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Methodology for Applying the Method of Innovative Pedagogical Technology "three by Four" in Teaching the Topic "Compton Effect" of the Course of Atomic Physics

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ANNOTATION

This article is devoted to the method of applying the method of innovative pedagogical technology "Three by four" in teaching the topic "Compton Effect" of the course of atomic physics in higher educational institutions.

Introduction

It is known that when a light quantum falls on a substance, it interacts with electrons in the atoms of this substance. As a result, a quantum can be absorbed by electrons, and a quantum can be scattered by these electrons. The course of any of these processes depends on the energy of the quantum incident on the substance. This energy is basically compared to the rest energy of the electron. If the energy of a quantum is less than the rest energy of an electron, then this quantum is absorbed by this electron. As a result, the photoelectric effect occurs. If this quantum energy is equal to or greater than the rest energy of the electron, but less than its double value, then the process of quantum scattering occurs in this electron. This process is called the Compton effect. In 1923, Compton studied this scattering experimentally.

The Compton effect is used in modern betatrons. A very interesting phenomenon can take place as a result of the scattering of soft quanta (for example, light) by ultrarelativistic electrons produced in modern betatrons. In this case, the value of the energy of the scattered quantum is comparable with the value of the energy of the moving electron. This allows light radiation to be converted into very short wavelength gamma radiation. The resulting gamma radiation is

monochromatic and highly polarized. The inverse Compton effect is used in the study of photonuclear reactions involving medium and high energy gamma rays.

You can also get information about the phenomena occurring in the universe around us, using the inverse Compton effect. It can be used to explain the origin of isotropic X-rays and the gamma background. These radiations are caused by Compton scattering of high-energy cosmic electrons of electromagnetic radiation with a spectrum similar to the spectrum of a black body with a temperature of 2.7 K. Based on this, we can conclude that the study of the Compton effect is relevant. Therefore, this article is devoted to the method of applying the method of innovative pedagogical technology "Three by four" in the study of the Compton effect in higher educational institutions.

Methods

To improve the methods of teaching the topic "Compton Effect" of the course of atomic physics, many methods of innovative pedagogical technology can be applied. One such method is the "Three by Four" technology. First, we describe the essence of this technology.

Regarding the description of the "Three by Four" technology, the following points can be noted: this technology allows students to think about and solve a specific problem (or topic) individually (or in a small group), find a solution, choose one from a variety of ideas, sum up. selected ideas and solving a problem based on them (or to form a clear idea about the subject), and also teaches you to approve your own thoughts. This technique is carried out in writing with students, first individually, and then in small groups.

The purpose of the technology is as follows: to make students think freely, independently and logically; work in a team, search; collect thoughts and form them into theoretical and practical understanding; communicate your opinion to the team, approve it; to teach how to use the knowledge gained on the topics covered in solving the task and giving a general idea of the subject.

Application of technology: individually (or in small groups) during seminars, practical and laboratory classes, group members are changed several times to complete the tasks.

Tools used in training: sheets of paper of A-3, A-4 format (depending on the number of groups), writing utensils.

The procedure for this technology is as follows:

1. depending on the total number of students, the professor-teacher divides them into small groups of 3-5 people (the number of small groups is 4 or 5 according to purpose);
2. the professor-teacher introduces students to the purpose and methodology of the technology implementation and distributes to each small group sheets with an inscription at the top of the sheet (for example, “Quantum is ...”, “Light pressure is this ...”);
3. the professor-teacher tells the small groups that they can continue the main idea written in the handout with just three ideas, that is, three words or combinations of words or three sentences, and assigns a specific time for this;
4. group, participants together write the opinion given in the handout;
5. after completing the task, the group members get up and turn round the clock, they change places depending on the direction, that is, group 1, group 2, group 2, group 3, group 3, group 4. Group 4 is similar to group 1 (in other small groups this order is preserved);
6. group members who arrived at a new place get acquainted with the ideas in the handout laid out here and write down three new ideas on it;

7. the group members change places again as above, with the small groups changing places and adding their ideas to the handouts until they return to their seats;
8. returning to their places, small groups carefully read all the ideas collected in the handout, summarizing them, bringing them to the state of one single definition or rule;
9. one of the members of each small group to report their common acceptance of the definition or rule;
10. The professor-teacher comments on these definitions or rules given by small groups, evaluates them and then completes the lesson.

Note: after the presentation of the groups, based on the definition or rules given by them, each member of the small groups can make a presentation individually, giving their author's definition and rule.

It is advisable that the number of small groups is 4. In this case, small groups will change places only 3 times, and this will not allow the learning process to become boring. If the number of small groups is more than 4, then they can be divided into two streams, and the exchange of members of the small group can be carried out separately between each stream, and the presentation can be carried out jointly. If the audience (or class) is not adapted (or inconvenient) to changing the places of small groups, then instead of changing the places of students, the handouts distributed to the groups are changed, they are changed until they return to their original places in the original groups, and they are collected students' opinions. From them a general definition (or rule) is deduced and stated.

Results and Discussion

A professor-teacher using this technology on the topic "Compton Effect" can organize the learning process using texts with the main concept or idea written at the top of the handout, which should be continued in groups or filled with ideas, and achieve the desired result. . On the topic “Compton effect”, below are examples of texts in which this basic concept or idea is written: “The Compton effect is ....”, “The purpose of the Compton experiment is .....”, “The inverse Compton effect is it is.....”, “The Compton formula describes.....”, “The meaning of the Klein-Nishina-Tamm formula is.....”. Text, with the main concept or idea, on the topic "The Compton Effect" can continue with the application of new definitions and physical meanings.

In conclusion, we can say that the use of innovative methods and technologies of pedagogical technology in improving the methods of teaching the topic "Compton Effect", but also other topics of the course of atomic physics, will not only lead to the formation of knowledge, skills and abilities. and competencies of students on these topics, and can also lead to an expansion of their range of thinking on these topics, can lead to the further development of creative thinking.

Conclusion

It should be especially noted that the undoubted advantage of these methods is not only the acquisition of knowledge and the formation of practical skills, but also the development of the system of values of students, life attitudes.

Acknowledgement

The advantage of such a lesson on this topic is that a student in the lessons of atomic physics can apply the knowledge gained not only when solving abstract problems from a textbook, but also solve a real problem from life, which, in general, he will do after graduating from higher education. institutions. The analysis of this lesson contributes to the active assimilation of knowledge and the accumulation of a certain baggage of practical information, which may be more useful in life than theoretical knowledge. Also, in the process of parsing this lesson, the

analytical, creative and communication skills necessary in the modern world are developed.

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