

ANNOTATION

to the thesis on a topic:

«Information and educational portal for distance learning based on SMART technology» presented for Ph. D. doctor's degree on specialty 8D06101 – «Information systems (by industry)» Toxanov Sapar Nurakhmetovich

Relevance of the research subject. Currently, distance learning is becoming increasingly developed and used in the field of education, in particular higher and postgraduate education, as a new, well-timed and necessary format of training, including students, undergraduates and doctoral students.

The particular relevance of creating an information and educational portal for distance learning today is due to several factors.

It is necessary to create an educational environment that will function as an open system with an improved intelligent interface that ensures interaction between all participants in the educational process, from the pre-university stage to postgraduate education. The formation and support of such space is impossible without the use of innovative approaches based on the use of information and communication technologies.

The creation of an effective structure that promotes the introduction of new information and telecommunication technologies in education and the formation of a common information space of the university is carried out with the help of an educational portal. The portal is a set of programs and equipment that is designed for an effective management of the university's main business processes, key information resources and provided services.

Distance learning opens real prospects for improving the quality of knowledge and efficiency of the educational process, which makes it possible to solve various social problems related to the functioning of the educational institution.

However, the organization and management of distance learning in Kazakhstan has not yet been sufficiently studied. Therefore, there is a need to find new approaches to develop and improve distance learning. This is the basis for choosing the topic and structure of the doctoral work, as well as for its logical construction.

The purpose of the thesis is to develop models and methods for integrating individual components of information technology to create a flexible, comprehensive information and educational environment on a unified system basis, through the use of Smart technologies, which will be focused on improving the quality and efficiency of the educational process in the conditions of the organization's credit-modular system educational process in the distance education system and increasing the efficiency of the education system in the Republic of Kazakhstan.

In accordance with the chosen method of achieving the goal, the following research problems to be solved are formulated:

1. analysis of the subject area of the information and educational environment of the university and justification for setting the research problem;

2. development of a structural model of the integrated information and educational environment of the university to determine priority areas of research;
3. development of multiple models for identifying subjects of the educational space;
4. development of a model of a subsystem for computer knowledge testing;
5. development of the architecture of an information and educational portal for distance learning.

The object of the study is the information and educational environment of the university, as well as the associated processes of processing and transmitting information.

The subject of the research are methods, models and means of information technology in the activities of the university, taking into account the requirements of the credit-modular organization of the educational process in the conditions of distance learning, including methods and algorithms for automated control of knowledge in the learning process.

Research methods. To achieve this goal, the following methods are used: system analysis - to study the subject area of research and identify patterns in the development of information technologies in teaching and monitoring knowledge; modeling theory, systems engineering, graph theory to describe the topological structures of networks; statistical research and comparative data analysis to describe the characteristics of the state of networks, fuzzy set theory for computer testing of knowledge; hierarchical analysis to evaluate development efficiency; probability theory and mathematical statistics; theory of algorithms for the development of algorithms and information technology software; methods for assessing the quality of knowledge diagnostic tools; technologies for object-oriented modeling of software products using the unified information systems description language (UML) and structural information modeling and design using data flow diagrams (DFD diagrams).

Based on the assumption that the logical organization of information, its systematization and structuring using portal technology can achieve certain goals, the hypothesis of this study is as follows: these processes contribute to expanding the accessibility of education and improving the quality of distance learning.

The scientific novelty of the research is determined by the fact that the architectural and software solution of the information and educational portal for distance learning with the construction of a student's individual learning trajectory based on Smart technology has been further developed.

For this study, theoretical and methodological foundations were used, based on the work of domestic and foreign scientists who dealt with the problem of organizing a distance learning system. The experience of creating such systems in foreign countries and the Republic of Kazakhstan was analyzed, and the legislative and regulatory documents developed by the Government of the Republic of Kazakhstan and the Ministry of Education of the Republic of Kazakhstan regarding distance learning were studied.

The information base of the study consisted of statistical data on the use of distance educational technologies in universities in Kazakhstan and abroad,

periodical publications, materials of international conferences, scientific and theoretical monographs, original research and surveys conducted in the process of preparing this work.

Practical significance: lies in the applicability of the proposed and developed solution of an information and educational portal for distance learning in any educational organizations and will allow for effective training of students, since the ability to build an individual learning path based on Smart technologies will greatly facilitate the teacher's task of using individual approaches to work with students, and will also automate the learning process itself, which will allow students to quickly master the material and increase the speed of learning.

The practical significance of the obtained theoretical results of the dissertation work is confirmed by the increased efficiency of assessing the quality of knowledge in distance learning systems, due to the proposed information and educational portal for distance learning, which ensures the automation of expert assessment of the quality of knowledge and the construction of an individual learning trajectory.

The implementation of the research results carried out in the thesis was carried out in the Toraygirov University environment and confirmed by a certificate of use of the developed system to support the educational process.

Basic scientific provisions submitted for defense:

- multiple models for identifying subjects of the educational space;
- model of the computer knowledge testing subsystem;
- architecture of the information and educational portal for distance learning.

Personal contribution of the applicant. Toksanov S.N.'s thesis is an independent research work that meets the objective needs of the IT development of our society at the present stage. All main results submitted for defense were obtained personally by the applicant. In scientific works carried out in co-authorship, the applicant personally owns: principles and methods for constructing an integrated information and educational environment as a system of parameterized (adaptive) functional components with an open architecture; abstract model of a university's complex information environment; abstract model of an information-integrated subsystem for computer knowledge testing with an open architecture; methods of differentiated analysis of testing results using fuzzy logic apparatus; conceptual model of an integrated information and educational environment.

Approbation of the results of the thesis research.

The thesis was carried out at the School of Information Technologies and Intelligent Systems of the East Kazakhstan Technical University named after. D. Serikbaeva. The main results were tested at International scientific and practical conferences in Kazakhstan and neighboring countries.

A total of 9 works have been published on the topic of the thesis, of which: 3 in publications recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Education and Science of the Republic of Kazakhstan; 1 in an international peer-reviewed journal, indexed in the Scopus database and having a percentile ranking according to CiteScore and (or) indexed in the data of the information company Web of Science Core Collection, Clarivate Analytics and (or) having a non-zero impact factor, 4 publications in conference

proceedings indexed in the Scopus databases, 1 in the proceedings of international conferences and 1 certificate of state registration for the copyright object.

Scope and structure of the thesis. The thesis consists of an introduction, three chapters, a conclusion, a list of references and applications. The volume of the thesis is 139 pages.

The introduction provides a general description of the work, which emphasizes its relevance, compliance with scientific programs, scientific novelty and practical significance, the object and subject of the study are defined, and the purpose and objectives of the study are formulated.

The first section contains an analysis of existing software and hardware information technologies for the educational process; a review of existing publications on informatization of the educational process was carried out and the main directions of development of computer-based learning and knowledge control systems were investigated.

An analysis of traditional approaches to informatization of the educational process was carried out, in particular, the creation of means of testing knowledge control, the organization of distance learning, the construction of support systems for the educational process and systems for supporting the daily activities of an educational institution.

The section also contains an analysis of the educational activities of the university under the conditions of compliance of the educational process with the requirements of the credit-module system for organizing the educational process. It is shown that compliance with these requirements is impossible without informatization of an educational institution, while the informatization of an educational institution should not be limited only to its educational and management activities - complex automation and effective, reliable and fast data exchange between university departments are necessary.

The second section proposes a method and priority for filling objects in a complex information and educational environment. Also, using the methodology of functional modeling, based on the formalism of data flow diagrams, a structural model of the complex information and educational environment of the university was developed in the form of a composition of two main subsystems: a subsystem for automating the management activities of the university and a subsystem for managing the learning process and monitoring knowledge. The decomposition of the subsystem for supporting the educational process was carried out to the level of the main functional subsystems, which made it possible to determine the main types and functions of specialized automated workstations as part of the information system being developed. A model of an open subsystem for computer knowledge testing is proposed in the form of a set of finishing systems with built-in and information-integrated external components; considering the analysis carried out, the requirements for its components in relation to knowledge assessment and assessment of test quality are determined. To implement the components of the proposed model, a method for assessing knowledge has been developed that ensures the use of both "hard" and "soft" assessment calculation schemes, requirements for the construction of computer tests and methods for assessing the quality of tests have

been determined. In view of the requirements of the credit-modular organization of the educational process, methods for rating assessment of students' knowledge have been developed.

The third section of the thesis is devoted to the development of an integrated information and educational environment to support the credit-module system and means of computer control of knowledge and training.

The scientific foundations of the integrated information and educational environment of the university, developed in the second section, largely determined the requirements for the functional and technical characteristics of the system and the features of its software implementation (object-oriented and structural models and algorithms obtained in the process of conceptual, logical and physical modeling). As well as an analysis of the results of the experimental testing and implementation of the developed information and educational portal for distance learning at Toraygirov University, which was built considering theoretical conclusions and a survey of the experimental research group.

In conclusion, the results of the study are summed up, conclusions are drawn, and prospects for further research are outlined.

The appendices contain empirical and methodological materials and tables.