



SOME EFFECTIVE WAYS TO DEVELOP CREATIVE THINKING SKILLS IN TEACHING PHYSICS

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Abstract

The article discusses the importance of teaching physics, as well as the benefits of developing creative thinking skills in children along with science, and several effective methods. Creativity is the ability to see a problem, to solve it in an unusual way, and this quality is the basis of new scientific discoveries, inventions and knowledge.

Keywords: creative thinking, physics, information and communication technologies, teaching methods, sensory channels.

Every phenomenon that occurs in nature is based on the laws of physics, because physics is a science that studies the simplest and most general rules of natural phenomena. Physics as a science of natural phenomena is the basis of modern natural science. It occupies an extraordinary place in the system of general knowledge accumulated by mankind. Physics shows that any field of knowledge can logically and rigorously deduce many results and accurately predict the end result of a process, based on a very small number of experimentally proven principles and a strong mathematical system through initial data [1].

The study of physics today plays an important role in the formation of an engineer in any technical field, because knowledge of the laws of physics helps to develop a scientific worldview and lays the foundation for the study of special sciences. In the modern world, all the technical means, gadgets and every technique that has become an integral part of our lives are based on the science of physics, and their discovery has made our lives much easier. Global Positioning Satellite or GPS Receives radio signals from many satellites orbiting the Earth and accurately calculates location to within a few centimeters. Without Einstein's relativity, GPS would probably be less accurate and functional. The reason radios work and cell phones connect to the Internet via Wi-Fi is due to the study of wave physics. Technology audiovisual data cannot be realized without an understanding of physics.



Given such indisputable evidence, the study and teaching of physics is beneficial not only to the country but also to the world community. Given that the study of physics is more complex for high school students, it is advisable to use a variety of interesting and effective methods of teaching.

Physics is considered to be the most problematic field in the field of science and has traditionally attracted fewer students than other disciplines such as chemistry and biology. Most students accepted physics as a difficult subject during high school.

Problems that have arisen over the years as a result of improper teaching of physics have forced the development of new teaching methods to achieve the goals and objectives of teaching physics. The teaching strategy used by teachers is also a key factor in achieving the set learning goals of students. Because teachers are the lifeblood of all educational institutions, it is important that teachers have a direct or indirect impact on the teaching process by changing different teaching strategies to meet the needs and interests of students. Learning strategies can be considered as an important factor in the search for knowledge. Methodological strategies for teaching science are methods that can be used to achieve a variety of meaningful goals; or determine how the content of a science curriculum should have long-term value. Since the main goal of teaching at any level of education is to bring about radical change in the learner, the use of Strategies in teaching can be traced back to constructive teaching and learning theory. The accepted theory is therefore based on constructivist theory and the theory of cognitive learning, as it involves a mental process in which knowledge is acquired through a change in human behavior. The constructivist theory derived from John Dewey, Jean Piaget, Vygotsky, and Bruner is that knowledge is not imparted, but is built on students' previous knowledge. Therefore, children can be helped to absorb new information quickly and easily by allowing them to experiment on a given topic based on their own experiences and knowledge gained from those experiences. In this process, students can work in groups or experiment individually. In both cases, the child uses all his senses and imagination. This, in turn, allows the student to anticipate the outcome of what they are doing and to do it through a variety of emotions [2].

Physics education refers to the methods currently used to teach physics. Physical education research refers to the field of pedagogical research aimed at improving these methods. Historically, physics has been taught at the high school and college level, mainly by the lecture method and by laboratory classes aimed at testing the



concepts taught in the lectures. These concepts are best understood when lectures are accompanied by demonstrations, practical experiences, and questions that require students to think about what will happen in the experiment and why. For example, students who actively participate in practical learning learn through self-discovery. Through trial and error, they learn to change their perceptions of phenomena in physics and to discover the concepts underlying them.

The results in the study of traditional teaching and traditional teaching methods show that it is necessary to introduce new teaching methods and technologies in physics teaching in order to increase the level of attitude and success in physics teaching.

Several teaching methods can be used in teaching physics.

Problem solving is the most commonly used approach in practice because of the mathematical aspects of the concepts. This approach involves knowing what to do in case you don't know what to do.

How can traditional education aimed at accumulating knowledge, skills and competencies be transformed into a process of developing a child's personality in a few years? First of all, it is necessary to move away from the monotony of the learning process with the help of new pedagogical technologies, to make it dynamic, diverse and interesting.

The teaching of physics, based on the specific nature of the science, creates a favorable environment for the implementation of a competent approach that offers a wide range of technologies and teaching methods.

The choice of technology can be made depending on the material being studied, the level of preparation of the students, the age category of interest and inclination. We propose to use the following technologies to adequately meet the requirements of the State Education Standards:

- Technology for the development of creative thinking;
- Information and communication technologies;
- Problem-based learning technology;

Technology for the Development of Creative Thinking - Modern education focuses on the development of the individual. Today's society needs a graduate who can think independently, see emerging problems, and solve creatively [3]. The way out of this situation can be organized on the basis of methods to develop students' creative thinking skills in the learning process.



The development of creative thinking in students in the process of studying physics is one of the urgent tasks facing modern school physics teachers. One of the most effective ways to teach is to develop creative thinking skills. Conducting such classes in conjunction with physics not only teaches creative thinking, but also teaches students not only how to easily learn physics, which is very difficult to master, but also how to feel it. There are not enough problems in school physics textbooks that can show students the role of observation, similarity, induction, experiment. A creative task is the best way to stimulate attention and interest in learning in a short period of time, bringing the opportunity for discovery closer [4]. Creative assignments can be given for both class and homework, and it is advisable to give the student the right to choose any form for the assignment, as the best time to create is at different times for everyone. There are several ways to help develop creative thinking:

Accustomed task - In this case, using emotional, figurative and mental imagery, the student tries to "move" to the object of study in order to feel and understand from the inside.

Task "Symbolic view" - In this case, the object or event under study should be represented in the form of symbols.

The task of "semantic appearance" - focusing on the object of study allows you to understand (see) its cause, the idea in it, the inner essence. "What is the cause and origin of this object?" "How does it work, what's in it?" "Why is he like that and not different?"

There are also some suggestions for developing creative thinking skills in students. The task of developing creative thinking should not be tailored to a more gifted student. This situation can lead to stratification in the classroom. That is why tasks are given to the whole class.

Since creative tasks require students to develop a high level of communication skills, the tasks should be such that they are appropriate for the age difference of the students' thinking, their behavior and scope of thinking, which is mostly more effective for grades 10-11 is calculated.

The inclusion of such tasks in the curriculum creates an opportunity to involve schoolchildren in creative activities, which is a necessary condition for the formation of various creative qualities of thinking. The highest level of creative



ability development is achieved when creative tasks are routinely incorporated into the learning process. As a result of creative tasks, students make discoveries for themselves, find an explanation for an event that is new to them, think about defining its essence, discover new ways to measure physical quantities, make new connections between events, they look for solutions to problems, changes in device design, new devices, and ways to create devices. Undoubtedly, all this will increase the student's interest in knowledge and motivation to study physics. Therefore, it is necessary to create an integral system of educational and creative tasks in physics at each stage of cognition [5].

Information and communication technologies - The development of information and communication technologies, their application in education opens up new prospects for improving the efficiency of the educational process. Today, the issue of effective use of information and communication technologies (ICT) in the educational process in educational institutions, especially in the teaching of physics, is urgent. Modern computer programs and telecommunication technologies provide students with access to information sources such as e-textbooks, learning sites, etc., which are designed to increase the effectiveness of developing knowledge independence and create new opportunities for creative growth of students. The use of Internet resources, e-textbooks, curricula in combination with traditional methods will help to achieve the goal - self-development, self-development and learning, able to apply theoretical knowledge in practice, able to learn independently improvement [6]. The use of information and communication technologies (ICT) in teaching has created new opportunities for students to organize independent work. From memorizing information, attention is focused on searching, processing, analyzing, and presenting it.

The use of ICT in education is an up-to-date and functional way of teaching students to help them gain the opportunities they need for the world of work. Very few jobs today require the use of technology, collaboration, teamwork, and information skills; all of this can be achieved through ICT training. It will radically change the way we live, study and work. Technology has entered the classroom at a tremendous rate to be part of the reading and learning process. However, physics is known for its abstract nature as a science-oriented direction or science (it does not have a material existence). Sometimes a physics teacher doesn't know enough. The use of ICT in teaching is an up-to-date and functional way of educating students to help them master the opportunities they need for the world of work.



Problem-based learning technology - A good understanding of the concept of physics can be a reference for students to solve various problems that exist in the subject of physics. A problem that students often face makes it difficult to interpret explicit and abstract concepts of physics. Students may not be able to find the right solution to the problem. Also, the physics issues presented today include high-level thinking skills. Students then have difficulty identifying, understanding, identifying, and analyzing the physical challenges they face. The ability to identify and analyze a concept is necessary to solve a physics problem [7]. They accidentally move directly to the problem analysis phase. This leads to the misuse of the concept of physics because the root of the problems has not been identified before. Teachers, on the other hand, often prioritize the delivery of materials directly without allowing students to participate in the analysis of existing problem-solving methods or processes. One of the right solutions to overcome this situation is to improve students' problem-solving skills by modifying teaching methods with learning activities that support the development of these skills [8]. In conclusion, it is impossible to imagine our lives without physics, especially in the current era of globalization [9]. Every technique, law of nature, and other things we use throughout our life activities would not exist without the science of physics. Therefore, every country needs to pay more attention to the teaching of physics if it wants to introduce new technologies [10]. Teaching this science using a variety of interesting methods and at the same time developing children's creative thinking skills is one of the key factors in the development of any country. After all, the key to success is to have a good knowledge of physics and creative thinking.

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