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Use Of Interactive Methods In Teaching Light Interference

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Annotation: This article discusses the use of interactive methods in the study of light interference, developmental factors, types, current issues. In particular, we encounter the phenomenon of interference in life. For example, we see thin layers of oil or grease on the surface of water glow when light falls on them. This phenomenon is called the color of thin plates in optics. Such colored flashes are also observed on soap bubbles on very thin oil curtains, on old glass or metal surfaces. If we illuminate a thin transparent film, we see the same phenomenon.

Keywords: light, interference, monochromatic light, coherent waves, pedagogical technology, roundtable technology, problem-based learning, signals or information, apperception, method, problem-solving.

Introduction

Light interference is the redistribution of light energy in space as a result of the combination of two or more light waves, a special case of wave interference. On the surface, light or dark paths or spots (for monochromatic light) or colored areas (for white light) appear side by side.

Although studied by Newton in the seventeenth century, his corpuscular theory did not explain this theory. In the early 19th century , it was theoretically interpreted by T. Jung and O. Frene as a wave phenomenon. It is the most common - stationary interference, which occurs under the conditions of a constant phase difference, that is, as a result of the addition of coherent light beams, consisting of a regular exchange of intensities in space, increasing and decreasing. Types of light interference are mainly related to the methods of forming coherent beams of light. Two methods of generating coherent beams of light are widely used : the wave front division method and the amplitude division method. In wave front amplitude structures, the radiation from the primary source is divided by the semi-transparent boundaries of the optical media. For example, soap bubbles, this type of light interference in the oil curtains in the water. occurs. In these cases, the interference of light returning from both surfaces is different . The amplitude division method is widely used in interferometers, in which wave fields are divided by special semi-transparent mirrors. In addition to the above two-beam interference, there are also multi-beam Light interferences.

We know from experience in everyday life that many scattered light waves propagate in space without interfering with each other, so when we see objects, we see them without distorting themselves. The reason for the propagation of light waves is that the effect of light electromagnetic waves on the environment occurs regardless of the presence of other electric and magnetic fields in that environment. From this we conclude that the electric and magnetic fields of various electromagnetic waves do not change their intensity, direction of motion, and other characteristics when they propagate in space. This is exactly what happens in reality. This is called the superposition principle. When the principle of superposition is fulfilled, the voltages Y and N of electromagnetic waves propagating in space at the same time are added algebraically to each other, but this principle is not fulfilled if the phase difference of the oscillations of two light waves does not change with time. These waves are called coherent waves. When coherent waves are added, there is an increase in light in one part

of the space, ie a maximum, and a decrease in light in other parts, ie a minimum. This phenomenon is called light wave interference. Light interference occurs only when coherent light waves are added.

Coherent waves are scattered by coherent sources. But not all light sources in nature are mutually coherent. Therefore, for the first time , they used an artificial method to observe light interference, that is, they split the light coming from one source into two using a mirror, lens, or other method, and then encountered it. This method has been used by scientists such as Fresnel, Jung, Lloyf, Bete, R. Paul. As an example, we see the Yung scheme. T.Yung placed a two-slit barrier in the path of the light radiating from one crack. As a result, after the barrier, the light propagates as two independent beams. Because these two lights come from the same source, they are mutually coherent, and the maximums and minimums of interference are observed on the screen. If the difference in the optical paths of two coherent light waves meeting on the screen is equal to the length of an even number of waves, a maximum interference is observed. The written condition (2.1) is called the interference maximum condition. Interference minima are observed if the difference in the optical paths of the two coherent light waves meeting on the screen is equal to the odd number of wavelengths . The written expression (2.2) is called the interference minimum condition.

We encounter the phenomenon of interference in life. For example, we see thin layers of oil or grease on the surface of water glow when light falls on them. This phenomenon is called the color of thin plates in optics. Such colored flashes are also observed on soap bubbles on very thin oil curtains, on old glass or metal surfaces. If we illuminate a thin transparent film, we see the same phenomenon. This is because when the light returns from the two surfaces of the thin plate, the light wave forms two coherent handles. These bundles meet and provide interference. The resulting interference patterns are called localized landscapes. Because they are only observed in an area close to the surface of the curtain. The interference phenomenon is widely used in precision measurements, physical experiments, industry, engineering, and many other fields. Based on the phenomenon of interference, special optical devices - interferometers - have been developed.

Materials and methods.

Today in many developed countries of the world there is a great deal of experience in the use of new pedagogical technologies that increase the scientific activity and creativity of students, as well as guarantee the effectiveness of the educational process . The methods that form the basis of this experiment are called interactive methods, and the ability to apply these methods to the teaching process is a high task for today's physics teacher. The successful design of pedagogical technology and the guarantee of the final result (effectiveness) depends on the teacher's level of understanding of the essence of didactic issues and the ability to correctly assess them in the classroom. [28] Defining a clear educational goal in each lesson is one of the important conditions in the design of teaching technology. This determines the diagnostic purpose of teaching science topics. Since its inception as the science of physics, the database of science has been growing exponentially, and it is getting richer every year at a high rate. For this reason, in the process of transition to physics, it is necessary to select only the necessary information and quantify the amount of data in accordance with the abilities of the student.

Roundtable technology is a method of teaching around a round table with students expressing their opinions on a problem or question.

Results.

is a proof that light reflects the wave nature . The word interference in Latin means to interfere. This very interesting and beautiful landscape is observed as a result of the addition of two or more waves when certain conditions are met. The two light waves combine to amplify or attenuate each other. As a result , the light and dark rings lying at one point in the center of the screen are placed alternately. These are called interference maximum and minimum. We have observed the phenomenon of interference a lot in our daily lives. For example, the splashing of oil products spilled on the surface of the water in different colors, the sparkling of butterfly wings, “A soap bubble blown into the air sparkles with all the colors that are characteristic of the surrounding objects. Soap bubbles can be called the most wonderful, the most delicate miracle of nature, ”described Mark Twain. It is this same light interference

that makes a soap bubble so enjoyable. The British scientist Thomas Jung came up with the genius idea that the reason why thin curtains glow in different colors can be explained by the combination of waves 1 and 2 (Fig. 2.1) returning from the outer surface of the curtain and the other from the inner surface.

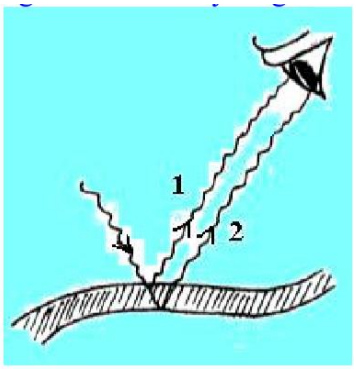

Figure 1.1. Occurrence of light wave interference .

This involves the interference of light waves - two waves are added, resulting in a landscape that does not change over time as the resulting (cumulative) light oscillations intensify or weaken at different points in space. is added.

Newton was the first to observe an interference phenomenon in a laboratory setting . The essence of this experiment is as follows: Concentric rings are formed as a result of the return of light from the glass plate that interacts with the lens. These rings are called Newtonian rings in science (Figure 2.3). The first light passes through the lens and returns to the glass plate (from the inner and outer boundaries of the air layer) and combines with the second light returning from the boundary of the lens to form an interference pattern.

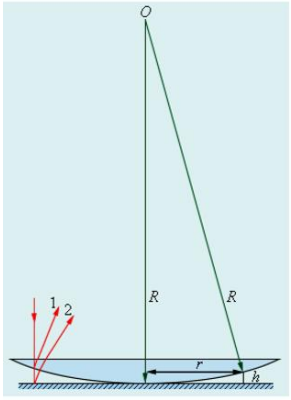

Figure 1.2. Observation of Newtonian rings

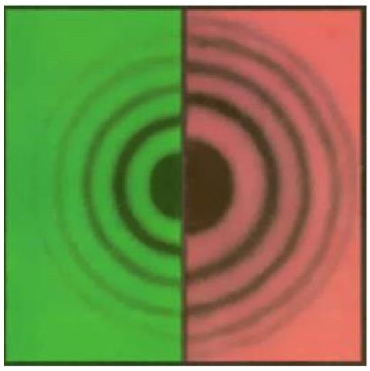

Figure 1.3. Formation of Newtonian rings in green and red light.

As for non-traditional methods of teaching, their types (numbers) have greatly increased. Among them, some of which are widely discussed and recommended for practice in the pedagogical community today ("Small groups", "Debate teaching", "Design", "Problem situation", "Brainstorming", "Role-playing games" methods). Among the non-traditional methods of teaching, the problem-based method of teaching (sometimes referred to as the problem-research method) plays a special role in developing students' ability to think independently, analyze and draw conclusions. Here we take a broader look at this method.

Problem-based learning involves placing cognitive tasks in front of students in a consistent and purposeful manner, with students actively assimilating new knowledge as they solve them under the guidance of a teacher. The problem of cognition is often raised by setting the most typical tasks for the relevant subject. Tasks in problem-based learning are primarily used to prepare students for a new topic and to activate the learning process. In a problem-solving approach, such tasks usually precede the reporting of theoretical rules. The task can become a cognitive problem only if it can meet the following requirements :

requires thinking about the problem being studied .

2. Stimulates interest in learning in students.

3. Relies on students 'previous experience and knowledge on the principle of apperception.

The first requirement is central, among others. Its essence is that the teacher deliberately creates a situation of difficulty in learning in the classroom, in which students are exposed to the need to independently use one or more

operations to learn a new topic: analysis, synthesis, comparison, analogy, generalization. The problem situation, relying on the involuntary attention of the students, gradually awakens in them a voluntary attention to the object of study, a desire to master the subject in spite of the existing difficulties. Creating a problem situation is the initial opportunity (phase, phase) in a problem-based learning system. Students should then independently go through the following steps of solving cognitive problems with the teacher's referral effect.

Demonstrate hypotheses, possible options for solving the problem .

2. Theoretical or practical examination of hypotheses.

3. Choose the most realistic hypothesis.

4. Expressing the conclusion of knowledge.

Ways and means of creating problem situations . Problematic questions play a key role in setting cognitive tasks. They are placed in relation to any other way of creating problem situations. The question of cognition should be of some difficulty to the learners, showing that their existing knowledge is limited and, at the same time, that they can do it, i.e. that cognition depends on life experience and a stock of theoretical knowledge .

Apperception allows students to develop an active attitude to a new topic, because previously formed temporal connections (signals or infomats) have a positive effect on the emergence of new connections (signals or information) in the cerebral cortex . rsatadi. For example, before studying the concept of "power", "Is it enough to know the amount of work they do to compare the ability of a excavator with an excavator?" the question is asked. Students will notice that the available information is not enough to answer the question, and they will have to guess (realize) that they also need to know the time it takes for a task to complete itself. Even such a small independent step leads students to recognize the introduction of a new, physical concept of "power" as a necessity with a greater understanding. The cognitive task can be set in the form of problem-based demonstration experiments in the classroom. For example, teachers start with the problem of Archimedes' power: they hang a metal cube on a dynamometer, record the reading of the dynamometer, then lower the cube into the water and again calculate the reading of the instrument. The students are then asked the problematic question: "Why is the dynamometer spring now slightly longer? Try to explain the cause of this phenomenon by calculating the pressure on the edge of the cube (sides, sides) . Students should use their knowledge of the effect of pressure in a liquid on an immersed body and that the force of pressure on the lower edge (side, fat) of a body is greater than the force of pressure on its upper edge (side) . it must also be concluded that the body is pushed out of the fluid. Thus, not only is the propulsive power of the fluid mentioned, but it is also determined to a certain extent by the students.

Once the problem is posed , we encourage students to use the thinking process again, but now to make hypotheses, discuss their realities, draw conclusions, that is, to go deeper, systematically, and consistently to solve problem situations. encourage you to use The processes of advancing and solving cognitive problems are like a continuous chain, joining together as one, because as we advance a problem, we begin to solve it at the same time, which in turn leads to a new problem. will bring. In general, there is a contradictory and continuous process of active, problem-based knowledge of new scientific concepts.

of problem-solving, verbal , visual, and practical methods . Problem-based teaching methods are used in practice using oral , visual and practical methods of teaching. Therefore, there is talk of problem-based methods of teaching material , problem-based and heuristic conversations, the use of problem-based visual methods, problem-based research or even research.

Narrating learning materials in **a problem -solving** and **problem-based lecture** method involves the teacher thinking in the narrative process, proving facts, analyzing, and engaging the listener's thinking more actively and creatively. The teacher does not simply "explain" the material, but he thinks about the problem aloud, looking for ways to solve the problem, ways to solve it. In the process of reasoning, some ideas are rejected (excluded) when they are considered unfounded , while others are developed, thus ultimately leading to the right and clear solution.

Heuristic and problem-based conversation is one of the methods of problem-based learning. The teacher puts a series of coherent and interrelated questions in front of the students, while the students answer them , make some assumptions and then try to prove their correctness independently. they have to do so that they try to move forward independently in acquiring new knowledge .

teaching **, visual aids are** no longer used to activate memory, but to set tasks that create problem situations in the classroom. In addition, more and more visual aids have been developed in recent years, in the form of a series of pictures and diagrams depicting specific situations that require students to think independently in order to tell a generalization, highlight the prevailing causes. .

Problem-solving exercises are used when students are able to independently perform certain types of actions that lead them to acquire new knowledge independently according to the teacher's assignment. Such exercises are widely used, for example, in physics textbooks, in which students do not apply new elements of knowledge in the process of solving practical problems, but master them, then these elements are understood and applied when performing training exercises. Problem-solving exercises can be used not only in the approach to mastering a new topic, but also in strengthening it on a new basis, that is, when performing exercises that deepen knowledge.

Research laboratory work is a valuable type of problem-based practical work. Such laboratory work is carried out before the study of the theory and exposes students to the need to make some educational "discoveries".

It is important to note that problem-based learning is intended not only for learners, but for all. The essence of the work is that the problem-solving approach should lead all students to be interested in the future problem, to be involuntarily surprised, to think about it, to choose the most realistic hypothesis . Problem-based learning ultimately allows students to manage their thinking, get information quickly in students, and give them immediate feedback.

cannot hope for the objective positive effect of problem-based learning on its own. A separate approach will be needed for loose assimilators . When setting cognitive tasks, teachers provide an option for their difficulty, which in turn encourages idle learners to answer easier questions, encourages their answers, and thus creates an incentive to engage in reflection on more complex problems. Assignments for blank learners should be instructive about the work they can perform, the variable (additional referral questions are given along with the problematic questions) . It is especially helpful for vacant students to prepare and hand in problem-solving experiments, which activate student thinking. The problem-based approach to teaching is usually combined with the information-reproductive method in the same lesson, because the content of the topic is always able to inform students or , conversely, is difficult for them to perform. there may be questions that need to be explained. Therefore, it will be necessary to optimally combine different methods and techniques of research and teaching of a reproductive nature.

Disadvantages of "problem-based learning " include **:**

- requires high motivation from students;

- The problem should be appropriate to the level of knowledge of students;

- takes a lot of time.

Conclusion

The following results and conclusions can be drawn from the research on the use of new pedagogical technologies in physics education:

As physics progresses to the upper grades, the phenomena and laws become more complex, and the volume of course material increases. These and other similar parameters can negatively affect lesson quality, student mastery. To this end, the use of new pedagogical technologies in physics education has been found to be effective.

The purpose of the use of new pedagogical technologies in physics education is to bring the student to the center of the lesson process, to develop independent and creative activity, to become an active participant in the lesson, keeping students away from mere memorization and voluntary repetition of learning materials.

The introduction of new pedagogical technologies in physics education as a full-fledged technological process, the technologicalization of the educational process is a complex process that requires a strong material and technical base of the educational institution, a lot of time and effort. In order to

use new pedagogical technologies in physics education, the teacher has high pedagogical skills, and it became clear that the subject of the lesson, the number of students, their interests, abilities should be taken into account in all respects.

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