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Multimedia Electronic Educational Resource for Students of Technical Fields

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Abstract

The article considers the conceptual and structural features of the multimedia electronic educational resources (EER) "Fundamentals of Power Supply", created on the basis of the educational and methodological complex. Multimedia ESM combines text, sound, video images and computer models of technological processes and principles of their visualization and measurement in a computer system. Multimedia EER consists of the content of the academic discipline (lectures, assignments of practical and independent work, descriptions and guidelines for laboratory work), means of self-control and control of the acquired knowledge and the communication environment of the participants.

Keywords: *Computer Model; Technological Process; Multimedia; Innovative Technologies; Simulator; Training Stands; Modeling*

Introduction

The use of information technology in the learning process becomes effective only if educational institutions have appropriate hardware (computers, projectors, interactive whiteboards, etc.) and modern (EER), which are educational materials of the discipline (block of disciplines) [1-3]. Designing an innovative EER from the creators requires a fairly high level of forcing competencies. The choice of learning technology, from among a huge range of interactive innovative technologies, should correspond to the goal and the expected results of mastering the discipline (block of disciplines). Since, EER is a set of didactic methods, combined in a technological chain and software and hardware tools that provide the collection, processing, storage, distribution and display of an educational resource in order to reduce the complexity of the use processes, as well as increase their reliability and efficiency [4]. The combination of textual and graphic audio-video information in electronic educational resources with computer simulations of technological processes and technical means of their quantitative assessments (lab benches with remote access, virtual simulators, etc.) dramatically improves the quality of the educational information presented and the success of their development by students. EER of this kind, increases the visibility of the educational process, perform control of the learning process, contribute to the formation of students' internal mechanism of self-control and motivation for learning, i.e., are interactive. It has

been experimentally established that the presentation of educational material with the help of visual demonstrations in safe learning environments increases the perception and processing of information by 100 times compared to oral presentation [5]. The exercise of visibility requires a safe and secure educational learning environment. Even special training stands are not a safe and reliable educational environment. At the same time, virtual simulators created using simulation software, consisting of computer simulators of various measuring instruments and more complex technical devices, most meet these requirements.

Main Part

In the traditional organization of the educational process, EER is used only as a way of transmitting information in lectures and seminars (a one-way form of communication, i.e. the teacher transmits information and then plays it back to students, the student only reads, hears, taking only the position of the perceiver) [6]. When organizing the educational process with interactive teaching methods, the most effective EER with the above characteristics. Interactive learning, the essence of which involves the organization of cognitive activity and the way of cognition in the form of joint activities of students, students and a teacher. In the work of the teacher, priority is given to dialogic methods of communication (exchange of information with each other, cooperation in solving the problem, joint solution of the problem). Now the activity of the teacher gives way to the activity of the students, the teacher creates the conditions for their initiative [7-8]. Such activities of the teacher contribute to the development of personal characteristics of students (spiritual unity, a sense of success and intellectual viability).

This paper describes the conceptual and structural features of the multimedia EER "Fundamentals of Power Supply", developed and improved by the faculty of the Department of “Power Engineering” of the Karakalpak State University named after Berdakh and the Department of “Power Supply” of the Tashkent State Technical University on the basis of the educational and methodological complex. The term "multimedia", in this case, means modern computer technology that combines text, sound, video images and computer models of technological processes and the principles of their visualization and measurement in a computer system. When designing a multimedia EER, the choice of innovative and interactive learning technologies was carried out in accordance with the goals set and the expected results of mastering the discipline (module). An innovation in a multimedia electronic educational resource, in our opinion, is the provision of lecture materials, practical tasks and laboratory work for various interactive methods.

A multimedia electronic educational resource consists of the content of the academic discipline (lectures, assignments of practical and independent work, descriptions and guidelines for laboratory work), a means of self-control and control of the acquired knowledge, and a communication environment for participants.

The creation of a content part of a multimedia EER, where several didactic requirements were required, is the most time-consuming. On the one hand, it was required that the volume of the theoretical material of each lecture in the offline form of training corresponded to the time limit allotted for the presentation of new material, on the other hand, the creation of the most effective communication with students with the inclusion of all channels of perception (visual, auditory and kinetic). Lectures, the main element of the content, are a set of theoretical material, where the introduction is presented in the form of an extended annotation of the topic being studied, at the end of which the topics of the sections of the lecture and assignments for self-study are given. Most of the lectures are based on the method of problem-based learning. At each section of the lecture, one question is considered, and at the end of which the question of the next section or task is formulated. Such a structure of lecture sections, in our opinion, creates additional motivation for studying the next section of the lecture or independent work. Lectures become like a dialogue, teaching imitates a research process based on the principle of independent

analysis and generalization of educational material by students. In other words, multimedia EER, stimulating the solution of the problem, "achieves" from students an independent solution to the problem [9].

The theoretical material corresponding to the topics of the lecture from the main textbook is also placed in the form of a single Word file, pdf, Power Point presentation, Flash presentation, etc.

It is known that the presentation of educational material with the help of visual demonstrations in safe learning environments increases the perception and processing of information by 100 times compared to oral presentation [10]. The effective implementation of visibility requires a safe and secure educational learning environment. Even special training stands, controlled by software, various technical devices are not completely safe and reliable. These requirements are best met by simulators modeled for the analysis of specific situations, consisting of computer simulators of various measuring instruments, technical devices and more complex mechanisms. With their help, it becomes possible to illustrate abstract concepts and aspects of real processes that cannot be carried out in a natural way due to the high cost of the necessary technical support or the scale of the process being studied. When demonstrating complex processes, computer models can be stopped at difficult stages, back to the beginning and repeated again, even addressing the most difficult issues at any convenient time.

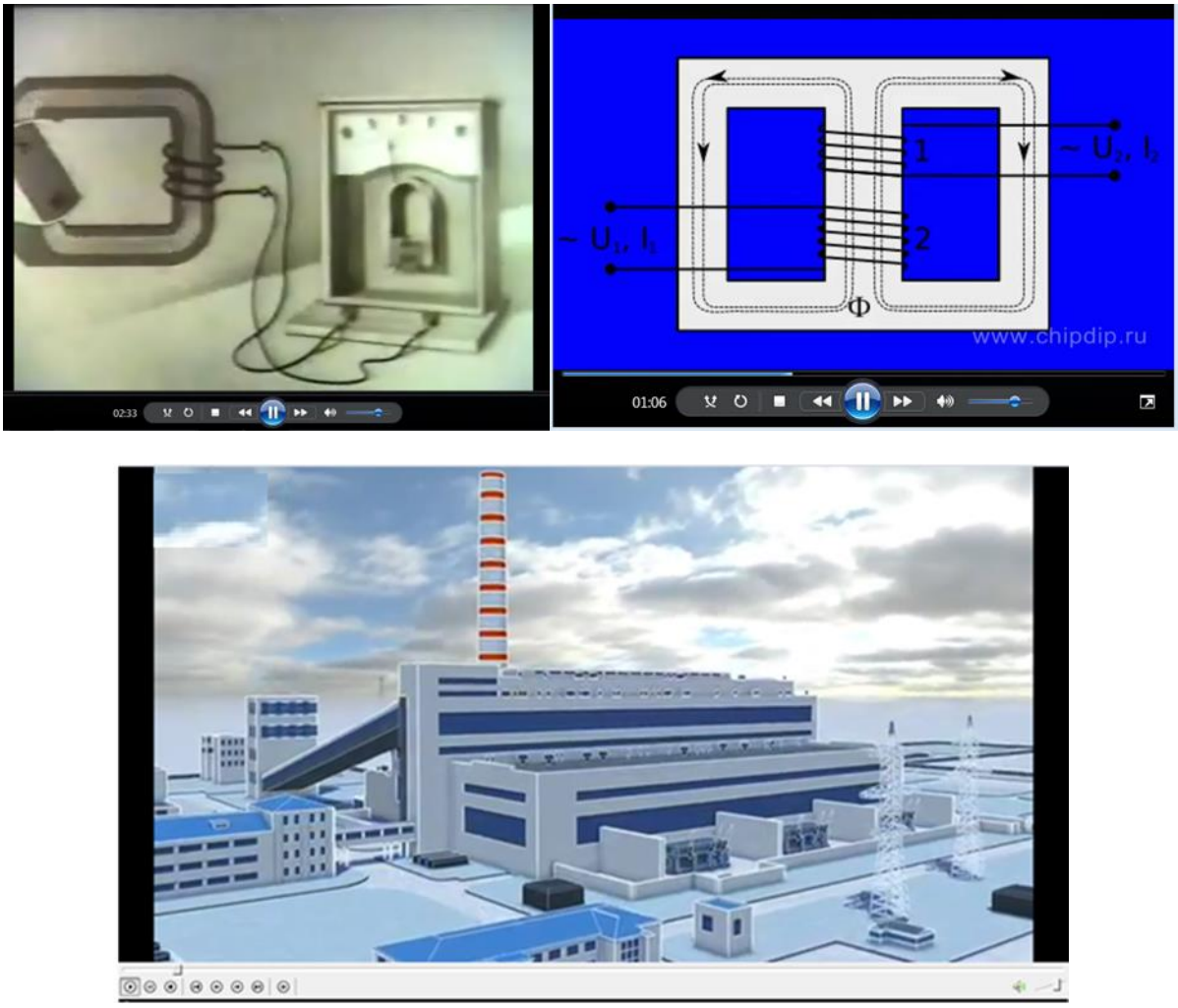

Figure. 1. Frames from computer simulations used to demonstrate the elements of an electrical network

The educational material intended for practical classes consists of thematic tasks, methodological instructions for completing these tasks and examples of solutions. The structure of the resource allows for offline and online classes using interactive technologies. Using the techniques of these methods, situations are created that are typical for their future professional activities, the resolution of which requires specific skills and competencies [11]. There is an opportunity for an individual approach to checking and evaluating the results of students' learning activities. For these purposes, tasks are used that are aimed at summarizing the content of the studied material in the form of a thesis, at identifying the essential features of the process being studied, at a verbal description of graphically presented technological schemes or depicted schematically (in the form of a table, figure, diagram and in other graphic forms) verbally described tasks. Students send a photo of the manuscript for verification of the answer, the teacher evaluates them in accordance with the established rating scale.

Reporting of independent work is carried out in the form of writing an essay or report, and the teacher evaluates them in accordance with the established evaluation scale.

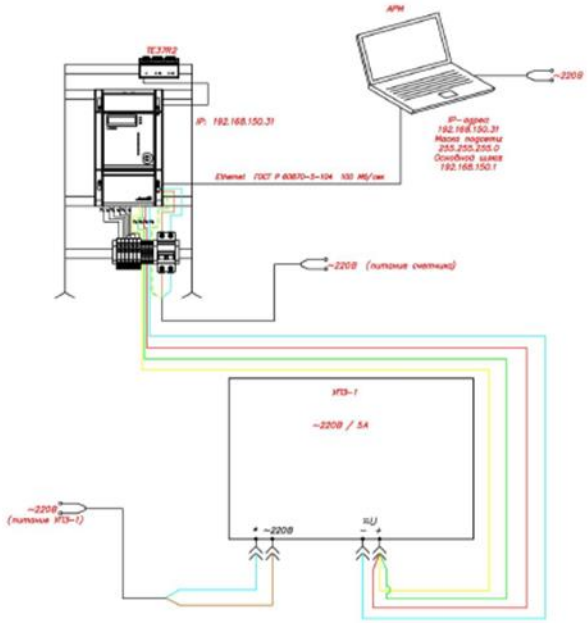

Figure 2. Structural scheme of the laboratory training stand

Laboratory work is equipped with brief descriptions of the process under study, used by real technical installations and its computer models (simulators), instructions for performing laboratory work in real and computer simulators. Virtual hardware - technical means (electrical measuring instruments, training stands) are created with the help of engineering systems for designing and analyzing electronic circuits. At the same time, systems were chosen with an easy-to-use interface and the ability to work with a large number of computer peripherals, such as Electronics Workbench, DIgSILENT Power Factory, Crocodile Phet and MathLab. Virtual electrical measuring instruments and installations have an appearance and controls that completely imitate their prototypes.

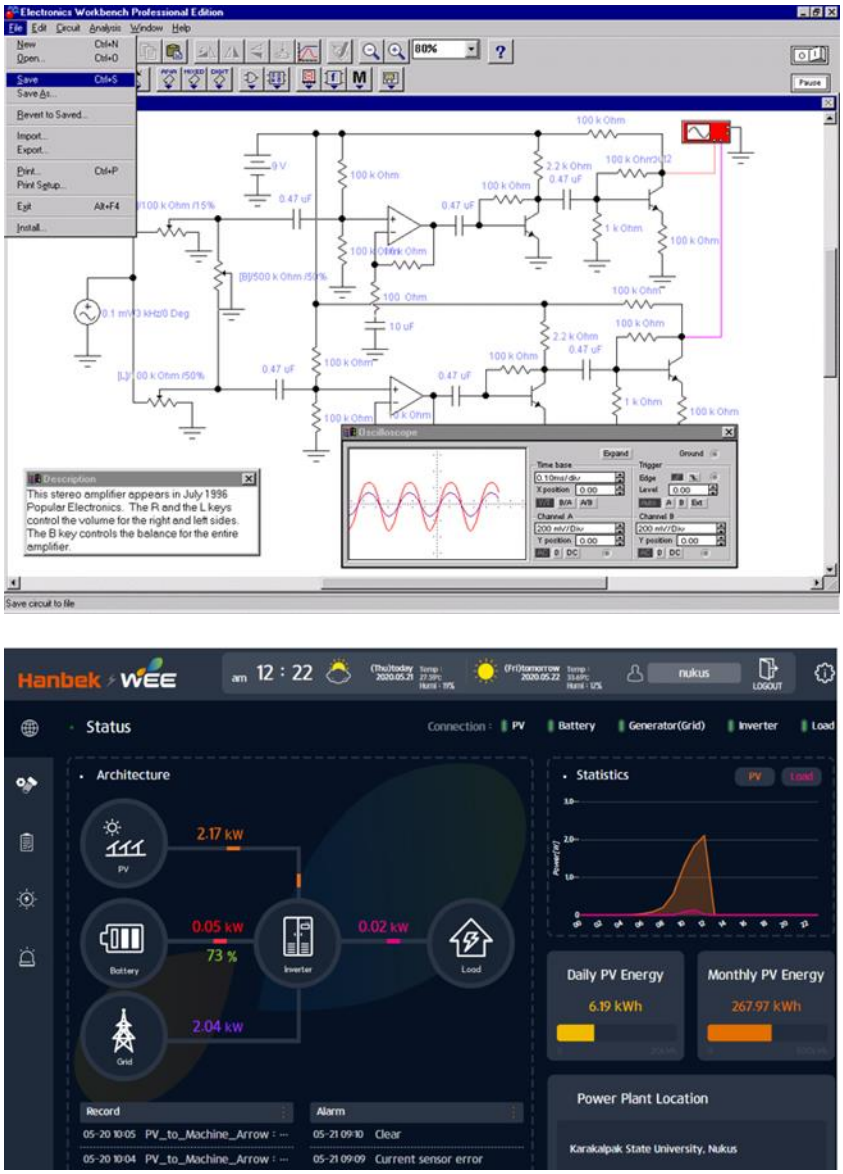

Figure 3. Working windows of computer simulators used in the performance of laboratory work

Conducting laboratory classes using virtual simulators, the teacher provides students with the opportunity to create and analyze various extreme situations, even erroneous ones. Computer simulators have the ability to repeatedly perform part of the laboratory work until a certain skill or skill is formed. Analysis of the results of laboratory work performed in virtual simulators contributes to the formation of decision-making skills in various situations, including extreme ones.

The report of the work performed is sent for verification and evaluation by the teacher in accordance with the established evaluation scale in the form of an independent file.

Conclusion

The multimedia EER uses many interesting tools aimed at assessing the level of knowledge. The interactive technologies used in the EER, in our opinion, make it possible to organize the control of the learning process, and to form the student's mechanism of internal self-control and motivation for learning. The teacher can independently create a test using the appropriate shell - a system for creating tests and

using computer testing using individual consoles in a short period of time to record, analyze the result of the work done, return to the completed task, work on mistakes. Small in volume, but in an interesting form for students, diagnostic control is distributed in all types of educational activities. Means of control of this nature allows not only to evaluate the acquired knowledge, skills, abilities, but also to provide the necessary assistance to improve further learning outcomes.

Thus, the created multimedia EER has the following qualitative characteristics:

1. Informativity: the ability to give the user the information necessary to study the object, the depth and nature of which are determined by the didactic purpose of the educational activity.
2. Visibility: the information obtained in the process of working with the model should have a form that is convenient for perception (dividing information into portions of the optimal volume, highlighting the most significant elements in it, choosing the rate of its presentation, using different types of information communication (texts, formulas, graphs, drawings) and etc.).
3. Dynamism: observation on the display screen of the image of various phenomena in their movement, development.
4. Variability of parameters and modes of operation: the ability to choose the mode and pace of work, repeat the elements of the demonstration and change the parameters of the object under study in one sequence or another.

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