

ORGANIZATIONAL CONDITIONS OF FUNCTIONING OF THE ADAPTIVE SYSTEM OF DISTANCE EDUCATION ON THE BASIS OF USING OPEN EDUCATIONAL RESOURCES

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Abstract: The aim of present article is to analyze the necessary organizational conditions of functioning of the adaptive system of distance education on the basis of using open educational resources. Based on the presented content of the article, we obtained the following conclusions and results:

- Distance education can be viewed as a technology of open education and an important step in the direction of increasing the level of education availability to people;
- In order to realize the open education principles, current educational practice requires not only the tools for publishing and storing the study materials, but also a well-developed system of means for cooperative work with these materials in accordance with clear criteria within the educational systems in the institutions, as well as outside of them;
- The most important tools of the open education systems, the occurrence and introduction of which significantly affects the distance education efficiency, are: scientific-educational information networks, technologies of virtual educational activity support, technologies of electronic design of distance education systems, technologies of Internet-based distance learning, technologies of electronic libraries, technologies of near field communications;
- Efficient functioning of the distance education system is possible under the condition of using adaptive systems, based on the modern information-communication technologies (ICT), which, in turn, are based on the principle of adaptive learning, aimed at creating individual educational strategies;
- Integration of open education principles in Russian education accumulates recent opinions of the researchers and applied specialists about the potential ways of education development in the informational society; it implies the use of the latest, most current achievements of psychological and pedagogical science, educational practice and scientific-technological progress; it provides support and reproduction of global tendencies of educational systems development in Russian education and performs the integration of Russian education system in the global educational space.

Keywords: Open education, distance education, open educational resources, Internet-based tools of the distance education system, adaptive distance systems of open education, personalization, federal educational Internet portals.

INTRODUCTION

Significant changes, which occurred in the field of communication and information technologies in the past decades, facilitated the development of educational institutions, which provide distance-education programs and use modern teaching

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tools and global educational resources, primarily, concerning the technology of information transfer. Each year, distance education (DE) further integrates in the classical forms of education, thus enriching them with innovative components, both in content and in organization, and therefore changing the traditional image of education.

However, the process of introducing the DE significantly anticipates the corresponding scientific, methodological and theoretical developments, which would have provided fundamental rationalization of its main principles; this does not allow fully actualize and involve its rich potential.

Addressing the organizational aspects of the DE system, researchers agree that DE developed in parallel with the development of technologies. It is impossible to argue with that, however, there is a more significant force that facilitated the DE development. This force is the global goal of providing free access to education. And DE acted as a strong mean for reaching this goal.

The fundamental pedagogical idea, which became the basis of DE theory and practice, became the idea of “open education”. An ideal of open, unlimited access to education originated in different countries, at different time and under different circumstances. Currently, it became the principle of UNESCO Institute for Information Technologies in Education: each person, regardless of their age, place of residency, professional, physical and physiological capacities, has to have the necessary conditions that could facilitate constant increase of their education level. This is the prevailing humanistic idea of using information and communicative technologies in education, as well as other fields of people’s material and spiritual life (Atkins, et. al., 2007).

The concept of Open Educational Resources (OER) was introduced during the UNESCO forum in 2002. In June 2012, First Global congress on Open Educational Resources made a decision to develop educational policy and to stimulate the governments to create favorable conditions for supporting the development and supply of the open educational resources integration. (COL and UNESCO, 2012)

Understanding that the only way to adapt in the modern rapid, dynamic and unstable social conditions is lifelong education forces the governments to solve the problems, related to the need in high-quality education of their citizens. But open education is not limited only by the open educational resources. It develops from open exchange of teaching techniques, facilitates the development of teaching culture, co-creation and mutual enrichment of teachers, thus having a global effect on education. Currently, teachers create the world, in which every person on the planet not only has access to the knowledge of the whole humankind, but is also able to make his/her own contribution to it. A new process of open education has formed in the world; it integrates well-established culture of ideas exchange between teachers and interactive culture of cooperation on the Internet. It is based on the

principles that everyone has the freedom to use, adapt, improve and distribute the educational resources (COL and UNESCO, 2011).

We would like to present the two main statements in conclusion of the introduction. Firstly, open education is not only distance education, as it is usually considered in many national studies. Distance education can be considered as a technology of open education, a significant step in the direction of increasing the level of education availability to people. However, the ideas and tools of open education are primarily directed on improving the education quality, along with providing higher availability. Here, the capacities of distance education, combined with other components of open education, promise to change the situation to the best in the near future and to transform lifelong education in everyday reality, which improves the quality of life in millions of people.

Secondly, open education is not limited only to the open access to educational materials. Open access to a wide range of such materials is a significant predisposition of open education development; however, “opening” the education is not limited to providing free access to everybody. Current educational practice requires not only the tools for publishing and storing the study materials, but also a well-developed system of means for cooperative work with these materials in accordance with clear criteria within the educational systems in the institutions, as well as outside of them.

Methodology of the Study. Modern Internet Tools of the Distance Education System on the Basis of using OER

We would like to describe some of the most important tools of open education systems, occurrence and wide introduction of which significantly affects the DE efficiency in open pedagogical systems, the support of development and maintenance of Internet-based OER in their current state, technologies of designing and using the DE technologies.

Firstly, they include scientific-educational informational networks (SEIN), which are essentially automatic information systems (AIS), filled with the information of primarily educational and scientific orientation, and aimed at informational support of education and science, which are technologically based on computer information-communicative platform for transporting and processing of the informational objects.

Due to the development of Internet tools and technologies, protocols and technical-technological interfaces of interaction in AIS, different SEIN integrate informational resources and provide access to integrated informational resources to a wide range of users almost worldwide. Because of this, retroactive access to the SEIN resources is provided, along with online interaction of its users in the process of conduction of the cooperative projects, solution of common study problems, mutual informing, etc. On the user’s level, SEIN electronic resources

are proposed in a structured layout for a certain topic, or for a category of users, and are provided with flexible and convenient means for searching for relevant information and navigation in the electronic networks.

The characteristics of ordered systemic integration of SEIN create a certain portrait of a united informational space of education and science. This portrait, on the one hand, reflects the main functional purpose of this informational space, content-oriented nature of its informational content and technical-technological and organizational specifics of its structure, specifics of realizing SEIN functions and the main constraints of its functioning. On the other hand, this portrait reflects general user qualities of the informational space, market mechanisms of providing users' demand for OER of a certain subject's field and competition on the information services market. Mutual dependence and mutual definition of these components of the united informational space of education and science allow talking about the SEIN as an integral developing system.

Internet electronic scientific and educational-methodic SEIN resources lead to the occurrence of electronic subject-information resources of the educational environment of the modern distance education. Based on these resources, the content of the components of methodical teaching systems not only becomes significantly more varied, but they also reflect the specifics of educational process realization. (Tikhonov 2009).

Secondly, there are the special technologies of virtual educational activity support (for example, Web 2.0), the use of which implies the involvement of students and teachers in the educational activity on the Internet.

Thirdly, they include the technologies of electronic design of the DE systems for the support and efficiency increase of the automated design and use of the distance-education systems.

In the field of education-oriented ICT, so-called information technologies of "educational objects" (ITEO) have appeared and are rapidly distributing. Technological basis of ITEO is the repeated use of educational objects with study content in the distance-education process.

Because of this, it is necessary to study the ways of generalized presentation of the integration of technologically-actualized ITEO-systems and to create an inventory for designing them. First of all, this implies the need to develop new approaches, tools and technologies for increasing the efficiency of the processes of designing educationally-oriented systems, which would imply, on this basis, wide introduction of such systems in educational practice. In particular, it concerns the development of tools and technologies of aggregation of the electronic dynamic educational objects, increase on the intelligence level of the means of their purposeful and rational integration, supply of flexibility and adaptiveness of the created education-oriented systems in accordance with individual needs of a wide range of users. (Ivannikov, et. al., 2009).

It is necessary to add that creation and introduction of such systems would allow, among everything, to transform the studies of knowledge changes processes in a certain way, by developing unified methods, models and scenarios. Using them should not only increase, for example, the quality of knowledge control results in distance educational, but also develop, accumulate and distribute the innovative technologies of designing the educational content in almost all educational subjects.

Transformations of such systems from “pedagogically neutral” to “pedagogically validated” would allow making certain steps towards developing the industry of education support systems, including the systems of regulating the education, content and knowledge. The use of ITEO-systems seems promising for the creation of these support systems.

Fourthly, there are technologies of Internet-based distance education that facilitate the realization of a unified scientific-technical and educational policy in the educational space, which are based on the principles of open education and which provide the development and maintenance of the unified open educational space functioning (Kulagin, et. al., 2010). Such environment is created in the basis of a unified paradigmatic approach, and it includes, supports and provides:

Informational, scientific and educational-organizational resources created by the educational and research institutions, which are structured upon tentative models that have similar computer-screen representation;

Informational resources of electronic libraries and specialized databases;

Unified tools for navigating in the informational space and searching the necessary information in it; other services provided in the computer networks.

The majority of these requirements and informational functions has to provide the use of special educational Internet portals on the basis of systemic content integration of informational resources, unification of computer networks’ services and user interfaces, which, in turn, would significantly raise the efficiency of Internet-based learning.

Educational process in distance-education systems proceeds in specific pedagogical systems, which should be oriented at the increase of students’ active participation in the support of their own education: in setting the educational goals, making independent and responsible decisions about using the educational innovations, choosing dominant directions, forms and rates of learning in different educational fields, choosing place of study and educational institution, etc. Based on these pedagogical systems, the students have to learn to study. In these systems, the heuristic component of the educational process has to increase by the use of interactive learning and multimedia education-directed tools, the use of telecommunication methods of constructing knowledge, acquisition of the experience of electronic communication with the whole world. An important role

in the establishment and development of Internet-based informational tools of the distance-education systems has to belong to the electronic professional scientific issues, which lie in the basis of scientific-methodic support of open education, as well as specialized Internet portals and electronic databases from different fields of knowledge available on the Internet.

Fifthly, there are the technologies of electronic libraries, which lie in the basis of providing local and network access to digital scientific and educational-methodical resources of the electronic libraries – electronic informational resources on the subjects of the educational environment of open pedagogical systems, as well as the processing of these resources in order to prepare, structure and analyze electronic documents and issues (IISN, SCOPUS). (Osin 2003).

Sixthly, there are the technologies of near field communication. These mobile electronic technologies and special tools provide an opportunity: to clear the Internet from a significant amount of relatively small-volume local and global electronic communications (e-communications), to identify the members of the electronic communication with their e-communications in the unified informational space, to personalize the wireless e-communication tools (with the simultaneous possibility of access to the Internet resources and services with these tools). (Osin 2014)

The use of personal mobile tools of electronic communication by the educational process participants allows accessing the electronic resources of computer networks of different levels and subject field, regardless of and independently from a certain place in space and moment in time.

Seventhly, there are the electronic technologies of project management, which are the basis of the support of automated management of projects and programs of innovative development of various technical and social-economic systems (including educational systems and their components). These technologies provide the general possibility to manage the creation and perfection of complex systems in the conditions of significant parametric and process-related indetermination of innovative projects; the efficiency of their preparation and actualization increases. (Pozdeev 2009)

RESULTS

The result of the study is the analysis of the realization of the adaptiveness principle of distance systems of open education.

Adaptive distance systems of open education have to design student's educational strategy with the consideration of personalization. As the researchers note, intellectual adaptive systems have to actively help a student and interact with him during the whole educational process (Brusilovsky & Peylo 2003). Usually, personalization implies: adaptive interaction; adaptive delivery of the course; adaptive content of the study material; adaptive support of cooperation (Khribi, et. al., 2009).

In our opinion, one of the promising forms of adaptive education support on the DE process is providing a student with recommendations. The system of recommendations can be presented both at the basis of the student's personal data analysis and in during the education support. From the perspective of using intellectual adaptive teaching systems, the system of automated personalization poses interest.

The procedure of creating recommendations consists of the following stages:

- Analysis of student's model on the basis of Web-resources. At this stage, student's Web-sessions are analyzed and cluster analysis is used;
- Preliminary review and indexing of educational resources;
- Acquisition of settings from the active study sessions;
- Combination of links to recommendations for the possibility to use them during the realization of educational strategies.

Such approach is based on two components – modelling phase and recommendations phase.

Modelling phase consists of the development of:

1. Model (profile) of the student;
2. Model (profile) of the group of students;
3. Mode (profile) of the study material's content.

The development of student's model implies the creation of the student's profile of the basis of the information existing on the server through obvious and non-obvious feedback channels. It uses two approaches to modelling: based on the cooperative activity and automated one.

Creating a model of the group proceeds after the creation of student's model. Based on the cluster analysis, student group's preferences in educational resources are developed. Indexing is used at the stage of modelling the content of study material. Analysis is conducted based in the Web-resources that a student has visited.

The phase of recommendations is based on two approaches: filtering based on content (content filtering) and filtering of cooperative activity (collaborative filtering). Content filtering is based on a number of discreet characteristics of educational resources in order to recommend additional educational resources with the same qualities. Collaborative filtering proceeds on the basis of collection and analysis of a large amount of information about the user and proposition of recommendations about behavior, activity or preferences based on their similarity with other users. The main advantage of collaborative filtering is the fact that it is not based on the content analysis and does not understand its meaning, because it is virtually impossible with automated analysis. It is possible to hypothesize that the combination of the two approaches – content filtering and collaborative filtering –

would allow obtaining more precise recommendations. Such hybrid systems can be actualized in two variations: successive content- and collaborative filtration with consecutive integration of the results, or integration of the two approaches in one model. Such hybrid systems not only lack disadvantages but also allow obtaining more precise results for recommendations. The phase of recommendations is concluded by the development of student's educational strategy.

The main algorithm of student's interaction with the adaptive system of distance education can be presented in the following way. In the beginning, there is active interaction between the student and the adaptive system of distance education. At this stage, the system presents its educational opportunities and attempts to collect the maximal possible amount of information about the student. Based in the personal data analysis, the profile of student, group and educational content is developed; this is the modelling stage. The modelling stage ends with the discovery of student's educational need. At the next stage – phase of recommendations – educational materials are selected and recommendations are provided for the student. Having student's educational strategy, the adaptive system of DE is ready to suggest the study materials with the use of the available resources.

Therefore, efficient functioning of the DE system is possible only in the condition of using the adaptive systems based on the modern ICT that are founded on the principle of adaptive learning, aimed at creating individual educational strategies. The adaptive systems of DE are based on the recommendations approach, which implies successful choice of an educational strategy on the basis of modelling phase and phase of recommendations. Modelling phase implies creating a profile of a student, a group and the content. Phase of recommendations is based on content filtering and analysis of group's collaborative activity.

DISCUSSION

Currently, many representatives of the scientific community have joined the open education initiatives. Teachers from all around the world create rich collections of study materials on the Internet, which are open and free for every user. Current global collection of open educational resources contains tens of hundreds of thousands of materials. They include study materials, plans of lessons, textbooks, games, software and other materials that help making the education more available. (Osin 2007)

The most established sources of OER are the leading universities of the world: Yale University, Harvard University, Massachusetts Institute of Technology, Nottingham University, University of South Queensland, Open Universities of Great Britain and Netherlands, Paris Institute of Technology and many other (Dneprovskaya 2010).

Recent tendencies of the DE development in the beginning of the XXI century are related to the creation of virtual universities, the whole functioning of which is based solely on the modern Internet technologies. Such educational institutions do

not have educational buildings and student residences, campuses and administrative offices, laboratories and lectures. Everything is conducted through computer networks: choice of the study course, payment for it, lessons with students, transition of control tasks and their evaluation, as well as creation of midterm and final exams. Certainly, such institutional form is very relevant, because it allows providing complete access to the OER, and on this basis, provides the conditions for the fullest realization of citizens' right for education, matching the model requirements in structure and quality. (Bisell 2007).

Among the virtual higher educational institutions and organizations, we can list: Virtual University of California, Virtual University of Kentucky, Virtual University of the state of Michigan, Western Governors University (USA), Oresanda Virtual University (Denmark), NKI Internet-college (Norway), and other (Kanwar & Trumbic 2011).

In the Russian Federation, the key educational Internet-portals of the federal level are integrated in the Federal System of Informational-Educational Resources (FSIER), which contains educational resources of federal and regional levels, access to which is supported by the common Internet-portal login (Unitary window).

The first stage in the development of educational content in the Russian Internet became the creation of federal educational portals system in 2002-2004 within Federal targeted program "Development of the unified educational-informational environment" (Table 1) (UNESCO, 2011), which included Federal Internet-portal "Russian education" and thematic Internet-portals for various fields of knowledge and educational activity directions.

In the Republic of India, similar work is conducted under the initiative of the Ministry for Human Resources Development (MHRD) and under supervision of the National Knowledge Committee (NKC), which have the goal of increasing the number of open educational resources (OER) and open access (OA). Upon their recommendation, the Indian government has started to conduct a number of innovative programs, such as SHAKSHAT (academic Internet-portal), National program on technology of expanded learning (NPTEL), OSCAR (Open Source Courseware Animations Repository), educational Internet-portal E-Grid, etc. The process of OER development is supervised by various elite institutions, such as Indian Institute of Technology (IITs), Indian Institute of Management (MMB), Indian Institute of Sciences (IIS), Indian Institute of Information Technologies (IIIT), National Institute of Open School (NIOS), Indira Gandhi National Open University (IGNOU), National Council of Educational Research and Training (NCERT), and many other private organizations that work on creating and developing the teaching, the learning and research materials for students, research workers and teachers of different levels of education. (Dutta 2016)

State (federal) Indian educational Internet-portals are presented in Table 2.

TABLE 1: RUSSIAN FEDERAL EDUCATIONAL INTERNET-PORTALS

<i>Name of the Internet-portal</i>	<i>Content</i>	<i>Basic organization</i>
Federal Internet-portal "Russian education"	It is an integrative Internet-portal; it contains not only the list of all Internet-portals with the links to them, but also provides information about the approaches, standards and technologies, accepted in the system, and publishes the materials about the development of Internet-portal system.	Federal State Institution of State Research Institution of Information Technologies and Telecommunications "Informika"
Russian general-educational Internet-portal	Contains a catalogue of Internet-resources (over 10 thousand reviewed descriptions of educational Internet-resources), news segment, official materials about the general-education field, information about education in the regions, forums and consults, thematic collections: Internet-portal's own resources aimed at satisfying users' educational needs.	Publishing house "Prosveschenie". Institute of new technologies (INT)
Internet-portal of informational support of the Unified State Exam (USE)	The Internet-portal allows: learning about the USE procedure, training in filling out the answer sheets, reviewing the trial versions of the tasks, listening to recommendations about passing the USE on all subjects, including the exam procedure and rules of appealing; news and relevant documents about the USE are also published there.	Peoples' Friendship University of Russia, then, State Research Institute of Informational Educational Technologies, then, Federal State Institution of State Research Institution of Information Technologies and Telecommunications "Informika"
Educational Internet-portal "Economics. Sociology. Management"	It is possible to obtain detailed information, such as description, forms of education, list of professions, specialties and directions of training and information about educational programs for each level of education in economics, sociology and management. The service of access to the full-texts storage is presented.	State University – Higher School of Economics (SU – HSE)
Internet-portal "Social-humanitarian and political-science education"	Methodical, educational, scientific and reference materials: reviewed links, full texts. Information about educational and research centers, conferences and seminars.	Peoples' Friendship University of Russia
Legislative Internet-portal "Judicial Russia"	Library of educational, scientific, legal and other resources. Information about organizations, conferences and people.	Faculty of Law of SPbSU

<i>Name of the Internet-portal</i>	<i>Content</i>	<i>Basic organization</i>
Natural-scientific educational Internet-portal	Links to the Web-sites and publications for school students, students and teachers. Editorial classification: subject-based (mathematics, chemistry, biology, physics), by the audience, by the education level, by the types of resources.	ITMO University
Internet-portal "Informational-communicative technologies in education"	Educational, methodical and reference materials; books reviews; texts of conference presentations and abstracts; information about organizations; collections of links to Internet-resources about IT.	Federal State Institution State Research Institution of Information Technologies and Telecommunications "Informika"
Internet-portal "International education"	Information about regional centers of international cooperation, Russian international schools; information about seminars, conferences, projects and programs; reviews; analyses; catalogue of resources.	Herzen State Pedagogical University of Russia

TABLE 2: STATE (FEDERAL) INDIAN EDUCATIONAL INTERNET-PORTALS

<i>Name of the Internet-portal</i>	<i>Content</i>	<i>Basic organization</i>
NMEICT	Unified Internet-portal that would connect all universities and colleges in India (currently, 400 universities and about 26000 colleges).	MHRD
SHAKSHAT	This Internet-portal is the main OER platform developed within the National Mission on Education through Information and Communication Technology (NMEICT).	MHRD
NPTEL	Electronic learning by video Web-courses on engineering, life sciences and humanitarian subjects; over 329 courses are complete and available.	IITs, IIS
OSCAR	Storage of open educational resources constructed upon Web-interactive animation.	Bombay Institute of Technology
E-Grid	Digital library that contains over 45000 books, including the books in Indian languages.	IIS, Carnegie Mellon University (a total of 21 Research Center)

Therefore, it is possible to note that Russian system of open educational resources: (1) has obvious priority in their use and distribution; (2) is ready to use and accept pedagogical developments of international systems; (3) is ready to participate in promoting Russian open educational resources on the international market of education.

CONCLUSION

In conclusion, we would like to point out that highly-technological and innovative nature of the educational system development implies expanding the range of fundamental and applied scientific studies, making the science, education and industry integration more profound, modernizing the content of education, pedagogical technologies and educational environment, training and increasing staff qualification; it also causes certain changes on the organizational structure of the education system and education activity management, and requires its targeted, sufficient and timely financial support. This nature is primarily based on the achievements of psychological and pedagogic sciences, scientific and technical progress, as well as on the wide introduction of their achievements in the educational practice, on the competence of teachers and education organizers, constant increase of their professional level; on the social and governmental awareness of the defining role of education in social-economic development of the country; and on the state's economic capacities.

This nature is significantly affected by the modern forms and technologies of education organization, which primarily include open education, systems of electronic distance education, electronic distance learning technologies, which are based on the principles of open education.

The tendency of information and communicative technologies' development certainly leads to the occurrence of global electronic libraries, scientific and educational laboratories with remote access, open virtual universities and global virtual campuses; all of this will become the foundation for the integral educational and scientific environment for the global community.

Ideas of global education and global goal of providing free access to education defined the new educational philosophy, which became fundamental for the development of theory and practice of distance education. Currently, the concepts of "open education" and "distance education" refer to such integration of approaches to the educational process, which mainly focuses on organizing widest possible access to the tools for education and professional training, thus liberating people, who are willing to study, from the dependence from time and space of studying; it also focuses on using flexible methods of individual and group education.

Introduction of the principles of open education to the Russian education accumulates latest opinions of researchers and applied specialists about the

promising directions of education development in the informational society. It implies the use of the most modern achievements of psychological and pedagogic sciences, educational practice and scientific-technical progress; it provides the support and replication the global tendencies of educational systems' development in Russian education, and integrates Russian educational system in the global educational space.

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