interest in the work if the project is delayed;

• Low possibility of success among students with different work speeds;

• Reducing the project to the level of an abstract downloaded from the Internet [6].

CONCLUSIONS. Project activity, in the presence of some shortcomings, still remains a proven motivational learning technology for many years of pedagogical practice. Therefore, each

student must master the skills in this field. All school subject programs are focused on this type of activity. Thus, we cannot abandon project activities due to shortcomings. Our task is to preserve this tool, while increasing the effectiveness of the project method.

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