

Efficiency of Learning with the Use of Information and Computer Technology Programs in Studying Nuclear Processes

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Abstract: In the article, the pedagogical analysis shows that it is possible to achieve effective learning outcomes using computer technology programs in the study of nuclear processes in the science of nuclear energy. It has also been proven that teaching the subject of nuclear energy in the context of demonstrating technological achievements contributes to the timely formation of the worldview of bachelors and masters.

Keywords: nuclear reaction, radiation, fission, neutrons, environmental sustainability, danger of radionuclides.

Introduction. Nowadays, as we know, thermal power, hydropower and alternative energy sources, which remain expensive, cannot compete with nuclear power in terms of long-term, power transmission stability and price. All developing countries successfully develop their economies due to the cheapness and availability of nuclear power plants. It can be seen from them that nuclear energy is of great importance in the development of society. In this sense, Yu.M. As Gorwitz said, "Learning should be planned with the importance of teaching not what is, but what is not."

In the process of modernization of our country, in the conditions of modern socio-economic development, the level of knowledge of the population, the level of development of educational and scientific infrastructures are of great importance. In this sense, in the allocation of each subject of science, a significant place is occupied by energy, which is considered one of the important factors in the development of society, "Analytical assessments of the upcoming growth in energy consumption", "Organic fuel". Energy and prospects for its development", Enriching the teaching of such subjects as "Renewable energy sources and their resources" with scientific and practical achievements achieved today is becoming a requirement of the time. The fact is that in order to raise economic development to a higher level, much attention is paid to the creation of alternative energy sources, and at the same time, great importance is attached to the use of nuclear energy, which is very necessary for industry, that is, the construction of nuclear power plants. In addition to the need for many specialists, this situation requires the society to correctly form its worldview in this area on a scientific basis.

Actuality of the research topic. It is known that nuclear energy plays a very important role in shaping students' scientific worldviews and modern ideas about the structure of matter. At the same time, the topics of nuclear energy are of paramount importance at the Department of Atomic Physics, and the process of studying them requires complex explanations and the ability to abstract to a certain extent from the analysis of textbooks and methodological literature, it is clear that some of the subject materials offered in this area are insufficient. In order for students to update the basic knowledge. Based on a detailed study of the content of such topics as "The state of traditional energy and opportunities for further development", "Organic fuel energy and its development prospects", "Renewable energy sources and their resources", the following can be done from the paragraphs of training materials. say. Issues such as new generations of nuclear power plants, the possibility of a scientific assessment of the level of safety and the formation of a positive attitude towards it were

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somewhat left behind. However, the creation of a system of continuous education based on innovative technologies, the creation of a national education system capable of withstanding today's fierce competition on a global scale, the improvement of textbooks and teaching aids based on the requirements of the time, although the need to address such issues as the creation of their new generation, the optimization of educational programs and standards, the content of the currently studied educational topics lags far behind in reflecting the content of the principles of operation of modern devices operating in real life. In particular, the lack of information about new generation nuclear power plants in nuclear power education cannot give a modern idea of them. The elimination of such a difference by improving the methods of teaching nuclear energy using computer technology based on innovative technologies is considered one of the urgent problems of our time.

The level of knowledge of the topic. Many scientific works and dissertations are devoted to the introduction of innovative technologies in the educational process, and most of them are devoted to virtual methods for performing physical laboratories [1,2]. Also, enough models and computer programs have been created that display the sequence of physical phenomena. In nuclear energy education, nuclear models and the methods based on them for explaining various nuclear processes are traditional methods, and now it is necessary to pay enough attention to methods of teaching nuclear energy using new innovative computer technologies. In particular, it is necessary to further improve the work devoted to the teaching of topics related to the development of time with the help of ICT.

Statement of the research problem. Raising the quality of knowledge on nuclear energy to a higher level, forming an understanding of nuclear processes, eliminating the gap between the insufficient development of the methodology of nuclear energy education based on innovative information technologies is considered one of the problems of nuclear energy education.

Aim of the study. In physics courses, all topics such as nuclear reactions, nuclear reactors, radiation safety, "Renewable energy sources and their resources" are used to improve innovative educational methods that allow achieving effective results that form a modern vision of nuclear processes using innovative computer technologies.

Tasks of the research. To achieve the goal, it is important to complete the following tasks:

- analysis of the state of the methodology of teaching nuclear energy to students and identification of the main difficulties in teaching this department;
- studying the experience of using new information technologies in teaching physics and determining their capabilities in the study of nuclear energy;
- creation of computer programs and presentation slides that improve the presentation of dynamic and static scenes in the study of nuclear energy;
- improvement of the methods of teaching nuclear energy using computer technology, aimed at developing personal qualities, thinking, creative abilities, experimentation skills, interest in learning students.

Methods of the research. Research methods include programs, information technology, documents on educational problems, methodological literature, audiovisual and technical teaching aids, computer programs for methods of informatics and applied mathematics, slides, aids for demonstration experiments, elements of taking [3]. Also, the basis of research methods are: student-centered teaching methods based on the modern concept of education, teachings about the methodology of pedagogical research and ideas and didactics on the use of information technology in the educational process [4].

The main part of the research. The resources of educational innovative technologies are used to model and animate the processes being studied, to develop students' thinking skills in a figurative way, to demonstrate educational information, to conduct laboratory work in a computer experiment, and most importantly, to simulate the real situation on the monitor, creates ample opportunities for showing interest to learning [5]. In order to improve the methods of teaching nuclear energy using such opportunities, it is necessary to ensure that the content of educational subjects corresponds to the



achievements of modern science and technology, to ensure the connection between theory and practice, to take into account the environmental organizers of physical education and to comprehend the physical essence of each concept, that is, a physical phenomenon, a physical quantity, a model, idea, theory, atomic nucleus, mass defect, binding energy, radioactivity, ionizing rays and other concepts must comply with the basic laws and scientific ones. The block structure of the content of logically related NPP training materials can be distinguished as follows. Atomic nucleus - nuclear changes - nuclear energy - the impact of ionizing rays on living organisms. The theory of the atomic nucleus includes two interconnected ones - the structure of the nucleus and the reactions of nuclear fission, which creates the need to use nuclear models to express nuclear properties. At the same time, the use of the necessary model for understanding a particular process using models that represent the special properties of the nucleus, and the limits of application and capabilities of each model are demonstrated directly with the help of computer programs, to expand information about the properties and structure of the nucleus, and to expand information about the universal structure kernel they will have information that the model has not been created [6]. It should be said that if the study of such information in the traditional way takes a lot of time, then the use of ICT not only saves time, but also facilitates the perception of the essence in a visual way. Also, one of the important issues of nuclear energy is the expression of the process of nuclear fission as a source of energy. Understanding nuclear fission reactions and fission reaction self-healing processes by creating mathematical models of the neutron accretion process and the probabilities of development or quenching of nuclear reactions [7]. Another of the central issues is the formation of students' attitudes towards nuclear energy and safety by demonstrating a real picture of the physical foundations of nuclear energy and radiation hazards in a demonstrative form [8]. To achieve them, new nuclear energy devices created with the help of nanotechnology achievements and many existing modern computer programs that help to teach based on scientific results are used: TechSmith Camtasia, MXSAFlash, ActivePresenter, EasyQuizy. " and "It is advisable to use AutoPlay MediaStudio" and the electronic programs developed by us "Atomic Energy", "Nuclear Reactions", "Modern Nuclear Reactors and Their Working Mechanisms". These electronic programs are created using the programming languages "ActionScript", "JavaScript", "C#" using modern computer capabilities. Includes animation of thermonuclear reactions associated with nuclear energy, animation of nuclear fission processes, presentation of the first and modern nuclear power plants - nuclear power plants, tables of criteria for assessing their safety level, animation of types of nuclear reactors, presentation of nuclear fission reactions and proton-neutron model of the nucleus At the Department of Nuclear Physics, Faculty of Physics, National University of Uzbekistan [9].

The result of experiments and discussions . By improving traditional teaching methods created by electronic textbooks, virtual laboratories, videos and presentations, a pedagogical experiment was initially carried out in order to determine the effectiveness of the results of training in nuclear energy and the level of formation of ideas about the physical laws that underlie modern technical development in this area, conditions, goals were determined and tasks of translation, as well as the shortcomings identified in the course of many years of teaching nuclear energy. The main purpose of the pedagogical experiment is to identify the problems that arise in the formation of the modern scientific worldview of students when teaching nuclear energy subjects, and to test the effectiveness of an improved methodology for teaching the sciences of nuclear energy, based on the use of innovative technologies in their solution. Pedagogical experiments take place in three stages; the first stage is the need to use innovative technologies to solve problems identified on the basis of studying the methods of teaching nuclear energy, theoretical and experimental work at the first stage in 2021-2022. He improved the methodology of teaching nuclear energy. At the second stage, the experience of studying educational materials was carried out, and on the basis of the specified methodological recommendations and seminars on the content of educational topics and teaching methods enriched with innovative technologies, nuclear physics was taught to students and training tests were conducted. In 2021-2022, the results of the improved teaching methodology were determined. At the third stage (2022-2023), a control experiment was carried out. The science of modern problems of nuclear energy was taught in the experimental and control groups, and the results of the pedagogical experiment were



analyzed. The developed guidelines were statistically processed and introduced into the educational process. According to the results of general pedagogical experiments, the developed methodology for teaching nuclear energy turned out to be effective in the study of nuclear energy, while an increase in the quality of education by 29 percent was noted [10]. As a criterion for the effectiveness of training, such cases as logicity, systematic, precise justification of answers, meaningfulness, completeness of knowledge were identified.

Resume (Conclusion). To sum up, we can say that the method of teaching nuclear energy, developed with the help of innovative technologies, according to the results of pedagogical experiments, is effective in the study of nuclear energy. The methods of teaching nuclear energy have been improved by combining achievements with existing ones.

In addition, the content of educational materials is at the center of the methodology for teaching nuclear energy based on computer technology, and the teacher is the organizer of the educational activities of students. And the computer performs the function of using information technology. It has been established that educational materials on nuclear energy are enriched with the achievements of scientific and technological development, and their teaching in a demonstrative form leads to an increase in the level of students' knowledge and activation of the educational process.

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