

Formation of The Virtual Educational Environment of The University in The Conditions of Education Informatization

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Abstract

The introduction of the unified technology platform for the deployment of the cloud-based educational environment in higher education institution helps to solve numerous problems of unifying the architecture of the environment, integrating the technological infrastructure of learning on a single basis, providing wider access to better samples of electronic resources and services. When designing a cloud-oriented learning environment, it is advisable to use a hybrid service model of its structure, its content covers electronic resources of educational and scientific purpose. The holistic model of specialist training in the cloud-oriented environment contains levels and components of competence that are inherent for the process of training scientific and pedagogical staff of the education informatization trained in a high-tech environment. The integration of different subsystems of the environment into a single training system ensures the integrity of this process through the separation of invariant factors inherent in different branches of education.

Keywords: Holistic Model, Electronic Resource, Environment Architecture, Hybrid Service Model, Educational Informatization.

Introduction

Formation and development of educational and scientific environment of higher education institutions on the basis of cloud computing technology is an actual direction of modernization of pedagogical systems of modern higher education. It is associated with the spread of more convenient, flexible, scalable systems for organizing access to electronic resources and services, facilitating teamwork with software applications, removing geographic and time constraints, mobility of all learning subjects using cloud technologies and other factors.

Prospective information and communication technologies (ICT) are an instrument for implementing the principles of human-centricity, equal access to education in pedagogical systems of higher education. The cloud technologies mostly meet the needs of solving urgent socio-economic, educational and cultural problems of modern society, the main of them are increasing the level of accessibility and quality of education, interconnection of processes of scientific research and training of scientific and pedagogical staff, improving the design, formation and provision of functioning of educational and scientific environment (OSE) of higher education institutions.

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The development of OSE is characterized by increasing requirements for the quality of electronic resources for scientific and educational purposes, expansion of more flexible, personalized, open organizational systems, which becomes possible with the use of cloud services.

The involvement of higher education institutions in cloud-based open information and educational space can also play a leading role in: deepening the links between education, science and production; expansion of cooperation between educational and scientific institutions; creation of various corporate structures, supported by cloud technologies, aimed at developing closer interaction with the higher education sector; solving urgent social and economic problems; improving the intensity of the scientific search and training process, etc.

Literature Survey

The current stage of society is characterized by the emergence and expansion of the digital market, which is constantly covering all new industries. Trends in the development of this market are largely determined by the progress not only of the technology sector itself but also penetration of advanced ICT into other fields of production and social activity (Feldman, J.D., et al. (2018)).

In particular, education is a prospective area for the introduction and application of new technologies. It will stimulate productivity and efficiency of activity in this field, make graduates more competitive, promote their professional realization, business development, economic growth (Pegalajar, M. C. (2018), Li, S. C., et al. (2006)). The dynamism of production processes, caused by the rapid change in technology, leads to the emergence of new areas of specialization, which may not have existed a few years ago, creation of new jobs.

The world's leading companies and governments are investing in advanced digital technologies such as mobile communications, social media, big data analytics, intelligent devices that control connected objects and sensors, and others (Idris, M.Y., et al. (2017)).

Among them cloud technologies using organizations around the world play a special role, and this growth is at an impressive rate (Wong, E. M. L., & Li, S. C. (2006)). The issue moves from a plane of competitive advantage to a plane of avoidance of backlog and overcoming a technological gap in comparison with more developed subjects of business in all spheres of economic and social development.

Global trends in cloud computing are characterized by data from leading market research companies in the IT sector.

Digital technologies are being introduced in education and education systems to make the learning process more efficient and up-to-date (Taylor, S. (2018)). Prospective learning systems are based on intellectual and interconnected environments.

But the existence of high-tech systems (infrastructures, environments) does not improve the quality of education yet. A key element in this process is the teaching staff (Paradarami, T.K., Bastian, N.D., & Wightman, J.L. (2017)). The lecturers and teachers should possess sufficient skills ICT use in order to become leaders of changes and to activate the processes of modernization of educational systems.

Methods

To solve the tasks set in the work scientific methods were used: theoretical - analysis of psychological and pedagogical, philosophical sources on the research problem to clarify the status of the issue development of formation and development of cloud-oriented educational and scientific environment of higher educational institutions, identifying research areas, principles and approaches to the environment design; analysis of current standards and regulations regarding the use of ICT in the process of education and informatization of educational institutions; generalization of domestic and foreign experience of using cloud services and technologies in higher education institutions to determine trends in development, to clarify the basic conceptual and terminological apparatus, establish conceptual bases of research; theoretical analysis, system analysis, systematization and generalization of scientific facts and patterns for the development and design of models of cloud-oriented environment, substantiation of the main conclusions and provisions.

Results

The design of electronic educational resources (hereinafter referred to as EER), which are elements of meaningful content of the environment, can be considered to some extent, regardless of the system means and resources of their

supply, which are also "in the cloud". Thus, the provision of system tools for network configuration, as well as the design of the filling itself, its quantitative and qualitative composition appear to some extent as separate tasks, separate stages of this activity. Therefore, the issues of justifying the ways of selecting and classifying the necessary electronic resources, ensuring the proper level of their quality play a more important role.

Electronic resources appear at the same time as objects and means of learner's activity, thus, they perform certain functions implemented in the process of mastering the subject area. It is expediently to characterize the types of activities conducted for ICT services in a cloud-based system which serve as its educational services. Obviously, not all functions that can be performed within a particular system are necessary, that is, not all of them need to be converted to services.

It will be necessary to determine the components of its content filling for the design of educational services on the basis of a hybrid model of the educational and scientific environment of a higher education institution. The components are electronic resources of educational and scientific purpose.

Electronic resources to support learning activities can be further classified according to the types of activities, including acquisition of theoretical material, consolidation of knowledge (tasks, exercises execution, skills development, and knowledge assessment (Table 1).

Table 1. Electronic learning resources in the cloud-oriented environment (copyright development)

Electronic resources	ACTIVITY		Electronic resources
	Essence of the activity	Type	
Resources for e-journal systems, e-libraries, information retrieval networks, collections, multimedia libraries, EOP reference and additional, text, editors of tables, images, presentations, EOP creation tools	Preparation of demonstration and printed materials, educational and reference literature processing	Preparation and search of learning material	
Resources of e-journal systems, e-libraries, information search engines and social networks, collections, multimedia libraries, EOP reference and additional, electronic textbooks, manuals, electronic training courses, linguistic analysis programs, educational expert systems, e-thesaurus	Processing of texts, formulation of statements, concepts, conclusions, syntactic and semantic texts processing, multimedia demonstration	Theoretical material processing	
Electronic text-books, tutorials, electronic training courses, learning expert systems on tasks solution, electronic tasks, activity environments, subject packages of applied programs (PAP), PAP modeling, simulator programs, training lab workshops	Tasks, exercises solving, skills development, execution of practical, laboratory work, modeling, data analysis and processing, construction, calculations, mathematical transformations	Consolidation of knowledge, formation of practical skills	
E-testing systems, automated knowledge assessment systems	Assessment, monitoring of educational activities	Evaluation of learning outcomes	

It is possible to suggest further detailing the types and varieties of electronic resources for educational purposes, which are a component of the educational constituent of the educational institution environment, by the criterion what place these resources occupy in the organization of the learning process.

Research pedagogical activity is an important component of practically all branches of education, where it is necessary to introduce modern innovative approaches, tools and technologies. Because of this identification of its

structure and functions, forms and levels of organization, processes and constituents becomes an urgent issue for the professional development of not only scholars, but also teachers-practitioners, lecturers and educators of many links.

Particular interest in this context is the issue of the activity aspects of the experiment organization, concerning the application of modern facilities and technologies, in particular means of informatization, to support certain stages of the process of scientific and pedagogical research, their role and place in the implementation of research activities, ways of their optimal selection and use.

Identification and systematization of different types of actions, as well as their corresponding forms of thinking is one of the areas of the activity approach application in the field of research of problems of scientific and pedagogical cognition.

In case of consideration of scientific and cognitive activity, the concept of cognitive action becomes a priority. It is an action with forms of thinking aimed at the realization of a function or correspondence. This approach assumes understanding of cognitive activity as a sequence of cognitive actions. Theory as a system of scientific knowledge (a system of various forms of thinking) in this sense can be considered from the point of view of the activity results fixed in thinking.

Consideration of scientific and pedagogical activity as a form of cognitive research activity involves the identification of the pedagogical knowledge of various structures and cognitive processes associated with them, which have a complex and multilevel structure. Such processes include, for example, hypothesing and their testing, scientific data collection and analysis, formulation and justifying conclusions, etc. It turns out that the isolation of certain types of activities and their procedural components often arises rather nontrivial methodological issues, because scientific theory provides in its structure a complex, multifaceted and hierarchical system of actions aimed at performing functions of various types.

Discussion

Identification and systematization of sets and systems of cognitive actions, their descriptions and conditions of implementation is an important area of analysis of the structure and functioning of pedagogical theory as a system of scientific knowledge. One of the ways to accomplish this task is to identify the types, varieties and levels of hierarchy in the structure of scientific and pedagogical activity and their systematization.

In order to successfully develop a procedure and technology for the implementation of a scientific and pedagogical activity of a certain type, it is necessary firstly to find out what kind of actions and in what sequence they will occur.

Technology and procedure, in this case, are a constructive description of a particular activity. An important element of technology research is the implementation of activities which also require typology in order to be able to organize their description, selection and place in the technology. Thus, systematization of types of activities in the structure of scientific and pedagogical activity is a prerequisite for the formation of technology of scientific and pedagogical research.

Conclusion

Pedagogically sound and appropriate introduction of cloud technologies into the educational process of the university, formation and development of educational and scientific environment on this basis is a factor of increasing access to electronic educational resources, increasing the efficiency of the use of ICT. An important prerequisite for it is the improvement of the ICT competency of researchers, teaching staff and students in the use of cloud technologies.

It is necessary to take into account the educational and scientific criteria for the formation of this competence, characterized by a number of indicators on the organization and effectiveness of scientific research, implementation of scientific results, forms and types of educational activities.

While designing the cloud-oriented educational and scientific environment of the university OSE, it is advisable to apply a methodological system for its formation and development, which is based on the use of certain methodological principles, methods and approaches, aimed at increasing access to electronic resources, using state-of-the-art tools and technologies, enhancing participants' ICT competencies, educational and scientific process.

The methodological system encompasses a number of techniques that are combined by a system-forming factor, which is a cloud-based approach that relies on relevant baseline characteristics and service models. The system includes: methodology of using the scientific-educational cloud of scientific / educational institution, aimed at improving the organization and increasing the efficiency of scientific research, implementation (publication, dissemination and use) of their results; techniques for using cloud-oriented components for educational purposes based on AWS hybrid cloud and a specialized service (SageMathCloud), focused on increasing the ICT competency of lecturers and students, improving learning outcomes.

Identifying and classifying different types of educational activities is a prospective subject of our research. It is consistent with the tendency to study the problems of technologicalisation of various aspects of pedagogical research. At the same time, identifying the types of activities and their procedural components within each stage is an important object of elucidating the structure of the study. These issues require further development and systematization, especially in the informatization aspect.

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