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INFORMATION TECHNOLOGIES IN TEACHING PHYSICS IN A TECHNICAL HIGHER EDUCATION INSTITUTION

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ABSTRACT

The article discusses current issues related to the methodology of teaching physics in technical universities. The prospects of information technology in the modernization of the educational process in physics, as well as in solving a number of methodological problems were discussed.

KEYWORDS: *Innovative Approach To Teaching, Information Technology, E-Learning Resources, Experimental Modelling, Multimedia, Distance Learning.*

INTRODUCTION

Physics is one of the priority subjects in the educational process in the training of engineers in higher education institutions. It is the basis for the study of special disciplines, explaining the basic laws of physical phenomena and processes, as well as shaping the worldview and thinking skills of future professionals. For many years, the traditional system of teaching physics has been preserved. This system includes lectures, laboratory and practice problem-solving. The curriculum in general physics has hardly changed over the years, which means that in its time it was considered to meet the requirements of engineering training. At the same time, the achievements of fundamental research in physics in recent years, the demand for human resources in production, the need to modernize technological processes, new opportunities for modern information technology and the need to revise curricula.

The growing role of nanotechnology in various fields of modern production has led to the need for students to study in detail the basics of quantum physics, solid-state physics because the behaviour of nanoparticles is governed by specific laws of quantum mechanics. The physics program is divided into three different levels of complexity depending on the type of engineering major. However, even in the simplest version, it is so wide that it is very difficult to fully master it in the hours allotted for training. In addition, one of the major challenges in modernizing the teaching process of physics in higher education is related to outdated laboratory equipment that

has not been updated since the 1970s. Old devices that have been repaired many times are used during the presentation of the lecture-demonstration. As for educational films designed to show specific physical phenomena, it can be said that they are manually and materially obsolete.

MATERIALS AND METHODS

There is no doubt that the endless possibilities of modern information technologies can make a great contribution to solving many of the listed problems and modernizing the educational process in physics. However, auxiliary computers and information technology tools in the learning process cannot completely replace the physical equipment in the training laboratory rooms. Due to the high cost of new, modern physical equipment, their purchase remains a topical issue. In recent years, many foreign and domestic companies are producing modern training laboratory equipment.

Many leading engineering universities, taking the long-awaited funding independence, are giving preference to manufacturers in Western Europe, primarily PHYWE (Germany, Göttingen), when purchasing training laboratory equipment. The worthy popularity of the equipment of this company is mainly due to the scientific tradition of the University of Göttingen, which has awarded 44 Nobel Prizes to the world. The equipment manufactured by PHYWE is visual, methodologically well designed and reliable in performance. The creative initiatives of advanced educators to modernize the physics course are diverse and undoubtedly innovative, as reflected in the fact that many ideas have already been implemented in educational institutions, in the materials of many conferences each year on physical problems [2].

Computer-assisted modelling of physical experiments, use of the Internet information environment in laboratory classes, multimedia presentations in lectures, remote laboratory practice by a researcher or student - this is an incomplete list of innovative innovations that contribute to solving more complex methodological problems. The physics program covers several complex topics. The most effective way to discuss such issues is to demonstrate these physical phenomena on real equipment. Unfortunately, it is not always possible to demonstrate a complex experiment in a training laboratory. In such cases, computer-simulated virtual experiments become a good methodological aid for the teacher in organizing the learning process in explaining complex processes to students. The fears of opponents of computerization in the teaching of physics are also not unfounded.

An excessive passion for computerization can sometimes turn out to be not only beneficial but also detrimental to shaping the knowledge of future engineers. An example of such problems is when students blindly download materials from Internet sites while preparing topics, coursework, and abstracts for independent work without understanding the essence of the issue. Even to perform simple arithmetic operations, many students turn to a computer without understanding the meaning of the task or the purpose of the actions being performed. An analysis of the methodological problems associated with the use of information technology suggests that the most appropriate approach is to conclude that it is a method that rationally combines traditional and information education technologies. It turns out that a virtual experiment performed on computers cannot completely replace a real experiment, and it should only be involved when necessary. Before the introduction of information technology in the educational process, a lot of hard work is done, such as creating the necessary computer programs on the topics based on the curriculum, as well as the purchase of licensed e-learning products. In

addition, the methodological and organizational aspects of the lessons should be well thought out, the computer classroom should be equipped with the necessary technical equipment, e-learning manuals should be available.

Traditionally, a lecture course in physics provides coverage of the material being studied through lecture presentations. In this context, it is information technology that can provide the necessary methodological assistance in creating presentation materials for lectures. At the same time, the information resources of the global Internet are a useful source of information in the selection of audio and video materials for a physics lecture course. The procedure for developing e-learning products, creating multimedia materials, videotaping demonstration experiments for a physics course is a very expensive and laborious task [1].

A presentation of lectures in electronic form has been developed for reading lectures on the full course of physics. Presentation slides prepared in MO PowerPoint program allow displaying formulas, drawings, graphics in animated mode.

The course of electronic lectures includes videos of real physical experiments taken from the Internet [4], video assignments (author prof. A.I. Fishman), animations from the site "Physics in animation" [2], as well as materials "Open Physics 1.1" [3].

The constant addition of such videos to the electronic lecture course allows supplementing it with necessary and useful materials [5]. During the presentation, the working slides of the electronic abstract are filled with formulas, pictures, and graphics in animation mode. That is, as the presentation continues, the material is broken into pieces. During the lesson, the speaker will give the necessary explanations orally, as well as use the board in the classroom. Clear images displayed on the screen allow students to record high-quality recordings of the material being studied. At the same time, the speaker takes the time to explain, explaining the most difficult issues. Formulas, diagrams, graphs, drawings in electronic form are easier to understand than those drawn by hand on the board. One of the main advantages of such a lecture course is the opportunity to improve it, to fill it with new materials. The achieved quality of the e-lecture course made it possible to start designing it in the form of a compact multimedia disc. The main work plan is to create a multimedia product for a full course of physics, which should help students and teachers in their work, both in reading lectures and in students' independent work. The disc project includes theoretical materials on this topic, along with video experiments, reviews. The disk contains attachments in the form of pdf-files, which provide a detailed description of the material provided. These attachments are copied from the slide so as not to confuse the viewing area with large amounts of text. The advantage of this multimedia product is its clarity, informative content and the ability to constantly improve it. At this stage, the structure of the future disk was developed, part of the work on its filling was completed.

CONCLUSION

In conclusion, the introduction of information technology in the modernization of the educational process in physics, taking into account the organizational components of the working program in the teaching of physics in technical higher education institutions, is a promising method.

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