Application Of Electronic Information And Educational Environment In Innovative Educational Activities

Yuliia Taranenko†, Nataliia Buhaiets††, Rymma Kyrychenko†††, Daryna Cherniak†††
Ruslana Mnozhynska†††, Iuliia Paskevska††††

†Berdyansk State Pedagogical University, Ukraine
††Nizhyn Gogol State University, Ukraine
†††Kyiv National University of Technologies and Design, Ukraine
††††Volyn National University named after Lesya Ukrainka, Ukraine

Summary

The article deals with the theoretical and methodological foundations of innovative approaches in the modern education system. The issues of introducing computerized and telecommunication technologies are characterized, which allow switching to distance learning (DL), which is a promising form of the system of open education support in the modern educational process. Special attention is paid to the study of practical technologies of vocational training and the activities of a teacher and innovative areas of vocational training of students.

Key words:
higher education, competencies, education system, information competence, computer technology

1. Introduction

Modern strategic guidelines in the development of the economy, politics, social sphere cause changes in the requirements of the state and society for education. The system of higher professional education is ready to respond to the challenges of the time while maintaining the existing fundamentality and multicultural priorities.
In order for the higher education system to be ready to take on the challenges of the 21st century, certain transformations are needed based on the use of modern information technologies. Many scientists working in the field of education, in this regard, place special hopes on the creation and maintenance of information and educational environments for open and distance learning, on the development of electronic textbooks and multi-agent technologies for educational portals.
Of particular note is the possibility of using such an educational environment for the purposes of teaching students with disabilities. The combination of electronic textbooks, distance education tools, educational portals and specialized social networks will provide the most complete educational process.
Each student during the entire period of study must be provided with individual unlimited access to one or more electronic library systems (electronic libraries) and to the electronic information and educational environment of the organization. An electronic library system (electronic library) and an electronic information and educational environment should provide access for a student from any point where there is access to the Internet, and meeting the technical requirements of the organization, both on the territory of the organization organization, as well as outside it.
The electronic information and educational environment of the organization should provide:
- access to curricula, work programs of disciplines (modules), practices, to publications of electronic library systems and electronic educational resources specified in work programs;
- fixing the course of the educational process, the results of intermediate certification and the results of mastering the main educational program;
- conducting all types of classes, procedures for assessing learning outcomes, the implementation of which is provided for using e-learning, distance learning technologies;
- the formation of an electronic portfolio of the student, including the preservation of the student's work, reviews and assessments of these works by any participants in the educational process;
- interaction between participants in the educational process, including synchronous and (or) asynchronous interaction via the Internet.
Thus, the main task in the article is to consider the organization of the information and educational environment on the example of disciplines in the context of the specialty Information Technology.

Manuscript received July 5, 2022
Manuscript revised July 20, 2022
https://doi.org/10.22937/IJCSNS.2022.22.7.45

2. Theoretical Consideration

The basis of the considered information-educational environment is an electronic educational resource - an electronic textbook. For all electronic textbooks developed within the framework of this project, certificates of state registration of the computer program have been received. Developments were presented at various competitions and exhibitions.

It is the electronic textbook that is the link that allows you to combine various educational and information resources, as well as tools distance education and means of knowledge quality control. An electronic textbook is made in the form of a CD or DVD disc, with which the student can work both during classes at the university and at home, and is also available to the student in the library.

It should also be noted that at the moment, active work is underway to develop such textbooks for mobile platforms, which will significantly expand them scope and ease of use.

The electronic textbook is a full-featured educational and methodological resource, which consists of several main parts, which include:

– Work program for the studied discipline;
– The theoretical part, which sets out the content of the subject;
– Course of laboratory work, with assignments;
– Course of practical training;
– Materials for independent work of students;
– Educational software;
– Educational videos;
– Reference literature.

Theoretical materials are presented in the form of files in the electronic documentation format - pdf, which is most suitable for technical disciplines due to the presence of a large number of formulas and symbols. To conduct classroom classes, a set of presentations has been developed, which allows students to get acquainted with the theoretical part of the studied disciplines in the most accessible and visual form.

An electronic textbook has all the basic properties that educational and methodological materials should have, namely:

- completeness of presentation, defined as compliance with the accepted curriculum of the discipline;
- the availability of the presentation of the material;
- the scientific nature of the content, reflecting the compliance of the content with the current state and the latest achievements in the relevant scientific field;
- consistency and consistency of presentation of the material.

In addition, it also has a number of specific properties, such as:

- Figurativeness;
- Interactivity;
- Adaptability;
- Intelligence.

Due to the combination of the above properties, the speed and quality of assimilation of educational material increases, and the use of modern tools also allows expanding the possibilities of presenting educational material [6].

Another important component of the information and educational environment is the availability and active use of educational portals. In this case, the portal can be understood as oriented towards user information Web - a system with a single point of access for each specific user to a variety of information related to the discipline. Users access the portal using browsers located on client computers. In the project under consideration, there are two types of educational portals, firstly, it is directly the portal of the university, which provides access to educational and methodological materials on the discipline and library system. And finally, the third cornerstone of the information and educational environment is the course in the distance learning system. The system is built on the MOODLE platform and is a set of technologies that provide delivery to students of the main volume of the material being studied, interactive interaction between students and teachers in the learning process, providing students with the opportunity to work independently to master the material being studied, as well as in the learning process [2].

Modern distance learning is based on the use of the following main elements:

- information transmission media (mail, information communication networks);
- methods dependent on the technical environment for information exchange.

The use of distance learning technologies allows:

- reduce the cost of training (no expenses for renting premises, trips to the place of study, both for students and teachers, etc.);
- to train a large number of people;
- improve the quality of education through the use of modern tools, voluminous electronic libraries, etc.;
- create a unified educational environment (especially important for corporate training).

The introduction of this educational and methodological project made it possible to transfer the educational process to a new qualitative level, increase the interest of students in the development of educational materials, and also increase the competitiveness of graduates in the labor market.

Let's consider distance learning technologies in engineering education in more detail: implementation conditions, tasks and problems. In the context of global informatization, the tasks of training, education and certification of personnel acquire new features and opportunities.

The goal of improving education today is the widespread use of information and telecommunication technologies that allow achieve comprehensive openness, flexibility, individualization and continuity of education [5]. In such a system, the educational process is built on the basis of individual curricula and programs with a free choice of time, pace and place of study.

Fundamental difficulties in the implementation of open education most often arise in the system of natural science and technical education, since here full-fledged training of specialists is impossible without practical training of students in educational laboratories, and at the final stages of training - without involvement in scientific research. It is known that laboratory workshops are the most expensive type of educational process, requiring for their implementation about 80% of all costs for the training of engineers.

material and technical base for the educational process. The lack of laboratory equipment and limited access to it do not allow for the preparation training of highly qualified personnel at the modern level.

This circumstance is also connected with the fact that the funds allocated in the 80s ... 90s of the 20th century for the development of the material and technical base of universities turned out to be clearly insufficient. These funds were not enough not only to equip the laboratories with modern instruments and equipment, but also to maintain the technical stands that were already in the material and technical base providing the educational process.

The introduction of computerized and telecommunication technologies makes it possible to switch to distance learning (DL), which is a promising form of an open engineering education system. It is based on the use of modern information technologies, while it is necessary to use only those technologies that are most effective in teaching. When conducting distance learning, information technologies should provide:

- delivery to trainees of the main volume of the studied material;
- interactive interaction between students and teachers in the learning process;
- providing students with the opportunity of independent work on the assimilation of the studied material;
- assessment of the knowledge and skills of students obtained in the learning process.

However, there are at least three problems:

- the effectiveness of distance education (due to the territorial distribution of students and tutors);
- information and technological security of part-time students and information security of educational institutions of distance education (due to the fact that educational information and teaching methods, as a rule, are of a confidential, original and commercial nature);
- the quality of educational and methodological materials, and especially for engineering education as the most science-intensive and "equipment-intensive".

The quality (value) of educational information is understood as a set of internal and external properties of information that characterize the degree of its compliance with the needs (goals and values) of users (trainees, tutors, etc.).

The main issue in the development of educational and methodological materials should be considered the choice of criteria that they must meet in order to achieve the goal - without the participation of a teacher, to develop the student's level of mastering the content of the discipline to the level determined by the federal state educational standard of higher education [6].

The biggest problem for high-quality DL in engineering disciplines is the performance of laboratory work, since the development of a theoretical course of disciplines is accompanied by their obligatory passage, which allows [12]:

- develop the skills of independent work (fix the connection between theory and practice in the mind, contribute to a deep disclosure of the physical essence of theory issues and their assimilation);
- provide confirmation and illustration of the theory in experiments.

Moreover, the amount of laboratory work performed should be necessary and sufficient for studying the discipline and, as a rule, more than students perform in examination sessions with traditional distance learning technologies.

When performing laboratory work, students must:

- get acquainted with the working schemes of the installations;
- to study the design of machines and devices;
- get acquainted with the methods of testing and research, with the technique of experimentation;
- to learn how to work with devices;
- to analyze the received data;
- draw the necessary conclusions.

Conclusions

Thus, the transition of teaching with the use of distance technologies to engineering disciplines is possible provided that remote real measurements and control of a physical experiment are provided.

When creating a remote access laboratory, two main stages can be considered that allow you to organize the educational process in the most optimal way.

First stage. The creation of an automated information measuring and control system for an installation, stand or laboratory layout is a necessary condition for local automation of a remote access laboratory. This requires the use of special technical means - a control computer

(laboratory server) connected to the bench through an interface device with the object [9, 10], various sensors and actuators, conversion and matching modules, etc.

The basis of the remote laboratory is a laboratory server, the connection of laboratory units to which is carried out by means of input / output devices installed either on its motherboards or connected via the corresponding ports (COM, USB).

The main requirements for any measuring device are the provision of input / output of information, data analysis and visualization of results. The main difference between virtual and traditional instruments is the flexibility in the construction of measuring systems, which are provided by the user depending on the requirements of the problem being solved, the computer platform used, the need saturation of the system.

Second phase. Providing remote access to the installation to a researcher or student. To do this, the local automated installation system is interfaced with network and telecommunication resources (local, mobile, global networks).

The functioning of the remote access laboratory is carried out according to the client-server principle. Access of remote users (students or teachers) to laborator resources (LR) is carried out through the global network Internet.

Thus, to implement a remote access laboratory, it is necessary to ensure the transfer of data between remote users, as well as the management of distributed laboratories. To manage the educational process within the framework of the remote access laboratory, it is necessary to integrate the system with the corporate educational process management system of the university.

The transmission must be provided in two sections:

– global network Internet (remote user – the main server of the system);

– local computer network of the university (the main server of the system university is a laboratory resource).

The software (software) for the functioning of the remote access laboratory should, on the one hand, serve in an interactive mode the dialogue of the remote user with the main server when setting the conditions of the experiment, and on the other hand, implement the specified mode on the stand and broadcast the results of its execution on remote computer. In addition, the specialized software developed for the remote access laboratory should also provide methodological support for the laboratory works, i.e. description of the laboratory stand, measurement technique, various reference materials, etc. Obviously, most of the software is original, written in high-level languages specifically for this workshop; when creating it, for example, graphical programming tools can be used [8].

Thus, based on our research, we can identify the main conditions necessary for the implementation of the information and educational environment in

parts of the implementation of distance learning technologies [3, 11]:

1. Developed material and technical and information and methodological base. This includes the availability of software and a single server for distance learning of an educational institution, which hosts electronic educational and methodological complexes, which, in turn, includes a study schedule for a semester, a working curriculum for each of the disciplines, educational and methodological materials for each discipline of the semester. It is also supposed to provide the means of such a server with the possibility of holding webinars, the availability of virtual laboratories for the needs of certain areas, specialties, etc.
2. Qualified teaching staff.
3. Regulatory and organizational base.

On the part of the student, respectively, it is necessary to have access to a personal computer with a set of necessary software and access to the Internet. To perform laboratory work in a remote access laboratory, you must have an Internet connection channel with a sufficiently high bandwidth.

It is necessary to highlight the main advantages of learning using distance learning technologies that were discovered in the course of our analysis:

1. Stimulate the cognitive activity of the student himself, which, in turn, correlates with the competency-based approach [9].
2. They allow to be trained outside the professional activity of the student, giving him the opportunity to receive education in this way

another specialty or to improve the level of his professional qualifications.

3. Solve the problem of the lack of distance learning full-time forms of conducting classes, allowing you to organize remotely various forms of conducting classes, including interactive ones.

References

[1] Gofen A., Blomqvist P. Parental entrepreneurship in public education: a social force or a policy problem?, Journal of education policy, 2014, № 29 (4), pp. 546–569. 61.

[2] Grant W. Pressure Groups, Polities and Democracy in Britain. Homel Hempstead, Harvester Wheatsheaf, 2011, 230 p.

[3] Meera N. S. Quality education for all? A case study of a New Delhi government school, Policy futures in education, 2015, № 13 (3), pp. 360–374.

[4] Sosenski S. Financial Education for Children: School Savings Programs in Mexico (1925–1945), Historia Mexicana, 2014, № 64 (2), pp. 645 – 662.

[5] McMillan R. Man Builds Twitter Bot That Humans Actually Like. Wired. URL: wired.com/2012/06/twitter_arm/

[6] Ktepi B. Deception in political social media // ed. K. Harvey. Encyclopedia of social media and politic. Vol. 4. Thousand Oaks, CA: SAGE Publications. P. 357-359.

[7] Iasechko S., Pereiaslavska S., Smahina O., Lupei N., Mamchur L. and Tkachova O. (2022) Artificial Intelligence In The Modern Educational Space: Problems And Prospects IJCSNS International Journal of Computer Science and Network Security. Vol. 22 No. 6, pp. 25-32.

[8] Rampton S ., Stauber . J . Trust us! We're experts: How industry manipulates science and gambles with your future . Tarcher. 2002.

[9] Iasechko, M., Shelukhin, O., Maranov, A. Evaluation of The Use of Inertial Navigation Systems to Improve The Accuracy of Object Navigation. International Journal Of Computer Science And Network Security, 21:3, 2021, p. 71-75.

[10] The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (or STCW) //IMO 4 AlbertEmbankment, London SE1 7SRUK«CPI BooksLimited»,third edition. Reading RG1.

[11] S. Piskunov, M. Iasechko, O. Yukhno, N. Polstiana, Y. Gnusov, K. Bashynskyi, A.Kozyr. (2021). Application Of Probability Filter For Maintenance Of Air Objects. IJCSNS International Journal of Computer Science and Network Security. Vol. 21 No. 5, pp. 31-34.

[12] Kotler P., Lee N. Corporate social responsibility: Doing the most good for your company and your cause. Hoboken, New Jersey: John Wiley & Sons, Inc., 2005.