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METHODS LABORATORY WORK IN PHYSICS WITH THE USE OF INNOVATIVE METHODS OF EDUCATION

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ABSTRACT

This article discusses the methodology for laboratory work in physics using information technology. The use of information technology as an effective teaching tool significantly expands the capabilities of pedagogical technologies.

Currently, much attention is paid to improving the efficiency of the educational process. The solution to this problem is associated with the use of new teaching methods and techniques in the educational process. New information technologies can be effectively used in traditional lessons, including demonstration experiments in physics, in laboratory classes, as well as in a physics workshop. Over the next period, in teaching physics, new pedagogical, innovative, interactive technologies are used, technical teaching aids are being improved. Recently, an increasing number of researchers, scientists and just practitioners are looking for new or reconstruction of old teaching methods, which are well known to pedagogical science, in order to ensure the relationship of educational, developmental and educational functions of teaching. The modern dynamically changing society makes more and more diverse and critical requirements for specialists, which cannot but entail the search for new methods for preparing them for their future specialty and education.

New teaching methods that appear, often do not yet have a psychological and pedagogical justification, do not always lend themselves to classification, however, as practice and experience show, their use in the educational process brings students undoubted success. The use of modern teaching methods can make it possible to successfully and efficiently achieve the learning objectives. The use of a computer as an effective teaching tool significantly expands the capabilities of pedagogical technologies: physical computer encyclopedias, interactive courses, all kinds of programs, virtual experiments and laboratory work can increase the motivation of students to study physics. Teaching physics, due to the peculiarities of the subject itself, is a fertile ground for the use of modern information technologies.

The effectiveness of using the means of the latest information technologies in the

educational process largely depends on the successful solution of methodological problems related to the information content and the way of using automated training systems in the educational process. The content of many modern electronic educational publications in physics includes animations, interactive models, constructors, simulators, video recordings of physical experiments, virtual laboratory work, etc. These educational objects can serve as a basis for organizing students' independent work both in the classroom and at home; they are designed to prepare schoolchildren for laboratory classes in physics. These objects differ in their learning capabilities. In the virtual environment, models are presented and of a sufficiently high didactic quality. Some of them are focused on practicing individual experimental skills among students (simulators, designers); others help to study physical phenomena that cannot be reproduced in a school laboratory; still others create conditions for students to independently model a variety of physical situations. A careful selection of model objects of electronic educational publications for laboratory studies is required. I believe that the most effective way to practice this organizational form is the use of virtual manipulative models, as well as video fragments of field experiments. There are still not enough such objects in the virtual information environment. The class of such educational objects must be consistently developed. In physics lessons, it is impossible to do without a demonstration experiment, but the material base of the office does not always meet the requirements of a modern physics office. And that's why a computer experiment comes to the rescue here. The computer becomes an assistant not only for the student, but also for the teacher. The advantage of a student's work with software is that this type of activity stimulates research and creative activity, develops the cognitive interests of students. The programs can be useful in preparing for laboratory exercises with real equipment and will be indispensable in the absence of it. Interactive experiences can be used to demonstrate in a lesson. This will allow to resolve issues related to the lack of laboratory equipment, to optimally organize working hours. It will also be effective to use interactive laboratory work in the independent work of students.

An important place in the formation of practical skills and abilities among students in physics lessons is given to a demonstration experiment and frontal laboratory work. A demonstration experiment in physics lessons forms in students the previously accumulated ideas about physical phenomena and processes, replenishes and expands the horizons of students. In the course of the experiment, conducted by students independently during laboratory work, they learn the laws of physical phenomena, get acquainted with the methods of their research, learn to work with physical devices and installations, that is, they learn to independently acquire knowledge in practice.

Experience shows that the use of only the traditional methodology for conducting a physical experiment leads to a low level of skills and practical skills of students in physics, since not all students are able to: analyze, understand and interpret graphs and tables obtained during the experiment (they are not able to use the knowledge gained in algebra and geometry in the study of physics); explain the essence of physical phenomena (weak vocabulary of terminology in physics); to understand the laws of physical processes (do not see the cause-and-effect relationship); independently obtain the necessary information from various sources, including electronic ones.

The above listed gaps in students' knowledge affect the formation of information competence and the level of student exposure in physics. In this regard, an idea appears: if you carry out a physical experiment and frontal laboratory work using virtual models by means of a computer, then you can compensate for the lack of equipment in the physical laboratory of the school and, thus, teach students to independently obtain physical knowledge during a physical experiment on virtual models. Thus, there is a real opportunity to form the necessary information competence in students and to increase the level of radiation exposure of students in physics.

It should be noted that a computer experiment is able to supplement the “experimental” part of the physics courses and significantly increase the effectiveness of the lessons. When using it, you can isolate the main thing in the phenomenon, cut off secondary factors, identify patterns, repeatedly test with variable parameters, save the results and return to your research at a convenient time. In addition, a much larger number of experiments can be carried out in the computer version. This type of experiment is implemented using a computer model of a particular law, phenomenon, process, etc. I believe that working with these models opens up enormous cognitive opportunities for students, making them not only observers, but also active participants in ongoing experiments.

Methods for conducting laboratory work in physics using information technologies allow: deeper understand the physical processes and laws, as well as learn to apply the knowledge gained in practice; implement a student-centered approach to learning; integrate learners' knowledge; stimulate students to master the personal computer; to carry out experiments in stages, creating a situation of success in the lesson, the ability to apply methods of differentiated teaching; to motivate students for research work on any topic of interest to them for independent creation of multimedia models of the interaction of bodies, physical phenomena and changing the parameters of interaction, to visually see the result.

Despite the big advantages, I recommend that physics teachers do not completely abandon real practical work, since at the initial stage of teaching physics (grades 6-9), adolescents have more developed subject activity than visual-figurative thinking, and in senior grades (10-11), when the teaching of students is based on the theoretical level of generalization, it is possible to use computer models that develop the logic and thinking of students. Expanding the teacher's knowledge in the field of “Methods for conducting laboratory work in physics using information technology” allows the teacher to: to master the latest achievements of pedagogical science and practice, to use new technologies for the teacher in his work on an actual developmental, personality-oriented basis, to carry out the optimal integrated selection of problematic, research, practical, reproductive teaching methods, use virtual manipulative models, video clips of natural experiments, stimulate research and creative activities that develop the cognitive interests of students, use a computer experiment, which is able to supplement the “experimental” part of the physics course and significantly increase the effectiveness of the lessons. Thus, teaching based on computer technology creates conditions for the effective manifestation of fundamental laws of thinking, optimizes the cognitive process. The factor that allows you to do this is the visualization of the basic mathematical and physical laws.

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