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Digital Technologies Es as a Perspective Information Technology in the Educational Process

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Abstract: *The article considers the possibility of using a virtual laboratory workshop on the example of the study of electrical disciplines.*

Keywords: *information technology, virtual laboratory, workshop, modeling packages.*

INTRODUCTION

Modern information technologies are becoming a determining factor in improving the quality of education. Virtual Educational Environment - this is a hardware-software methodological complex, belonging to the class of intellectuals, which ensures the conduct of all types of educational process, as in single-user and in group mode. Analyzing the role and importance of virtual educational environment in education, it can be stated that this role is strategically important, and the importance of virtual educational environment in the development of education is growing rapidly. It has unique capabilities that provide a significant increase in the individualization, intensity and effectiveness of the educational process.

THE MAIN PART

Simulation of electrical processes in combination with virtual measuring instruments gives previously unattainable opportunities both in the educational process and in promoting new developments to the market. The implementation of laboratory work at the university is an important pedagogical device in the teaching of natural sciences and technical disciplines. The manipulation of material objects helps to develop a student's associative connections necessary for a deep understanding of the studied subject, promotes the connection of abstract and subject thinking, and for future engineers also the formation of the initial skills necessary for successful mastery of the chosen specialty. The effectiveness of this technique depends on what tasks are set for the laboratory course, on what instrument base they are built, and also on the experience gained by the scientific and teaching staff. In accordance with the current state educational standards of higher professional education, graduates of technical universities should be prepared for the following types of professional activities:

- design and technological;
- research; operational and service maintenance;

- installation and commissioning activities;
- Organizational and management activities.

ANALYSIS OF THE LITERATURE ON THE SUBJECT

Moreover, the specific types of professional activities of graduates are determined by the content of educational and professional training programs developed by universities [1]. The activities of modern engineers are very diverse and require a diverse and deep knowledge of the laws of nature and the laws of development of a number of related branches of applied science and technology, skills in order to carry out and accompany the competitive development of technical devices, systems, complexes, and technologies. The widespread introduction of high technology into the industry, the specifics of engineering problems solved in them, located at the junction of several technical sciences, which require combining the efforts of specialists in various fields in the process of solving them, has led to the transformation of many engineering specialties. For the successful performance of its functions, a modern engineer must possess not only the sum of general and special knowledge, skills, and abilities, but also a set of certain personality traits that ensure fruitful work in a team of diverse specialists [2]. One of the features of higher technical education is its industry focus, which is manifested in a wide variety of areas and training programs. Tangible differences between the areas in the content of training are beginning to appear at the level of general professional training. Another feature of the current system of training specialists in the field of engineering and technology is the need to pay considerable attention to such components as design tasks, term papers and projects, technological and production practices, and laboratory work. As a rule, these types of training sessions are conducted according to individual tasks. Students carry out the assignments during the time allotted for independent work with the consulting support of teachers. When completing assignments, students are forced to spend a significant part of their time on computational and graphic works that contribute to the development of such generally useful qualities as attentiveness, accuracy, patience, but to a small extent help active practical mastering of educational material, i.e. achievement of the main goals of these types of educational process. It is required to more actively use computer technology when performing design tasks, term papers and projects with a corresponding change in the nature of the tasks to be solved.

RESEARCH METHODOLOGY

The importance of “practice” is confirmed by the current state educational standards governing the lists of academic disciplines, the study of which should be accompanied by the implementation of laboratory workshops and practical exercises. The implementation of this component of the educational process involves a significant expenditure of resources. The costs of organizing and conducting laboratory workshops can be up to 80% of all costs for training specialists in the field of engineering and technology. It is clear that in the conditions of a sharp decrease in funding for educational institutions, the first victims are educational laboratories: the equipment quickly ages morally and physically becomes inoperable. But the main thing is that traditional educational laboratories do not fulfill their main function, which is to teach students how to set up, conduct and process the results of engineering experiments. Instead, students are encouraged to perform a given sequence of actions to turn on and off power supplies, record readings of measuring instruments, and build graphs. The creation of a system of modern open education in the field of engineering and technology is associated with the implementation of new approaches to the organization of laboratory workshops based on information and communication technologies. The scientific and technological progress of recent decades has led to the fact that traditional, conservative approaches to organizing a laboratory workshop in higher education no longer allow maintaining the effectiveness of the educational process at the modern level. Scientific and technical developments also encountered problems of laboratory equipment and laboratory research methods. In the same way as the ability to read technical literature, understand electrical and wiring diagrams, design documentation, the ability to carry out verification and design calculations, use a modeling apparatus, a future technical specialist. Must be trained in the technique of setting up and conducting an engineering experiment [3]. Without this, a specialist in the field of engineering and technology simply will not take place, because he will have to create research equipment to study new physical processes, laboratory stands to assess the quality of created technical products, technological stands for factory acceptance tests of serial production, etc. At simple and diverse educational facilities, the student must master the skill of setting up an engineering experiment and competently apply this skill in his practical activity when creating new and more complex objects for which the model description, if it exists, is very inaccurate. In this case, the main thing in the design of the experiment is the determination or refinement of the structure and parameters of the mathematical model from the experimental data, i.e. the problem of identifying the structure or parameters of a mathematical model is solved.

ANALYSIS AND RESULTS

The following important tasks are assigned to a laboratory workshop in a technical university:

1) Practical consolidation of theoretical knowledge gained;

2) Acquisition of skills of independent work with real equipment;

3) Planning and setting up an engineering experiment;

4) Selection of equipment for the experiment;

5) Processing and explanation of experimental results;

6) Comparison of the results of theoretical analysis with experimental data.

In the ideal setting of the educational process to increase the efficiency of learning material, each object of study within the framework of the discipline must be supplied with all the necessary moments of theoretical, practical, model and experimental study. Let us analyze how the educational functions listed above are realized in various types of existing laboratory workshops and what is the degree of their effectiveness. As a basis for comparison, we will present some hypothetical "ideal" laboratory workshop on a concrete example from the discipline "Electrical Engineering". An "ideal" laboratory workshop would look like this:

- equipment used in the training laboratory;
- various types of electric machines of direct and alternating current;
- DC and AC power sources for various output power, frequency, voltage;
- Measuring instruments of various types and types (ammeters, voltmeters, wattmeters, phase meters, etc.);
- actuators, regulators and load devices of various types and types and other necessary attributes of experimental research;
- in accordance with the individual task received and the theoretical knowledge about the object previously mastered, the student selects from the set of laboratory equipment at his disposal only that which is necessary for the fulfillment of his individual task;

- At the laboratory bench, the student independently collects the laboratory setup and conducts an experiment, as a result of which he gets the opportunity for active independent actions with real equipment and devices.

However, in practice, such an ideal approach is never applied, since it requires a lot of free equipment and time for its implementation, as well as a high risk of damage to equipment due to inept actions of poorly trained students. A traditional laboratory workshop is, as a rule, a set of almost ready-made, fully mounted laboratory stands intended for experimental study of the basic set of objects in a given academic discipline. The student, at best, performs routine operations of changing voltages, switching individual devices, circuits, etc. At the same time, the student loses the main thing - an independent experiment, the choice of instruments and equipment. In addition, in the real world, setting up a laboratory workshop encounters organizational, technical, and economic difficulties. So, from the point of view of the efficiency of assimilation of the material, it would be most expedient after fixing the theoretical part for each section of the discipline to immediately fix this material with a laboratory workshop. However, a lecture, as a rule, is given for 100-150 students, and the capabilities of the training laboratory are designed for 6-12 jobs at best, which does not satisfy the needs of even one study group. Forced it is necessary to implement team work on one laboratory bench (2-4 people per team). The effectiveness of this method is extremely low, because in each such team the work is performed by one student, who is the leader of a particular mini-team. The rest of the students get routine, auxiliary operations, which do not contribute either to the acquisition of practical skills in working with real equipment, or to the assimilation of the essence of the processes under study. This violates one of the main educational functions of the laboratory workshop - the independence of the practical development of real technology. Other study groups of the general flow of students, at best, with a delay of 2-4 weeks will be able to start laboratory work, i.e. there is a time gap between the theoretical, practical and experimental study of the material, which also does not contribute to the effectiveness of its assimilation. Thus, the problem of individualization of instruction in the conditions of a mass audience and limited time is at the forefront. A qualitatively new level of teaching is required using non-traditional forms and teaching methods with an emphasis on independent work of students [4]. This is possible with virtual support from the teacher and student. A virtual laboratory workshop is one of the progressively developing types of laboratory classes, the essence of which is to replace real laboratory research with mathematical modeling of the studied physical processes, but with elements of the student's virtual interaction with the laboratory equipment. Depending on the used software tool environment, you can create a good illusion of working with real objects. The capabilities of modern simulation computer models create the complete illusion of working with real equipment. There is a positive moment in this approach, which allows each student to realize their individual creative abilities. While in a virtual laboratory, you can select virtual instruments and equipment, assemble an experimental scheme on your individual task on a virtual bench, conduct a search simulation of the physical process under study for various given parameters and limitations, process the research results without spending effort on routine calculations and graphical constructions. Thus, computer simulation of the studied electrical processes is today an indispensable component of the modern educational process in a technical university. Active implementation of information and telecommunication technologies in the educational process has generated a number of related problems related to the peculiarities of creating electronic educational resources and the effectiveness of their use in independent study.

In particular the need to select or develop specialized software to support technologies for the collective access of remote users to real laboratory equipment. For humanitarian areas of training, this problem, in most cases, is solved by standard means of network technology. Here, as a rule, there is an exchange of text information in HTML format, which is supported by the http network exchange protocol, and no special software for the exchange of information is required, since there is no need to manage a text educational resource. Therefore, the main efforts of the developers of this direction are aimed at creating effective software systems for administering the educational process [5]. The situation is completely different for areas of training in the field of engineering and various technologies, where the obligatory component of training is practical work and laboratory practice. The main requirement for their implementation is to control the object of study according to the individual task of the student in real time on a computer network. Providing remote collective access to real laboratory equipment is not supported by standard means of network technologies and requires the development of specialized software, without which this section of training is simply not feasible. Currently, there are many domestic and foreign tools for developing electronic educational resources. However, few of them allow providing access to real laboratory equipment in real time over a computer network. The author uses the PSpice simulation package, which was chosen as a universal solver, capable of performing tasks of modeling objects of various nature and complexity using the method of analogies at the Department of EE, KNITU, to simulate various electrical processes. [6] The used student version of the Pspice simulation program allows students to independently perform laboratory work. Pspice is a world leader among simulation programs for electronic circuits and working with this package allows a future specialist not only to speed up the learning process, but also to use the acquired skills to work with the package already in production [7].

CONCLUSION

Consequently, both theories are being taught in parallel and the practical skills needed by a qualified specialist are being developed. Let's consider how computerization of the discipline "Electrical Engineering and Electronics" is implemented. At the same time, the following units are involved in the educational process:

1. Website with teaching materials.

2. Computer class with Internet access.

3. A set of computer tests on the main topics of the discipline.

4. A complex of simulation and mathematical software

Pspice has the following learning benefits:

- ✓ allows the student to independently perform laboratory work both in the classroom and at home (remotely),
- ✓ allows you to complete tasks with a specific option for each student, which is basically impossible when working with a laboratory bench,
- ✓ provides good visibility when performing tasks,
- ✓ Provides parallel training both in theory and the practical skills required in production are developed.

Thus, in the process of classes there is an intensification of the educational process through the use of modern information technology. As a result, there is an increase in the activity of cognitive activity of students and, consequently, an increase in the efficiency and quality of the learning process.

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