

Virtual Labs in Distance Learning

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Abstract: The article describes the types and structures of innovative teaching materials with computer support, the class of practical training tools, as well as the functions and significance of virtual laboratories, new information technologies, the possibilities of new information technologies, the main types of educational activities using new technologies, the goals of innovative training, current forms and methods of cooperation between teachers and students in order to activate their intellectual and creative resources.

Keywords: Innovation, information, virtual laboratory, educational and methodical material, learning tools, multimedia.

Introduction

Currently, the activities of higher education, the reform of higher education are aimed at implementing the law on education and government regulations on education, since progress in the economic, social, cultural and technical development of the country is possible only if the national educational system is improved.

In recent years, a multi-level structure of higher education has been developed and is being implemented.

Bearing in mind that higher education is, first of all, self-education, and self-education is, first of all, active actions of the student, higher education should be the best tool that reveals to the student the basic methods of thinking and research. Young people who come to the first year of higher educational institutions often do not know how to think logically, nor follow other people's thoughts, nor read books, nor use computers, nor express their thoughts. However, the main task of higher education is to instill in students a certain level of culture, as the most important component of education. First of all, an educated person should leave the university. The growth of education today is the most important social order for higher education, including for technical universities.

Literature review

It should be emphasized that pedagogy has always established a close relationship between the improvement of activities and the formation of the personality of students. Only

when the student is included in active learning activities, adequate to the content and goals of training and education, can a personality be formed. The substantiation of the principle of the unity of cognition and activity is contained in the fundamental research of leading Russian psychologists: L.S.Vigodsky, P.Ya. Galperin, A.N. Leontiev, S.L. Rubinshtein, A.A. Smirnov, V.M. Teplov, N.F. Talizina and others.

In this regard, P.I. Pidkasty, speaking about the relationship between consciousness and activity, wrote: "A specific feature of human activity is that conscious and purposeful activity. In it and through it, a person regulates his goals, objectifies his plans and ideas in the reality he transforms. At the same time, the objective content of the objects on which he operates, and social life, in which he is included by his activity, is a determining principle in the psyche of the individual. The meaning of activity lies in the fact that in it and through it a dual connection is established between man and the world, thanks to which being appears as a real unity and interpenetration of the subject and the object".

Many didactics and philosophers of the past (Plato, Aristotle, Ya.A. Komenskiy, I.G. Pestalozzi, K.D. Ushinskiy, etc.) noted that development and education cannot be given or communicated to any person. Anyone who wants to learn something must achieve this by his own activity, by his own strength, by his own effort. That is, the main efforts of teachers should have been aimed at teaching the student to learn, that is, independently and actively gaining new knowledge, skills, and skills and independently controlling the course of this process. Therefore, at present, for higher education, the main task should be to reorient the didactic system of higher education from a predominantly informational type of training to training, which allows to identify and develop the cognitive and creative abilities of students, manage the formation of their independent activity, as well as educate in this process volitional and professional personality traits that ensure independent, active, purposeful and, most importantly, effective educational and professional activity of students.

Thus, the most important issue in solving the problem of increasing the efficiency and quality of the educational process is the problem of activating and managing the cognitive activity of a student based on the development of elements of independence, self-government and self-control.

The effectiveness of training is determined by the quality of training specialists at a given level of costs for providing the educational process. The quality of a modern specialist is determined by the ability to use the newly acquired knowledge to make technically sound decisions, confirmed by regulatory documents, calculations or experiment.

Confucius wrote: "I hear - I forget, I see - I understand, I do - I remember". This pedagogical principle remains relevant to this day.

The traditional technology of organizing and conducting a laboratory workshop in the disciplines of general scientific and general technical cycles in the correspondence form of training assumed laboratory work only during the students' stay within the walls of the educational institution during the laboratory-examination session, which significantly increased its duration. From the point of view of optimizing the learning process, such a technology is far from being the most successful, since students perform a significant amount of laboratory work in various academic disciplines in a limited period of time. As the analysis of the training plan shows, in various courses, within 10 - 15 days, students must complete from 20 to 30 laboratory works, which, in combination with the writing of 4 - 5 written tests and defense of 3 - 4 coursework and projects, creates an unbearable load on trainees. In such conditions, teachers do not always succeed in obtaining from students appropriate preparation for laboratory work, which, in turn, affects the quality of training.

Discussion

The conditions for the successful solution of the accumulated contradictions associated with the organization and conduct of a laboratory workshop within the traditional form of distance learning and obtaining the necessary experience necessary for the transition from correspondence education to distance education of students is the solution of the following tasks:

- finding ways and methods to intensify laboratory studies due to better training of students through the introduction of individual complex tasks into pedagogical practice, containing both calculated and experimental components;
- development of options for methodological support for the use of the material and technical base of the completing bodies of the means for the students to independently perform individual tasks during the extracurricular period of study;
- development of the optimal structure and software implementation of software and computer systems, as well as the necessary methodological support, allowing students to perform laboratory work independently during the extracurricular period of study;
- development of the necessary methodological support to ensure the documentation and transmission of the results of individual assignments and laboratory work to the institute of correspondence and distance education and to the departments of the educational institution using telecommunication means.

The pedagogical significance of the problem posed, its insufficient scientific elaboration in the psychological, pedagogical and technical literature, the need of universities for practical recommendations on the use of distance technologies determined the choice of the research topic, determined the goal, object and subject of research.

The purpose of the study is to develop distance pedagogical technologies for organizing a

laboratory workshop, which will improve the quality of training specialists in the correspondence form of their education and create the necessary prerequisites for the transition to a new form of education - distance education.

The object of the research was the process of distance and correspondence forms of training of specialists in universities.

The subject of the research is to identify the conditions and ways of effective distance learning for specialists in universities based on modern information technologies.

The modern concept of "laboratory practice" is closely related to the traditional broader concept of "laboratory work" and includes not only the actual process of conducting a laboratory experiment, but also the tools of this process necessary for the implementation of a laboratory experiment by the students themselves within the framework of the teaching technology used. Learning technology is understood as a certain systemic concept that would ensure the optimal organization of the educational process based on the use of modern information tools.

When carrying out a laboratory experiment, trainees, as a rule:

- determine the purpose of the laboratory experiment;
- put forward a testable hypothesis or choose one from the proposed list;
- select the necessary measuring instruments and auxiliary equipment;
- assembling and testing the experimental setup;
- carry out the necessary preliminary observations of the course of the experiment;
- carry out the necessary measurements provided by the procedure;
- based on the results of the measurements, the absolute and relative errors of the measured values are calculated, statistical processing of the results obtained is carried out;
- in the case of indirect measurements, the results are processed;
- plotting graphical dependencies of directly measured values obtained during processing of measurement results;
- analyze the results obtained and make a conclusion about the correctness of the proposed or selected hypothesis, accept or reject.
- draw up a report on the results of the experiment and make its defense, if necessary.

At the same time, students form experimental skills and abilities and develop design abilities when working with various equipment.

In the educational process of a higher educational institution, a laboratory workshop performs the following main functions:

1. Is a source of new knowledge about physical phenomena, principles of operation of devices, apparatus, machines and mechanisms, technological processes.
2. Provides a fundamental basis for theories already known from previously studied

material, a criterion for the truth of the knowledge gained in the course of a theoretical course.

3. Serves as an illustration of the studied phenomena, living contemplation, a means of revealing their practical applications.

Since a laboratory experiment, as a rule, is organized at the final stage of studying the corresponding topic, then, on the basis of its results, students evaluate their activities as a whole and individual actions, their successes and failures, and also make the necessary adjustments to the work done, fill in the gaps found, that is Ultimately, the quality of its professional training largely depends on how well the laboratory workshop is organized.

When organizing a laboratory workshop, the problem of duality includes three contradictions:

- The contradiction between the fundamental and the narrowly specialized;
- The contradiction between the requirements of the humanization of education and its natural-scientific and technical content;
- Contradiction between general and professional.

One of the main features of the modern educational process is the development of the personality of learners, their intellectual abilities, and creative potential. This is one of the prerequisites for their professional self-realization. Systemically, this task can be solved with the help of developing educational technologies, one of which is a laboratory workshop, but the following conditions must be met:

- systematic impact on the learner;
- a holistic approach when choosing a range of laboratory experiments;
- individual approach to trainees;
- activation of their own cognitive abilities;
- priority of the development of thinking, intelligence.

The following components of the structure of the act of conducting a laboratory experiment can be determined:

- the purpose of the laboratory experiment;
- object of measurement, assessment and correction;
- the standard with which the object is compared, the object is compared;
- the result of the experiment;
- evaluation criterion;
- assessment in the form of a detailed characteristic;
- formalized type of assessment (if the technology of conducting a laboratory experiment provides for such);
- means of correction;

- the result of correction as a new object of measurement (if the technology of the laboratory experiment provides for such).

Even before the advent of computers, serious efforts were made to create methodological and software support for the effective use of modern information technologies in the following main areas:

- Video versions of laboratory works in physics.
- Computer modeling of physical processes and phenomena in the framework of educational research work of students.
- Development of computer laboratory work.
- Computer processing and analysis of experimental data from laboratory work.

The search work of the presented direction is being tested on some of the students of the taught streams. Observation and analysis of learning outcomes showed that the use of the developed elements of information technology in teaching subjects:

- increases the visibility of training;
- raises cognitive activity;
- realizes the creative potential of students;
- allows students to better understand the essence of physical phenomena;
- teaches students to solve problems using modern computer technology, ie. is a powerful tool for the development of logical thinking in students, allows you to get the skills of setting and solving research and practical problems on the basis of fundamental physical education using modern computer technology.

The impossibility of conducting a real experiment for the following reasons:

- expensive equipment is used;
- a real experiment is dangerous for the health of students and teachers;
- high labor intensity and duration of full-scale execution;
- the complexity of mathematical calculations of the obtained experimental data;
- solving problems of researching processes, where it is impossible to use modern metrological equipment.

A computer simulator should be a comprehensive software for conducting automated practical classes with students of correspondence and distance learning. Therefore, he must:

- give brief information on theory, methods of problem solving, laboratory research;
- make it possible to organize the student's independent work;
- to ensure the possibility of operational self-control of the quality of acquired knowledge;
- to instill the student's research skills;
- be a single software package and meet all modern requirements for building computer

programs.

The shell of an electronic textbook is used as an environment for a computer simulator, which facilitates the viewing of hypertext information and has the following number of interface capabilities:

- its interface is endowed with content in the form of a tree, along which you can move in a chaotic manner;
- allows you to navigate page by page, both forward and backward, making bookmarks on the necessary pages;
- allows you to navigate through the bookmarks;
- has a glossary of basic terms. Moreover, each term is a reference to the place in the text where its definition is given;
- in places where certain modules are launched, there are corresponding links to them.

Thus, the modules, which have a single mathematical platform, make it possible to implement a computer simulator for any technical discipline.

An automated virtual laboratory practice should include visual and easy-to-learn electronic teaching aids necessary both to prepare for laboratory work and to write a report after the experiment and data processing.

The virtual laboratory should have simple navigation, which implies an easy transition to other subsystems of laboratory work in front of the visual menus and return to this section. The user-friendly interface, convenient for the perception of text and graphic information, makes the student want to work in this laboratory practice.

Conclusion

The set of necessary teaching materials and software should include:

- theoretical material of the topic, presented taking into account the student's independent study. Concise enough that it can be perceived directly from the monitor screen without the additional use of a hard copy;
- reference and regulatory material;
- test questions;
- recommended literature;
- descriptions, characteristics and photographs of devices. This section contains technical specifications and photographs of the device and a description of its use;
- detailed methodological instructions for conducting laboratory or practical exercises with illustrations;
- two videos: one high quality and the second medium quality (to save traffic). These videos show an experienced teacher conducting an experiment. The student has the opportunity

to see the device in action and the procedure for conducting laboratory work in real time;

- an emulator program.

The effectiveness of distance learning for specialists will increase if:

- when organizing a laboratory workshop, network and case remote technologies will be used;
- a form of software implementation of network and case technologies is the student's virtual laboratory;
- use samples to perform laboratory experiments in the duty station.

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