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Research Article

CREATIVE LESSON ON THE GENERAL COURSE OF PHYSICS ON THE TOPIC "RUTHERFORD'S EXPERIMENTS AND RUTHERFORD'S FORMULA"

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ABSTRACT

This article provides the content of the creative lesson of the atomic physics section of the general physics course on the topic "Rutherford's experiments and Rutherford's formula" for students of higher educational institutions.

KEYWORDS

Creativity, creative lesson, J. Gilford, E.P. Torrance, Rutherford, Rutherford's experiment, alpha particles, Rutherford's formula.

INTRODUCTION

In order to improve the methodology for teaching the topic "Rutherford's experiments and Rutherford's formula" of the general course of physics in higher educational institutions of the Republic of Uzbekistan, the first task is to organize a creative lesson on this topic. Thanks to such a lesson, students of higher educational institutions can develop their creative thinking and abilities on this topic. What is meant by creative thinking and student abilities? The development of creative thinking and abilities is the guiding principle of learner-centered learning. In this case, the student is an active subject of his self-expression within the framework of professional interests and needs through independent learning activities in the context of specific personal-creative technologies of developing education.

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The term "creativity" first appeared in the late 50s in Western psychology and meant the ability of a person to create new concepts and develop new skills. The concept of creativity, universal creativity as a cognitive ability became popular after the publication of the work of J. Gilford. Therefore, creativity, that is, creative thinking and abilities, is rather a collection of different thinking and abilities that a person can acquire at different levels. In a broad sense, creativity is a non-trivial and skillful solution to a problem. Creative abilities of students is a psychological and pedagogical phenomenon. The concept of creativity as a universal cognitive creativity gained popularity after the publication of the works of J. Gilford.

E.P. Torrance continued Guildford's research and developed his own program for the development of students' creative abilities. It included several stages. At the first stage, he developed convergent thinking according to Gilford, and at the second stage, divergent thinking.

E.P. Torrance understands creativity as a person's ability to perceive shortcomings, gaps in knowledge, disharmony, etc. In his opinion, the creative act is divided into the perception of the problem, the search for a solution, the emergence and formulation of hypotheses, their verification, modification and finding the result.

Based on this, he gives the following description of the main criteria of creativity: ease - the speed of performing test tasks, i.e. test norms are similar to the norms of the speed intelligence test; flexibility - the number of switches from one class of objects to another in the course of responses; originality - the minimum frequency of a given answer to a homogeneous group. Accuracy in Torrance tests is evaluated by analogy with intelligence tests.

The content of a creative lesson on the topic "Rutherford's experiments and Rutherford's formula" may be as follows.

Lesson type: repetition and generalization of the topic " Rutherford's experiments and Rutherford's formula".

Tasks: 1) explain the essence of Rutherford's experiments and his formulas related to classical atomic physics; 2) control of students' knowledge on this topic; 3) the formation of the ability to apply the acquired knowledge in a non-standard environment; 4) develop the ability of logical thinking to compare, find common features and differences, systematize, draw conclusions; 5) development of communication skills.

Tasks (Table 1):

Table 1

Educational:	- to expand the theoretical knowledge of students in classical atomic physics; - creating the necessary conditions for students to fully assimilate the experiments and the Rutherford formula; - demonstrate the practical application of knowledge about experiments and the Rutherford formula.

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Developing:	students learn to answer oral questions correctly, develop thinking (perform analysis, comparison, generalization, concretization), learn to draw conclusions based on logical thinking, develop flexibility of thinking through the introduction of game elements, develop emotions and motivation when performing practical tasks.
Educative:	- formation of students' scientific outlook; - the formation of life qualities, such as perseverance, accuracy and responsibility.

Decoration: interesting information and quotes: 1) the most serious area of physics is the atomic nucleus; 2) everything that surrounds a person consists of atoms; 3) the physicist strives to make the complex simple, and the poet strives to make the simple complex (L. Landau).

Equipment: screen, projector and computer.

During the classes

This lesson can be carried out according to the method of RTV and F (development of creative thinking and imagination). The main thing is that students repeat the educational material on the topic. It develops their creative thinking and imagination. They develop knowledge, skills and competencies on the topic. The lesson is built in the form of blocks as elements of the creative structure of the lesson.

Block 1. This block is an original object system that will amaze students. They create conditions for increasing motivation and increasing the curiosity of students. For the topic "Experiments and Rutherford's formula" this block may look like this.

1) Lenard bombarded the atoms of matter with a stream of electrons. Why does he need such an experiment? Complete the sentences below with the answer to this question.

A) Nagaoki did research to study.....

B) Thompson conducted research to determine……..

C) Rutherford conducted experiments to study .....

D) Kelvin did research to determine……..

2) An atom consists of a hollow sphere, inside which are small magnets called dynomeds. What does this idea mean? Complete the sentences below with the answer to this question.

A) the theory of particle scattering is a theory that proves…… ……

B) Bombardment of gold foil with particles makes it possible to study .....

C) The purpose of Rutherford's experiment is to determine .....

D) In classical atomic physics, there is an opinion about ...

In conclusion, we can say that as a result of creative search and invention, any person is able to make his life easier and more comfortable, which means that it is necessary to develop ingenuity and creative thinking.

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Block 2. This block contains the program material of the atomic physics course. Provides the development of creative thinking and creative abilities of students.

1. Students must solve a puzzle related to Rutherford's experiment and a formula aimed at developing students' creative thinking. To do this, each student is given cards where you need to find an additional word in a given line, that is, a word that is not related to the topic. An example of this is the following map:

• Pendant, Rutherford, Nagaoki, Thompson, Chadwick.

• alpha particle, scintillator, electron, diaphragm, gold foil.

• effective scattering cross section, distance to the target, scattering angle, particle departure angle from the source, scattering angle.

2. Task "Read the sequence of lines."

Students are offered the following qualitative task and given several answers: “What conclusion can be drawn from the Rutherford formula?”

• The relative amount of scattered particles depends on the mass of the scattered particle.

• the relative amount of scattered particles is directly proportional to the sine of their scattering angle.

• the probability of particle scattering by the foil is inversely proportional to the fourth power of the sine of the half-scattering angle.

• the probability of particle scattering by the foil is directly proportional to the fourth power of the sine of the scattering angle.

Block 3. With the help of this block, psychological relief is provided, which is necessary to harmonize the development of the cerebral hemispheres of students through the game. This block may look like this for the topic "Experiments and Rutherford's formula": Stories about famous physicists related to this topic. The professor-teacher shows a photograph of one of these scientists. Any student who knows him will briefly tell what he knows about this scientist.

Block 4. This is a block puzzle. The professor-teacher shows students one of the computer animations on the topic under study "Experiments and Rutherford's formula" and asks students to justify it. If every student immediately understood the meaning of this animation, then this animation would lead him to a dead end, requiring explanation and reflection, as well as animation and observation. Increases interest in the subject and the knowledge that needs to be obtained on it. The student who carefully watches the animation exercises his mental faculties, thinks and begins to apply his knowledge in an unconventional way. If the students cannot solve the problem, the teacher explains it.

Block 5. This block is a system of complex tasks in which the student first has to puzzle over the physical content of the given text on the topic under consideration. Only after that he will extract the necessary information on the given question from his knowledge base and make the final decision. This block might look like this for the topic "Experiments and Rutherford's formula". The famous Sherlock Holmes and the Watson give the following story on this subject.

Problem of Rutherford's student participating in Rutherford's experiment

• This task was given by Rutherford's student who participated in Rutherford's experiment. He was instructed to select the substance to be used in the experiment and to be bombarded with alpha particles. When Rutherford's student told Sherlock Holmes that he would choose an arbitrary piece of metal of a

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certain thickness for the experiment, he told Rutherford's student that the experiment could not be carried out with such a piece. Sherlock Holmes suggested using gold foil. Here

• It doesn't have to be gold foil, any metal foil will do, Watson was surprised.

• Try to experiment, gold foil is very convenient for the flow of alpha particles, - continued Sherlock Holmes, I came to the conclusion that the substance bombarded by alpha particles must be gold foil.

Why did he come to this conclusion? Dear students! Prove Sherlock Holmes was right.

Block 6. This block provides feedback during the lesson. Gives a qualitative and emotional assessment of the lesson itself by students. This block might look like this for the topic "Experiments and Rutherford's formula":

1. Dear students! Let me remind you that Rutherford's experiment could be carried out with a stream of protons.

2. Write an essay on the topic "Rutherford, father of nuclear physics."

3. Prepare a presentation "The structure of the atom and its model."

It is worth saying that at the end of each block, the professor motivates the students who actively participated in it. At the end of the lesson, the total score of each motivated student is announced.

Summing up this lesson, we can say with confidence that pedagogical optimism has a strong influence on the upbringing of a creative personality, and confidence in a student is manifested not only in his abilities, but also in his moral qualities. Pedagogical optimism is expressed in the problematic nature of teaching the formation of the educational process, in the constant complication of cognitive (a theoretical approach aimed at comprehending the way of thinking and understanding the psyche) tasks, in the development of students' creative abilities in rather difficult conditions. than simple education. If the student's reputation with other students and in his own evaluation increases, communication between professor and student will increase the effectiveness of the promotion described above.

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