PROBLEMS AND SOLUTIONS OF THE METHODOLOGY FOR TEACHING PHYSICS AT A TECHNICAL HIGHER EDUCATION INSTITUTION

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ABSTRACT

This work discusses the problems of using virtual laboratory work in higher education in independent education. Problems in the use of Virtual and real laboratory work have been compared. The problems of using a Virtual laboratory as an independent work in self-education have been solved methodically. During the development of Science and technology, the rules of independent self-education of students, which are important for universities in the directions of technical education, were analyzed, disadvantages were outlined and proposals were developed. Physics lessons reflect on the use of Information Communication Technologies, their role and role.

Keywords: Virtual laboratory, real laboratory, independent work, self-education, educational success, efficiency, ability, engineering.

INTRODUCTION

One of the main factors affecting the skills of future engineering professionals in their future professional activities is quality education. Independent education in higher educational institutions is a kind of tool for organizing and managing independent activities of students in the educational process, mastering the necessary knowledge, skills and qualifications, self-awareness and self-education of students. Independent education is the main indicator of educational success, it is an important indicator both in the process of learning and in the results of teaching. The concept of" independent education " itself implies a wide range of work and directions. The concept of independent education refers to a specific meaning, depending on how it is used.

Analysis of all methods of independent work, which in recent years have been widely used in pedagogical practice and include traditional and innovative methods of activating students in the educational process beyond the audience, shows that at different stages of education, students will have certain opportunities for self-education and self-control through their independent work.

The methodology of our work consists in analyzing the problems and advantages of using virtual laboratory work as an independent work of students in quality. At the same time, we will analyze the use of virtual laboratory work as a structural element of independent preparation for the performance of real laboratory work in physics. It consists in the deductive generalization of personal experience in the use of scientific literature data in understanding the process of carrying out laboratory work and the implementation of a differentiated approach in the training of students. Analysis of scientific literature has shown that improving the teaching of physics, which is the basis of technical FA, is one of the pressing problems of

modern engineering education. From the stage of development of engineering education, physics laboratory classes have been important in the preparation of engineering technicians.

MATERIALS AND METHODS

During the development of high-innovation technologies and science technology, universities in the areas of technical education are faced with the task of training highly qualified specialists who will solve engineering and technical problems. Therefore, it became necessary to revise teaching methods using new technologies, without abandoning the traditional methods of teaching physics in the form of lecture, practical and laboratory classes. In a modern student, the formation of independent self-teaching skills is an important task. The development of quality knowledge is carried out by the student through the integration of knowledge learned in an educational audience and in addition to an independent audience. Independent work is, as a rule, the process of preparing a written, improvised and experimental form of homework by the teacher based on the materials described in detail in the audience and using the methodology presented in detail.

The methodology for the correct Organization of laboratory and practical training in many ways leads to the successful assimilation of theoretical materials [1]. A university graduate must have such skills as setting up experiments, conducting independent research, creating innovative technologies. To develop these skills, the role of independent self-education is important when students prepare and perform real and virtual laboratory work. The scientific and professional activity of students should be formed by the active use of new innovative technologies in classes by professors and teachers of higher educational institutions.

It is necessary to train students to work with scientific and educational literature, laboratory equipment, use multimedia tools, internet resources. In fact, this is a very difficult task because if it is not properly organized, the consequences can be devastating for education. In connection with the reduction of audience hours in higher education institutions, many issues are being transferred to independent self-education. However, we cannot achieve the results of training by giving the student to study this or that material independently without direct supervision and guidance from the teacher.

The necessary abilities for the specialty are the process of consistent and logical thinking, planning and organizing work, working with devices and techniques, applying skills in future labor activities. Physics provides the basis for the development of special disciplines in the direction of technical education, so its special role in the preparation of a modern engineer of any profile is undoubtedly great.

One of the main points in modern views of the training of specialists is the correct Organization of independent work of students. Let's analyze it on the example of performing laboratory work in physics. For example, when performing laboratory work in physics, let's consider two types of independent work of a student. The first: the student independently prepares to work outside the educational institution, for example, at home or in the library (work outside the auditorium), the second is an audience work, that is, the student prepares for work and performs work in university laboratories. At the same time, it should be noted that in order to optimize classes, it is necessary to develop new teaching methods that complement traditional teaching methods.

To qualitatively carry out laboratory work, it will be necessary to independently prepare for laboratory training in advance. First of all, it is necessary to independently study theoretical materials from the lectures and textbooks recommended in this lecture course. It is also

necessary to familiarize yourself with the content of work in educational and methodological manuals.

Today, most teachers offer to replace real-world laboratory work with virtual laboratory work. But we think it's wrong. Because the future engineer must work with real devices, experiment, perform measurement and mathematical accounting work.

Now let's look at the advantages and disadvantages of each type of work. Virtual laboratory work in computer laboratory devices, as a rule, represents a computer model of a real experimental device. Since Virtual laboratory work (VLI) is a model, it cannot always reflect the specifics of the phenomenon or object under study. In addition, the disadvantage of virtual work to some extent is that one or another work must be performed individually by a student at home or in a laboratory room equipped with a special computer, but we must take into account that a specialist who graduated from a university lives in society and works as a team. Real laboratory work (RLI) trains students to work in a group, put and design experimental assignments, and perform them realistically [2].

Again, let's consider a number of advantages of virtual laboratory work over traditional laboratory work:

• The number of laboratory work and their volume in many ways are associated with the possibility of availability of laboratory equipment of the educational institution;

• That the laboratory equipment in the study rooms is not updated as we wish;

* Failure to perform most experiments from some departments (electromagnetism, quantum, atomic and nuclear physics)in training laboratories;

• The possibility of creating computer models without purchasing expensive equipment;

• The fact that virtual work can be done over and over again, regardless of Real-time mode.

We also look at the work of a virtual laboratory as an integral part of distance education, which is widely used in the modern educational system. Today's generation of students have made extensive use of computer technology capabilities since school, so we look at them as ready for a virtual job to be done on a computer.

One of the main issues of using virtual laboratory work applications for independent work is to give the student the opportunity to prepare for real laboratory work. As a result, the student who comes to the practical lesson will already have an idea of laboratory equipment, understand the methodology for conducting real laboratory work and significantly reduce the time for their implementation [4-5].

If real laboratory work in universities is replaced by virtual laboratory work, it will lead students to break away from real situations. When performing Virtual laboratory work, practical skills in measuring physical sizes with tools and equipment, conducting experiments, assembling electrical circuits and other qualifications are not formed. Training a specialist who cannot work with real objects determines the poor quality of graduate personnel in higher education. Often a modern student who can work well with a virtual laboratory will not have practical skills in working with real models, which is a significant drawback in the training of a modern engineer [6].

The execution of any real or virtual laboratory work consists of several stages:

1) preparation for work - the student enters a brief description of the work in the work book. The description of the work reflects the purpose of the work, a concise theory, the necessary equipment, the procedure for performing the work, tables for recording the measured values;

2) work permit-the teacher conducts a job survey;

3) performing the experimental part of the work;

4) calculation and processing of measurement results. Tool error detection;

5) **protection of laboratory work**. Students answer control questions asked at the end of each case and submit a written report on the results of the study [7-9].

But the main difference is that VLI is performed individually, while RLI is performed in small groups of 2-3 people. Working in a group forms the ability of students to work cooperatively, a sense of responsibility in working in a team, which is a necessary factor in their future professional activities. We also note the difference in the experimental part of the work. Let's analyze this difference in the electromagnetism section using the example of performing VLI and RLI

The student starts the experiment when working with a computer model while performing a VLI, for example by pressing the ”Run” button with the mouse. The circuit monitors the movement of the conductor and the change in magnetic flux (numbers at the bottom of the window). While performing the RLI, the student collects the desired device. Observes the formation of an induction current by changing the magnetic field. If an error occurs when working with a computer model, you can simply clear the area and repeat the experiment again. But when performing the RLI, it is not so easy to correct the error, which forces the student to be careful and follow the safety rules to the bottom [2].

Professional skills (development and calculation of projects of electrical circuits, measurement of physical magnitudes using electrical measuring instruments, techniques for correctly returning results, etc.) develop very easily. After the completion of laboratory training, the indicator of mastering the teaching material increases significantly [10]. Therefore, laboratory work allows the student to comprehend the essence of the phenomenon being studied, to understand it more deeply and to remember it extensively. Having carried out the necessary research in the process of performing laboratory work, the student acquires the skills of conducting an experiment, working with tools or using any research method in accordance with the goals and objectives set by the teacher, using them in professional activities and production.

In the process of performing laboratory work, the formation of skills and competencies, as well as knowing that they will be necessary for mastering the specialist subjects in further courses at the university, is a complex and requires additional effort from the teacher. We give examples of the role of physics in mastering special disciplines (such as electrical engineering and theory of electrical circuits)for the implementation of this process. We must provide students with the opportunity to do these jobs with pleasure, in addition to having the knowledge and skills necessary for future professional activities when performing laboratory work or other educational work[6].

CONCLUSION

We note that it is necessary to put real laboratory work into practice not by replacing it with virtual work, but by filling them as independent work. The introduction of information technology into the educational process justifies itself only if there are additional advantages

over traditional forms of Education. We consider direct communication between a student and a teacher as an integral part of the training of highly qualified specialists. The number of laboratory work and their size largely depend on the availability of laboratory equipment of the educational institution. If the teacher has not developed a methodology for conducting laboratory work and has not thought about it enough, then it will be possible to waste time, teaching efficiency, even when performing the most necessary laboratory work. During the years of study at the University, the student's cognitive activity should be organized by teachers using new innovative technologies.

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