

ELECTRONIC EDUCATIONAL RESOURCES CREATED ON THE BASIS OF INFORMATION AND COMMUNICATION TECHNOLOGIES ARE THE FOUNDATION OF AN INNOVATIVE LEARNING ENVIRONMENT

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Annotation: This article analyzes the role and significance of electronic educational resources created on the basis of information and communication technologies (ICT) in shaping an innovative learning environment. It highlights the impact of electronic textbooks, virtual laboratories, digital simulations, distance learning platforms, and interactive learning materials on the modern educational process. The mechanisms for creating electronic educational resources, their pedagogical effectiveness, and their potential for individualizing the learning process are also examined. The article concludes with recommendations and promising directions for the effective use of electronic educational resources.

Keywords. Information and communication technologies, electronic educational resources, innovative learning environment, digital education, distance learning, virtual laboratory, interactive materials, digitalization, educational innovations.

Introduction

One of the urgent tasks facing higher education institutions today is the training of highly educated, culturally developed, highly qualified, and competitive specialists in our country. Fulfilling these tasks, in turn, requires improving the efficiency of education in higher education institutions and utilizing the possibilities of modern information and communication technologies to develop professional knowledge, skills, and competencies in future specialists. This process has a significant impact on creating fundamental changes and new perspectives in the thinking of students, who constitute a considerable part of society. Improving the content of education and organizing the learning process based on pedagogical technologies built on modern information and communication technologies is a requirement of this rapidly evolving era. If the opportunities of information and communication technologies and pedagogical technologies are effectively utilized in education, and if higher education institutions consistently implement the use of new-generation educational literature and teaching aids created in accordance with state educational standards and qualification requirements, this will lead to an increase in the quality and effectiveness of education. The main goal of applying information and communication technologies in education is to develop the learner's personality and prepare them for independent and productive activity in an information-driven society, which includes: developing

logical, constructive, and algorithmic thinking through interaction with computers; enhancing creative thinking by reducing the role of reproductive activity; developing communication skills through collaborative project work; forming the ability to make optimal decisions in complex situations; developing research and inquiry skills while working with modeling software; and cultivating information culture.

Modern information and communication technologies provide learners with access to non-traditional information sources, increase the efficiency of independent study, and offer new opportunities for creativity and the acquisition and reinforcement of professional skills. They also enable the implementation of new forms and methods of teaching by applying mathematical and conceptual modeling tools to various phenomena and processes. Educational modeling allows the visual representation of the studied object, increases students' interest in this form of learning, and helps them study the material more thoroughly by observing processes dynamically. Since modeling itself is an educational goal in several disciplines, software tools that allow teachers and students to develop and modify learning models in an interactive mode without the need to create programs have been developed and continue to emerge. Teachers gain additional opportunities to support the development of the learner's personality, foster collaborative creative work, and develop and select new versions of educational programs. The wide-ranging application of information and communication technologies in the educational process of higher education institutions positively influences students' development as qualified specialists in their chosen fields. It also contributes to the improvement of key qualities such as independent work, self-education, self-management, increased initiative, and the ability to make quick and independent decisions. Through the use of the didactic capabilities of information and communication technologies, students gain access to a vast flow of information, their thinking abilities improve positively, and they can utilize ready-made electronic educational resources available on the Internet.

Main Part

Electronic educational resources are teaching tools designed to partially or fully automate the learning process using computer technologies. They are considered one of the promising forms for increasing the effectiveness of the educational process and are used as teaching tools based on modern technologies. The quality of the technological stage also depends on compliance with the following requirements: completeness, consistency, and relevance of the resources to the content of professional education; individualization of the learning process; consideration of the continuity and integrity of education; availability of necessary information within the resources; adaptation and continuous updating of resources according to professional education content; and identification of the main components and the ways they interact with one another. The technological stages of electronic educational resources are associated with the development of components that facilitate the organization of

practical activities, allow the measurement of learning outcomes, and provide reference materials for teachers and learners. These components include: questions for self-control and self-assessment for each topic, chapter, section, and the entire course; training exercises and assignments; test tasks and questions for knowledge assessment; lists of topics for essays or final project work; approximate lists of final exam questions for the entire course; Internet resources (virtual electronic libraries, educational websites, and informational platforms); materials stored in the institution's media center (previously created electronic teaching aids, multimedia tools, etc.); chronological indicators; and glossaries. Electronic educational resources are divided into two groups: those available directly to the learner or within a local network, and those located on the Internet (on global network servers). The method of presenting information in electronic educational resources imposes specific requirements on the technology used to create them. In this process, the computer serves as the main didactic tool. Along with various educational software, there is a need for an integrated interactive course that fully presents all learning information. Interactive tools allow combining different types of media—text, static and dynamic graphics, video, and audio—into a single complex and turn the learner into an active participant in the learning process. The programming systems used to create the local components of electronic educational resources allow access to Internet resources by integrating networked and local electronic learning tools. Any form of teaching requires the creation of a psychological-pedagogical foundation. Without this, it is impossible to speak about the success and effectiveness of the learning process. Therefore, when using electronic teaching tools, it is necessary to take into account several psychological principles that affect teaching success and quality. The issue of considering human psycho-physiological characteristics occupies a central position in implementing the technology of creating electronic educational resources. The success of teaching largely depends on the characteristics of sensory-perceptual processes that organize information retention and retrieval and determine information perception. Modern teaching technologies based on information and communication technologies have great potential. However, fully integrating electronic educational resources into the learning process requires a serious reconsideration of the human–technology interaction problem. Here, the discussion refers to a biotechnical system in which the flow of controlled information is distributed in a particular way. The complexity of such a system can be extremely high if the psycho-physiological capabilities of the learner are not adequately considered. Practice shows that this may lead to a decrease in the effectiveness of the teaching process. In fact, this often becomes the reason why certain electronic educational resources are abandoned. The amount of information presented to the learner within a specific period depends on their individual characteristics. Although there are formal methods for determining the existing level of knowledge, an experienced teacher “intuitively” senses the

learner's preparedness and emotional state and adjusts the lesson accordingly. However, this is one of the main challenges in creating and implementing electronic educational resources, because a computer cannot take into account a learner's emotional condition. The situation is further complicated by the fact that information perception consists of several stages. The amount of information processed by a person within a certain time may lead to informational overload. Whether this overload has a positive or negative effect depends on the balance between orientation and protective reactions. Information overload is considered positive when it triggers orientation reactions while minimally activating protective reactions. This shows that high teaching efficiency can be achieved only when informational overload does not occur. Despite the importance of independent work supported by electronic educational resources, the main subjects of the learning process remain the learner and the teacher. Equal participation of the learner in cognitive activities alongside the teacher is one of the essential conditions for high-quality education.

According to A. V. Osina, the foundation of informatization of education can be presented in the form of a pyramid consisting of electronic educational resources, telecommunications, computers, and implementation of learning outcomes.

E. G. Azimov also identifies electronic educational resources, technical equipment, and teacher training as essential components of successful informatization of education and considers all components equally important.

The leading role of electronic educational resources is determined by their emergence and implementation in the learning process, which changes the structure of informational interaction between teachers and learners. The need for active technical equipment in educational institutions and the processes of training and retraining pedagogical staff are indispensable conditions for informatizing education and, at the same time, necessary until the educational process built upon electronic resources proves its efficiency. In modern methodology, the classification of electronic educational resources is considered, and this study identifies the typology and terminology adopted in research.

According to A. D. Garsova, the electronic system of educational tools has the following architecture:

- educational-methodical complex
- electronic textbook
- educational-methodical simulator (practicum)
- assessment software (tests)
- presentation-type programs
- informational-reference programs
- multimedia educational games

In the study by A. I. Bashmakov and I. A. Bashmakov, the authors propose the classification of computer-based educational tools based on: the nature of the subject;

pedagogical tasks being solved; the scope of learning material; level of education; use of telecommunication technologies; forms of information presentation; characteristics of the model of the studied object or process; and the form of the user interface and intellectual functions.

From the perspective of solved pedagogical problems, they identify:

- theoretical and technological training tools (computer textbooks, computer teaching systems, computer-based knowledge assessment systems)
- practical training tools (computer problem sets, computer simulators)
- auxiliary tools (computer laboratory practicum, computer reference tools, multimedia lessons)
- complex tools (computer learning course, computer reconstructed course)

They also categorize electronic educational resources into the following groups:

- drill-and-practice computer programs
- Internet-based communication software tools
- testing systems
- multimedia informational systems
- electronic textbooks
- subject-specific information and databases and reference resources.

The diversity of terminologies and classification parameters of electronic educational resources complicates pedagogical research. Therefore, it is advisable to classify them into larger groups by examining their components in detail. The classification proposed by A. V. Osina and A. N. Bogomolov is considered most appropriate.

Excessive use of electronic educational resources may have negative effects on learners, such as reduced human interaction, increased dependence on information and the Internet, and social isolation. Overloading learners with too much information may negatively affect learning outcomes and health. Such overload may lead to poor mastery of the material, loss of focus, reduced emotional and intellectual capacity, and chronic fatigue syndrome. Some researchers also include long-term computer use and technical factors among the negative aspects of electronic educational resources.

In addition, several problems hinder the creation and development of a unified system for the widespread use of electronic educational resources:

- lack of high-quality electronic educational resources aligned with state standards, curricula, and pedagogical practice
- lack of convenient and well-tested methods for using electronic educational resources
- absence of a comprehensive teacher motivation system that encourages the implementation of electronic educational resources.

This study focuses on solving several problems related to forming an electronic information-educational environment, creating a scientifically grounded scenario, and

developing an electronic educational simulator model designed to prepare learners for professional activities. This, in turn, implies the development and implementation of a new teaching tool in educational institutions and the creation of methodological guidelines that form a part of a unified system of teacher support.

Conclusion

Electronic educational resources created on the basis of information and communication technologies are becoming an integral component of the modern education system. They play an important role in effectively organizing the educational process, individualizing learners' activities, developing independent learning skills, and increasing learning motivation. Electronic textbooks, virtual laboratories, interactive multimedia materials, and distance learning platforms significantly enhance the quality and convenience of the learning process. As highlighted in the article, it is essential to ensure the harmony of pedagogical requirements, technical capabilities, and didactic approaches during the development of electronic educational resources. In addition, improving teachers' ICT competencies and expanding digital infrastructure in educational institutions are crucial factors that enhance the effectiveness of the electronic learning environment. Overall, electronic educational resources facilitate the formation of an innovative learning environment, help adapt the teaching process to modern requirements, and raise the quality of education to a new level. Therefore, continuing scientific and practical work on the creation and improvement of these resources remains one of the urgent tasks for the development of the education system.

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