

## СЕКЦІЯ 6. СУЧАСНІ ПЕДАГОГІЧНІ ТЕХНОЛОГІЇ

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## DISTANCE EDUCATION SYSTEM FUNCTIONING IN SCIENCE-INTENSIVE EDUCATIONAL ENVIRONMENT

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Стаття присвячена вивченню функціонування системи дистанційної освіти у наукомісткому освітньому середовищі технічних університетів шляхом реалізації різноманітних доступних організаційних компонентів. Аналіз наукової літератури показав можливості для впровадження інновацій та різних моделей дистанційного навчання. Подано короткий огляд стадій організації та функціонування дистанційного навчання.

**Ключові слова:** дистанційна освіта, компонент дистанційного навчання, дистанційне навчання, оцінювання, наукомістке освітнє середовище, системне оцінювання, методика навчання.

Статья посвящена изучению функционирования системы дистанционного образования в наукоемкой образовательной среде технических университетов посредством внедрения различных доступных организационных компонентов. Анализ научной литературы показал возможности для внедрения инноваций и различных моделей дистанционного обучения. Дается краткий обзор различных этапов организации и функционирования дистанционного обучения.

*Ключевые слова:* дистанционное образование, компонент дистанционного обучения, наукоемкая образовательная среда, оценка, системное оценивание, метод обучения.

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Distance learning is a promising type of modern education as it significantly reduces the cost of specialists training, which permits to reduce the burden on the state budget and facilitates the education for all social groups as well as those with special needs. Since the information and communication technologies are constantly developing, as well as knowledge and skills are being reviewed, the distance education is constantly being reconsidered, supplemented, and modernized.

In the system of organization of distance education the initiatives have been drawn upon the existing didactic principles, which take into account the specifics of the organization of the student education. The organization and functioning of distance learning comprise the stages of pedagogical planning, content development, setting reliable student-teacher communication, and credible evaluation framework.

The target component involves the analysis of modern education requirements for the students' learning activities in the science-intensive educational environment. The formulated goals should reflect the demands of modern education, social and individual needs in the system of distance learning.

Among distance learning components the most widely used the explanation techniques and setting goals and objectives of the lesson, the content component, which comprises the distance training course structure, the learning curriculum, and instructions for students, rules for the content updating, the content of the preparatory stage of the educational process organization and guidelines for working with the distance learning system, requirements for its technical and methodological support.

The main conditions of successful distance learning in a knowledge-intensive educational environment and the realization of the need for self-development through distance education have been identified. The use of the suggested distance education model is a basic pedagogical condition in a knowledge-intensive educational environment and can contribute to the training of highly qualified specialists.

*Key words:* distance education, distance education component, distance learning, assessment, science-intensive educational environment, system evaluation, teaching method.

**Introduction.** One of the consequences of modern computerization is a significant increase in the processes of information technologies introduction to educational practice. As the result, a promising, individual education, a new type of training so-called distance

learning has appeared. It can significantly reduce the cost of specialists training, as the e-learning of one student is about three times less expensive than training in the traditional education system. This permits to reduce the burden on the state budget and facilitates the education for all social groups as well as those with special needs. In the context of the global financial crisis, reducing costs and improving the efficiency of learning becomes one of the most important tasks of university training. Therefore, today the issue of the full implementation of distance education in the system of higher education institutions becomes the particular relevance.

Analysis of recent research and publications. The analysis of scientific and educational works on distance education system functioning in the modern science-intensive environment has shown that it depends on a range of conditions [1; 2; 3]. The greatest influence on the teaching results is dependent on different types of components comprising organizational criteria of distance learning. At the same time, these components are partially described at the scientific literature on distance education technologies [4; 5; 6].

Theoretical studies on distance learning are based on the methodological works of D. Abrioux, A. Bandura, F. Binns, G. Boyd, J. Brennan, S. Goncharenko, R. Dillemans, T. Elias, S. Hargadon, J. Harris, C. Jackson, E. Bruegmann, O. Jegede, D. Keegan, S. Nikolaenko, L. Vygotsky and others. Scientists S. Dimyati, T. Devlin, D. Padmo, C. Maddux, D. Johnson, and J. Willis made significant efforts in the creation of a distance education system. Psychologists B. Ananiev, G. Ball, M. Potashnik, V. Vygotsky, M. Danilov and others analyzed the process of individual student-oriented learning.

Purpose of the article. The purpose of this article is to study the relevance of distance education and to identify the main components facilitating distance learning implementation in the educational process of higher educational institutions.

Main aspects of research problem and results. Since the information and communication technologies are constantly developing, as well as knowledge and skills are being reviewed, the distance education is constantly being reconsidered, supplemented, and modernized. In the distance education system it is important to provide the flexible design of distance courses combining various types of components such as lectures, workshops, individual tasks, chats, forums [7, p. 13].

In the system of organization of distance education the initiatives have been drawn upon the existing didactic principles, which take into account the specifics of the organization of the student education. The main of them are the principles of sequence and consistency, learning flexibility and mobility, information and communication technologies implementation expediency, interactivity and learner-centered approach.

The organization and functioning of distance learning comprise the following stages: general pedagogical planning of the distance education system, substantive content development, setting reliable student-teacher communication, and establishment of credible evaluation framework of the students' achievements.

The distance learning system in a science-intensive educational environment is non-linear, open to changes, dependent on the reliable and timely management of the educational process [8, p. 19]. Also, it is multi-component and comprises such components as a target, content, technological support, and effective evaluation.

The target component involves the analysis of modern education requirements for the students' learning activities in the science-intensive educational environment. The formulated goals should reflect the demands of modern education, social and individual needs in the system of distance learning.

Components used in the development of information and knowledge subsystems by means of the distance learning in a science-intensive educational environment provide teaching for technical university students. Among them the most widely used the explanation techniques and setting goals and objectives of the lesson. In the distance learning they are usually implemented in the form of a short text or video description of the contents.

The content component comprises the distance training course structure, the learning curriculum, and instructions for students, rules for the content updating, the content of the preparatory stage of the educational process organization and guidelines for working with the distance learning system, requirements for its technical and methodological support.

The technological support includes the coordination of the educational content in the distance education system between students, teachers, partners, the scientific and educational community abide by the logic of educational process management in a knowl-edge-intensive educational environment, the logic of the project organization and students activities in the distance learning system.

The criterion-assessment component contains the criteria and rationale of the important competencies development in a knowledge-intensive educational environment with the implementation of distance-learning technologies. The results of the important competencies development in a knowledge-intensive, professionally-oriented environment in accordance with the levels of the required competencies permit to evaluate the value of Збірник наукових праць

the pedagogical conditions of distance education and correct them.

The explanation, which does not require complex design, could employ text pages. Explanation including formulas, tables, and illustrations with links to external Internet resources use web pages. For links to external resources on the literature for additional study the specially designed links for web pages are created. A collection of files containing texts, presentations, video and audio fragments, materials for practical and laboratory work require a link to a file or directory of files. Test items represented by different types of questions are arranged in the different test formats. Specially designed tasks solutions, the implementation of practical or laboratory work report can be presented in the form of a file or text with complex content.

Workshops are employed for the solution of the problem for the specific lesson, where the evaluation is conducted by the teacher. The survey is carried out through guestioning, different reflection and self-reflection on the results of the lesson. The specific glossary can be compiled by a teacher or students of the course. The announcement about the news and events of the course are implemented through news forums. The different issues arising in the learning process are organized on forums discussions and opinion exchange. As well as the short messages exchange on the course topic could be conducted in real time chats within the same study group. Additionally, a web page or wiki page can be created by a group or individual students, as a report on research activities, writing creative tasks and project activities.

The main framework of the educational process in distance education is a set of controlled independent activities aimed at the studying of specially designed distance courses [9, p. 21]. The course management involves the implementation of quality control essential for the success of any pedagogical process. The proper evaluation of the education level in distance learning technologies implementation is relevant at all stages of the education system development.

Different types and forms of teaching quality control could be implemented through a variety of methods. Methods of quality control of educational activities should ensure a systematic, complete, accurate and timely receipt of information about the educational process. Control in a distance learning system should possess an individual character and reach every student, be conducted systematically and with equal frequency, engage a variety of forms (tests, surveys, multiple choice questions etc.), comprehensive measurement and coverage of all course materials, promote accuracy and objectivity.

The range of the quality of distance learning indicators comprises teacher's qualifications, a number of students, teaching methods and technologies involving traditional or innovative educational technologies, conventional or computer-based learning, and teacher- or student-centered education techniques.

The evaluation of the learning process outcomes is carried out at different stages as a part of the general monitoring of the entire educational process. Evaluation and self-evaluation are vital at the educational level measurement and permit to create a favorable area of the student's proximal development at every stage of the distance learning and anticipate the knowledge and skills development based on the data, which can promote the construction of an effective pedagogical system [10, p. 18]. Based on the received data of the developed evaluation system, an automated assessment of the student's professional competence is carried out successfully.

The student training involves the implementation of a large number of diverse practical tasks, which in distance education system should comprise two main aspects: a range of different workshops with examples of their implementation, and similar tasks for self-implementation. The materials can be either included in the course or presented as the links to network resources. The examples can be presented in a format of text with illustrations or video excerpts, video and audio materials.

The workshop implementation involves the necessity of conducting an independent research using additional literature and global recourses and experts' consultations.

The important task is to ensure proper communication subsystems for all participants of the educational process from any place and at any time. Communication mechanisms in the distance learning system integrate traditional and computer-based communication. For the organization of distance communication it is possible to use such information and communication tools as forums, chats, virtual premises, video lectures, and seminars.

Proper organized communication should provide group and individual contacts. In the course of training and the students' activities monitoring, it is difficult to understand the effectiveness of the pedagogical influence of distance learning. The lack of personal interaction is traditionally attributed to the disadvantages of distance education and to the causes of negative attitudes towards distance learning as such. Information in the process of communication should at first be formulated, specified, and developed and then transmitted. The role of the course authors is the most important as they could modify the information and change the structure of the course for a specific task.

Distance education lacks verbal communication, which could be realized through the use of modern technological means of video communication for creating the illusion of close contact [11, p. 92]. Non-verbal means of communication can be represented by the graphic images and photos, through gestures and facial expressions at video contacts. The interactive aspects of communication are used in group activities by means of such common social services as a wiki, blogs, forums etc.

It is important in the process of communication to maintain a mutual understanding between the participants, the organization of student-student and student-students communications without teacher's supervision, employing social networks, groups, blogs, forums, to achieve mutual understanding between the participants in distance learning.

Project activity is another important element in the educational process organization in a science-intensive educational environment by means of distance learning. The project activity permits students to work in a group, which size depends on the project complexity and the implementation time. During the project development, its participants can observe all the occurring changes, follow its process, and different stages of its development. Students not involved in the project could get acquainted with the subject of the project at the superficial level if they are interested.

If the project is completed, a special distance course web page briefly presents its main results, provides links to the reports and publications, proposals on the potential application of the project results, as well as contact information. The project manager is able to overview project materials, communicate with project participants, organize their discussions, and reallocate the participants into subgroups for solving special tasks and project activities.

Also, the organization of the library of educational materials in the distance education system should consider internal documents of the course itself and integrates network resources. The library system requires an organized catalog search of electronic materials, access to other libraries, either for a fee or free of charge. The training materials (books, manuals, articles, reports) are provided in the accepted standards (html, pdf, djvu), and supplemented illustrative materials. The prognostic potential of the distance education system and particularly the target, content, technological, criterion-evaluative components permit to adapt it to the constantly changing conditions of the knowledge-intensive educational environment.

**Conclusions.** Thus, the main conditions of successful distance education system development have been identified. These conditions assist distance learning system implementation in a knowledge-intensive educational environment including all spheres of the students' activities: educational, scientific and practical, as well as the realization of the need for self-development. The use of the suggested distance education model is a basic pedagogical condition in a knowledge-intensive educational environment and can contribute to the training of highly qualified specialists.

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