European Journal of Humanities and Educational Advancements (EJHEA)
Available Online at: https://www.scholarzest.com
Vol. 5 No. 04, April 2024
ISSN: 2660-5589

CONTENT AND METHODS OF DEVELOPING THE PHYSICAL AND TECHNICAL CREATIVITY OF STUDENTS IN THE PROCESS OF PHYSICS TEACHING

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Article history:
Received: January 28th 2024
Accepted: March 20th 2024

Abstract:
This article provides information about the content and methods of developing physical and technical creativity of students in the process of teaching physics in general secondary schools.

Keywords: physical and technical creativity, physics teaching methodology, experimental issues, laboratory work, project work.

INTRODUCTION

In the Decree of the President of the Republic of Uzbekistan dated January 28, 2022 "About the development strategy of new Uzbekistan for 2022 – 2026 " No.60 and special emphasis is placed on bringing the qualification to the international level [1]. It is necessary for schoolchildren to be well-educated in all aspects in the implementation of the tasks specified in this decree, and their physical and technical creativity should be developed in order to be able to apply the knowledge they have learned in future activities. The analysis of scientific, pedagogical and methodological literature revealed that there is no comprehensive approach to solving the problem of developing physical and technical creativity of students. At the same time, it is clear that optimal results can be achieved only if the task of developing physical and technical creativity of students is comprehensively solved and covers all the main types of educational activities of students. In the process of developing physical and technical creativity of students, it is important to take into account the age dynamics of technical interests of schoolchildren and, in this regard, take into account the characteristics of physical and physical development. So, in the 7th-8th grade, students already know how to work with simple construction sets, they like to assemble models according to the instructions provided for the construction set, but sometimes they use the proposed scheme, drawing, etc. 'they try to go beyond the guidelines. They can do simple technical modeling using the skills and competences they have acquired in labor classes and clubs.

RESEARCH MATERIALS AND METHODOLOGY

It is noted that students have a low level of understanding about the constructions of machines and mechanisms, their meaning and movement, and they are interested in certain objects of technology. In our opinion, it is very important that at this stage students can already perceive the elements of theory and apply them in practice in their technical activities, and show interest in designing and building models and technical devices.

In the process of teaching physics, especially at the elementary level, we took these features into account when developing the methodology for developing the physical and technical creativity of students.

Types and methods of organizing physical and technical creativity of students in explaining new material, solving problems, doing homework, performing laboratory work and practical work, repeating and summarizing the learned material are the main elements of the methodology. We can indicate the following as the main tasks to be solved by using this technique:

- development of students' physical and technical thinking;
- development of research, experimental, design and innovation skills;
- stimulation of independent cognitive activity;
- to develop the ability to apply acquired knowledge in solving practical problems related to the world of technology;
- introducing students to modern techniques and technologies;
- introducing students to the main directions of scientific and technical education, modern achievements in various fields of knowledge of science and technology;
- development of interest in creative design, rationalization and inventive activities;
- professional guidance of students to the specialties related to physics and technology.

The relations between the elements of the developed system are determined by the goals and tasks formed above, and the characteristics of the subject being studied.

The methodology developed by us for the development of physical and technical creativity of students in the process of teaching physics reflects the main idea of the theory of developmental education: first, it becomes the acquisition of knowledge, skills and abilities for the purpose of education. Secondly, the teacher and the student create a system of mutual relations, in which one works for the other as a condition, means and result of their development. Third, the teacher and the student create a certain educational environment that helps to reveal natural information for the self-development of intellectual, cognitive and other abilities. Fourthly, developmental education is based on deep knowledge and competent use of the psychological laws of the process of interaction between the teacher and the student.

RESEARCH RESULTS

The main principles of methods of developing physical and technical creativity of students are as follows:

Relying on the material learned in physics with the possibility of going beyond the curriculum. The material offered for learning should be based on the knowledge, skills and competences acquired by the students in previous lessons, which ensures the continuity of the studied material. On the other hand, the new educational material should encourage students to deepen their knowledge and expand their worldview using materials not provided for in the curricula and textbooks.

Taking into account the individual characteristics of students (depth and direction of their interests, persistence and persistence in achieving goals, level of preparation, observation, etc.). Diagnosis of individual characteristics of students allows to determine the most effective methods, methods, forms and means of organizing educational activities of all categories of students and to choose individual tasks for the development of physical and technical creativity.

Gradual increase in the level of complexity of physical and technical assignments and various types of assignments performed by students. In accordance with the dynamics of the level of preparation, the formation of generalized and special skills and qualifications, it is necessary to complicate the content of the theoretical foundations of the material studied and studied by students, as well as the practical activity of an individual. and technical direction.

Extensive and systematic use of theoretical knowledge in performing any practical work of a physical and technical nature. This principle includes providing students with mandatory theoretical reasoning requirements, analyzing the physical basis of the operation of various physical and technical devices, devices, and tools.

The variety of forms and methods used for the development of physical and technical creativity of students in the teaching of physics and their systematic application. The use of various forms and methods in the study of specific educational material of a physical and technical nature helps to reveal it in all aspects, which, in turn, creates the basis for students to acquire a more solid and deep knowledge of the subject. .

The practical importance of physical and technical crafts prepared by students (their use in further educational work, in solving various everyday problems, etc.). Each construction, tool, device prepared by students should find its application in the educational process (showing physical and technical devices, performing laboratory work, in physics workshops, etc.) or for use in everyday life. It is unacceptable for students to leave their work unsolicited.

Polytechnic principle. This principle involves introducing students to the physical foundations of the most important modern industries and new technologies.

Professional guidance in working with students interested in physical and technical creativity. Introducing students to physical and technical creativity, taking into account their inclinations and interests, helps them to determine their professional self-determination and to form the initial skills necessary for their future professional activities.

DISCUSSION

We understand the operation of the proposed methodology as a condition of the educational process that ensures the development of students' independence, initiative, cognitive interest and abilities in engaging in physical and technical creativity, which includes the following conditions:

- the presence of a specially created material and technical base in the physics office;
- appropriateness of each physical-technical task in all types of educational activities, their interrelationship and continuity;
- consideration of theoretical and practical issues of the physics course in close connection with the modern world of surrounding physical and technical devices;
- planning the educational process in accordance with the methodology developed for the development of physical and technical creativity of students;
- conducting systematic and consistent work on the development of physical and technical creativity of students;
- regularly increasing the complexity of physical and technical tasks and their creative content.
- methods of solving physical and technical problems and features of their application in the educational process.

In order to develop the physical and technical creativity of students in the teaching of physics, in our opinion and as shown by the pedagogical experiment, we note a number of methods.

Trial and error method. The essence of the method is to go through the most possible options for solving the problem until the desired result is achieved.

The solutions must be prepared by the teacher in advance and correspond to the topic of the problem being solved. When using this method, attention should be paid to the development of the ability to evaluate actions, which consist of evaluating and choosing one of many alternative solutions; development of flexibility of thinking, i.e. the

ability to quickly abandon a compromised idea or way of solving a problem. The disadvantage of this method is its significant time duration.

Brainstorming method. There are three types of this method in pedagogical and methodological literature: - collective oral brainstorming, written collective brainstorming and individual brainstorming. All three options can be used in the educational process. The goal of this method is to get as many ideas, suggestions, and ways to solve the problem presented to the students as possible in a short period of time. In our opinion, it is clear that this method and its possibilities in the educational process are not sufficiently evaluated. We see the reasons for this in the fact that teachers and students are not ready to do this type of work. The use of this method in solving educational and practical problems allows students to develop the ability to generate the necessary ideas. The more ideas students come up with, the more likely they are to come up with an idea that is acceptable for solving the problem [3].

Method of control questions. Its essence is that when solving a problem, students answer specially selected and logically related questions. Answering all the questions, they come to solve the problem. Thus, students learn to plan their creative activities step by step.

The method of analogy is to establish a similarity between previously solved and new problems, between the methods of solving them. Excessive enthusiasm for establishing similarities between events or objects can also play a negative role, because when reducing a new problem to an old one, students begin to use stereotypical methods to solve it.

The theoretical method of solving various physical and technical problems can be used at various stages of the implementation of the methodology we have developed, but it is mainly used for studying new material and solving problems.

Experimental method. The results obtained when using this method to solve the problems of developing physical and technical creativity of students in teaching physics allow us to conclude that this method is one of the most effective methods for developing students' creative abilities. We developed a detailed summary plan for the experimental method:

Experimental design. We believe that an experiment plan should cover all the activities, tools and equipment needed to conduct the experiment, including instruments. At this stage, students' activities include developing an experimental device, choosing the necessary equipment and devices, understanding their principles of operation, operating rules, assembling and adjusting the experimental device, identifying errors and possible errors caused by devices and devices, and consists of reduction. devices.

Conducting experimental work. At this stage of the application of the experimental method, we used various tasks to determine ways to further improve the experimental technique, its strategy and tactics, as well as to improve the tools, devices and equipment used.

Generalization of results based on experimental data. Our study showed that this part of the experimental method should include the tasks of assessing the completeness and accuracy of the obtained results, their practical significance and the possibility of use in further work related to physical and technical creativity [4].

CONCLUSION

The conducted pedagogical experiment showed that it is very difficult and sometimes impractical to fully implement all the points of such a plan in the classroom. This is primarily due to the didactic possibilities and features of the studied material, as well as the lack of time in the lesson. We organized and carried out work based on this plan in close cooperation between the teacher and the student. This made it possible to form a general idea about the possibilities of this method and to teach students how to use it in solving physical and technical problems.

All the listed methods were tested in the implementation of the methodology we developed for the development of physical and technical creativity of students. It should be noted that theoretical and experimental methods can be used not only in series, but also in parallel. It is effective to combine observational and experimental methods, on the one hand, and theoretical methods, on the other hand, to search for, solve and analyze more complex educational and cognitive physical-technical problems and tasks that are difficult to study directly. Achieving the desired result occurs in two different directions, which confirm or deny the results obtained under certain conditions.

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