

The Development of Electronic Educational Environment of the Contemporary Higher Educational Institution within the Context of Teaching Innovations

Irina V. Khairova^a and Vera I. Toktarova^b

^aKazan (Volga region) Federal University, Kazan, RUSSIA; ^bMari State University, Yoshkar-Ola, RUSSIA

ABSTRACT

The problem under study is acute due to rampant development of electronic education putting forward new demands to the arrangement of professional education of HEI students. The article makes a review of innovative means and technologies contributing to the perfection of instructional design of new-generation electronic educational environment. The work is based on the methods of theoretical and empirical investigations. It elicits and describes main features of teaching innovations having led to the changes in the structure, content and methods, forms and tools of teaching. The article determines the essence of didactic components within the context of teaching innovations and the role of electronic educational environment when they are introduced. The results of the research will be useful for the implementation of system changes in the educational process in conditions of the necessity to meet the requirements of up-to-date Federal State Educational Standards of Higher Education.

KEYWORDS

Educational environment; instructional design; e-learning; teaching innovations; educational process

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Introduction

During the last years the educational reform led to a number of changes and renovations in the teaching process which introduced and confirmed the term “innovation” in the teaching practice. The concept of long-term social and economic development of the Russian Federation for the period up to 2020 among innovations in the educational environment distinguishes the following lines of its development (The Conception, 2008):

– to enlarge the use of information and communication technologies for the development of new forms and methods of teaching, distance learning, and media education;

CORRESPONDENCE Vera I. Toktarova ✉ toktarova@yandex.ru

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– to provide an innovative character of basic education, including the renovations in the network structure of educational institutions in accordance with the tasks of innovative development.

According to the RF State Program “The Development of Education” for 2013-2020, one of the priority directions of the state policy is the support of innovations and initiatives of teachers, professional societies, educational organizations and their networks (The State Program, 2013).

The analysis of concept-based papers defining the directions of educational system development in the Russian Federation has shown that the innovative character of the development of educational environment makes a direct contribution to the growth of education investment attractiveness and is becoming a significant tool influencing the rising generation.

Methods

During the research process the following set of methods was used:

– theoretical investigations, including studying and summarizing of Russian and foreign experience on the implementation of teaching innovations in HEI educational environment in conditions of education modernization; methods of scientific summarizing and theoretical modeling of innovation phenomenon, system approach to the analysis of teaching phenomena, analysis of literature sources on didactic, teaching, psychological and technical problems connected with informational support of education and e-learning; structural and functional analysis of research object and subject; analysis of acting and designed educational standards, curriculum, programs and other documents applied for a study of the character and the content of specialists’ activity, update of requirements to their knowledge and skills;

– empirical investigations: carrying out of teaching measurements, comparison and collation analysis, different types of diagnostics and examinations, summarizing of teaching experience in the field of innovation design, experimental teaching.

Results and Discussions

Teaching Innovations in Conditions of Educational Environment

According to studies the innovative processes in the educational environment are observed in three directions: social and economic, organizational and management, psychological and educational. They touch upon the methods of managing the educational institutions, elaboration and implementation of new educational technologies, creation of innovative schools, etc. Teaching innovations include innovations connected with renovation and change of technology, methodology, and content of education.

A teaching innovation is understood as

– a teaching novelty, purposeful progressive change introducing new points into the educational environment which improve features of separate parts, components, as well as educational environment as a whole – ideas, processes, means, methods, forms, technologies, informative programs, etc. (Simonenko and Retivykh, 2003);

- introducing new points in the goal, content, methods and forms of teaching and education, arrangement of team work of a teacher and a student (Slastenin, 2000);

- renovation, change of existing teaching technologies applied for teaching and educational processes (Shcherbakova, 2011);

- innovations in teaching activities, content of teaching and educational technologies aimed at improving the efficiency (Khutorskoy, 2003; Demir & Kutlu, 2016).

First of all, all these definitions are similar because of novelty of separate elements of educational processes leading to the changes in the content, methods and arrangement of the teaching process. There are no significant differences and contradictions between them. The aim of teaching innovations is to elaborate and introduce educational technologies providing the quality improvement of teaching and educational processes. According to studies teaching innovations are divided into three types: radical (change of the educational process or its component), combined (combination of existing forms, means, and methods and their transformation into a new technology), modifying (perfection of educational technologies without their substantial change).

Introduction of innovations into education is carried out by organizational and technical means aimed at providing the most efficient achievement of results into teaching activities. Recently because of intensive development of e-learning there has been a necessity to develop a system which includes tools of its implementation, including technical and learning and teaching tools. The electronic educational environment (EE) of the educational institution may serve as an example of such system as a combination of tool ware and resources providing conditions to implement the educational activity on the basis of information and communication technologies. EE of the higher educational institution, which is a system-based organized structure of information and communication, learning and teaching, soft and hardware tools, is becoming not just a supplement to forms of organizing educational process, but one of its significant factors to improve HEI educational system (Robert & etc., 2008; Savci & Aysan, 2016; Ilbay & Akin, 2014). Taking into account a specific character of modern time EE of the contemporary higher educational institution shall allow to implement totally conceptual approaches of the Federal State Educational Standards of Higher Education, being an efficient means of implementing e-learning.

A number of teacher training studies have considered the issues of creation and development of a modern educational environment of educational institutions. In her works I.N. Rozina (2010) defines the following basic principles, the implementation of which makes EE a unique and efficient tool of preparation of specialists with a new informative level of thinking: interactivity, motivation, modularity, appropriate assessment, and feedback. Another study (Krechetnikov, 2002) gives a description of a creative educational environment promoting the formation of student's capability to analyze, summarize, compare, determine cause-and-effect relations, investigate, prove, and generate new ideas. I.G. Zakharova (2003) introduces a definition of an ICT-rich educational environment which is an open system combining intellectual, cultural, program and educational, organizational and technical resources. One more study (Herzen University, 2016) considers a high-technology educational environment

as a perspective educational system in which information and communication processes are spread both in traditional and virtual, electronic forms causing qualitative shift in the solution of scientific, educational, social and cultural tasks.

The elaboration of high-technology EE is considered as a complex technical task which allows modernizing a technological direction of the educational system, implementing a transition to an open educational model. However, it is quite true that the efficiency of a teaching and educational process is highly correlated to the quality of its arrangement. At the same time a notion of instructional design occurs inevitably, which supposes the choice of tools, organizational forms and methods of material feeding, planning of learning and cognitive activity, preparation work on the course of study.

Considering the issues of instructional design with regard to educational environment of the modern HEI, this process may be defined as a system of psychological and educational specifications and approaches to model, elaborate and implement the educational content in accordance with didactic approaches. According to studies of I.G. Zakharova (2003) we can distinguish four basic principles of EE instructional design: openness, structural and resource redundancy, integrity, non-linearity. Yu.S. Pesotsky (2002) expands this list with the following principles of design of high-technology EE: authenticity, cultural conformity, manageability; and openness is understood as flexibility and responsiveness in the form of capability to interact with other systems (teaching, organizational, social and cultural, etc.).

Instructional design of the modern high-technology EE shall be aimed at provision of qualitative education, wholeness and unity of students' knowledge, giving purposeful formation of their individual and cognitive activity. EE development within the context of teaching innovations brings inevitable changes into the structure of didactic components: content, methods, forms and means of teaching.

Structural Modifications of Didactic Components within the Context of Teaching Innovations

Teaching Methods

The teaching process in EE conditions may be presented as a didactic system with definite combination of cooperating components and management functions. At the same time a manager is a teacher or a computer teaching system, and a manager is a student. They interact on the basis of technical devices through transmission, perception and transformation of information flows in the interactive mode. This approach divides the teaching methods into two types:

- methods of managing teaching process and information and cognitive interaction;
- methods of independently realized learning activity.

Management efficiency will be achieved on condition of clearly-defined goal, algorithmization of actions, ways and criteria of direct and feedback channels arrangement. Management algorithm is a tracking and correction system for student's educational and cognitive activity aimed at supporting adequate stability in perception of learning material and achieving educational goals.

Successful activity of a student has a direct dependence on a proved algorithm, and a feedback channel is a basis of qualitative management of the educational process. The works by V.P. Bepalko (2002) underline feedback significance in the systems supposing a continuous analysis and diagnostics of the main factors, among which there are a perception level (α), scientific character of studying a subject (β), awareness of perception (γ), and a degree of its automation ($K\tau$). Teaching management is inseparably associated with definite influences which are necessary to implement the goals of an educational process: support within the set limits (functioning) or transition to a new state (development). According to T.I. Shamova, T.M. Davydenko and G.N. Shibanova (2008) this type of management is directed to control the teaching process with the purpose to transfer it to a higher level. The system of methods of teaching management in conditions of the modern educational environment shall include all functional stages (Toktarova, 2015c):

- planning (designing a general model of the course of study, description of goals, strategy of achieving the results, set of students' competencies, analysis of the initial level of preparation, individual characteristics and personal qualities of a student, etc.);

- arrangement (arrangement of the educational process for students on the basis of individual learning routes and flexible adaptation algorithm; students' involving into implementation of individual learning activity);

- motivation (stimulation of interest through creation of comfortable conditions in accordance with psychological and personal qualities of the students; acceptance of the idea of freedom and responsibility by the students, provision of involvement into procedure of choice, self-determination, and reflection);

- control (use of different means of assessment and diagnostics; students' involving into the process of self-assessment and self-control);

- coordination (application of technological methods and flexible adaptation algorithm, providing a system coordination of the educational system components aimed at perfecting educational activity and management process).

Forms of Arranging the Educational Process

Forms of arranging the educational process in EE conditions may be classified along three directions:

- audience coverage (individually mediated, pair, group, collective learning in the interactive mode, mass learning with a unlimited number of students);

- goals (formation of knowledge and skills, development of competencies, summarizing and systematization of knowledge and skills, acquisition of professional skills, control of learning material perception, etc.);

- interactive mode (synchronous and asynchronous learning).

The innovative forms of arranging include the development of mobile learning, BOYD technologies and MOOC concepts (Toktarova et al., 2015a).

Mobile learning (m-learning) is considered as e-learning with the help of mobile devices (smartphones, tablets, netbooks, personal communication devices, etc.) which is not limited by student's location. BYOD technology (Bring Your Own Device) was developed on the basis of m-learning. It supposes the use of personal mobile devices by the members of the educational process to have an

access to the network-wide and specialized resources and services of an educational institution and the Internet. Such approach means introduction of technologies and services into HEI educational space, which are oriented towards granting personified access to the information resources via mobile devices, arranging a distributed online access to the content, providing academic mobility of students, teachers, and scientists, etc. Success of BYOD approaches is determined by the following prerequisites: high level and dynamics of mobile devices distribution among students and teachers and sustainable interest to their use; adequate audience perceptive to the changes in the established practice of educational process arrangement and quickly adjusted to the use of new approaches; easiness to transform learning materials into media content and content for interactive mobile services; technological and methodological integration of mobile services and content into the infrastructure of HEI educational and research and development environment.

MOOC concept (Massive Open Online Courses) is based on the use of new multimedia technologies, electronic resources, remote access to the web services, as well as team work over a distance (Bugaychuk, 2013).

Main principles of such courses arrangement and participation in them are the following: a big number of participants, open enrolment to the course, involvement of teachers from the best universities, presence of numerous feedback channels, flexitime, adaptable schedule and deadlines. We can introduce the following examples of MOOC introduction into HEI educational process: support of learning process (to arrange individual work, to study basic non-major subjects, etc.), advanced training of teachers by studying the courses of the best world universities, studying and mastering MOOC technology together with the students.

Teaching Resources

Active introduction and effective use of new information services, systems and technologies of teaching, electronic educational resources of the new generation are defined as strategic tasks of transition to the electronic learning and are the factors of social and economic efficiency of the implementation of education development program.

In the modern EE, teaching resources take the renewed meaning, the main functions of which are access and provision of electronic educational content, tools for the organization of information and cognitive interaction of the participants of the educational process. Teaching resources with necessary potential can provide adaptability to students' skills, differentiation and individualization, development of self-dependence and self-organization, formation of creativity and critical thinking, access to the new sources of learning information, etc. This leads to the new requirements to the elaboration, selection and use of teaching resources in EE conditions:

- provision of wholeness of academic subject perception, provision of necessary content for the efficient arrangement of learning and teaching process;
- integration with different systems and services of e-learning, for example, tools of team work and feedback with the teacher (video conference, webinars, podcasts, etc.);

- provision of learning materials of the course in different forms and formats depending on student's preference (text description, video materials, audio lectures, etc.);
- provision of functions of calculation, editing, visualization and modeling when connecting of students' mobile devices to the measuring instruments, different multimedia and office appliances;
- ergonomics, easiness, possibility to master work with learning resource easily and quickly;
- sustainability, reliability, and productivity, which allow providing an efficient and uninterrupted operation for a great number of students using this electronic application at the same time;
- technological effectiveness which is a variety of tools of information and cognitive interaction, presence of ready-to-use software products which allow organizing the communication process to different extents of complexity, simplicity and comfort.

Curriculum Content

One of the peculiar features and distinct advantages of e-learning is a possibility to provide the content in the electronic environment taking into account personal orientation to a student. Personalized learning is directed to detecting, taking into account and developing individual students' aptitudes, perfecting their style of thinking and perception, achieving a high level of perception and knowledge. Provision of personalization conditions promotes formation of high-technology educational environment which allow students to study taking into account their skills and possibilities. It is necessary to determine a set of criteria for the qualitative building of the personalized environment. The analysis of scientific works in this filed has revealed the following criteria:

- a primary level of student's knowledge, academic progress;
- peculiarities of perception of learning materials: limited physical capacities, dominant information perception channel, concentration skills;
- rapidity of learning materials acquisition, capability to analyse information of diverse complexity;
- students' age peculiarities;
- teaching and learning styles, etc.

The work (Toktarova and Panturova, 2015b) on designing and elaborating the personalized environment based on the models of teaching and learning styles defined the following criteria: presentation view of learning materials (text description, graphical description and models, audio lectures, video lessons), strategy of material feeding (small-volume fragments, full details of learning elements), speed of study (quick, normal, slow), form of organising learning activity (theoretical classes, carrying out the laboratory and practical works, running of experiments and research, measures of control), instructional techniques (provision of methodological recommendations and instructions, creation of problematic situations, games and simulations, learning plan scheduling, organization of communication with experts, record keeping, etc.). Having such approach, students shall pass a quiz at the initial stage to determine their individual peculiarities and preferences according to the

corresponding model; after that they get an access to EE services and learning materials, which was formed taking into account their personal style peculiarities.

EE Development within the Context of Teaching Innovations Implementation

Let's consider the essence and the characteristics of didactic components within the context of teaching innovations and the role of modern EE in their implementation.

Table 1. Didactic components and electronic educational environment.

<i>Component</i>	<i>Essence and characteristics of the component within the context of teaching innovations</i>	<i>EE role in the implementation of the component</i>
Tasks and goals	Professional and personal development and self-determination, formation of key competencies, improvement of information culture, capacities for self-organization and self-education, development of critical thinking, improvement of quality and durability of knowledge and skills acquisition, continuous long-life learning	EE is a tool of learning and development, assessment and diagnostics, information and cognitive influence
Content of learning	Personalized orientation of learning content, commitment to formation of key competencies, taking into account student's individual characteristics: type of thinking activity, levels of perception and memory improvement, initial preparation level, speed of learning, etc.; adaptability of the environment to the student depending on these factors; variability of educational programs, expansion of context and practice-oriented learning; non-linearity of the educational process promoting personification of the learning activity and organization of multi-level provision of wholeness of academic subject perception: provision of necessary content for efficient arrangement of teaching and learning process	EE is a tool of personalized and differentiated learning, individualization and adaptation, implementation of individual educational learning paths
Teaching methods	Expansion of the complex of methods of individual work arrangement, management of learning and interaction, increase of volume of interactive learning, increase of the role of cognitive interaction of the participants of the educational processes	EE is a managing tool of learning and interaction, self-education and self-organization, assessment and diagnostics, correction of learning and development
Forms of arranging the learning process	Implementation of individually mediated, pair, group, collective forms of the learning process in the interactive mode, development of mass learning which means connection and work with EE resources of any unlimited number of	EE is a tool of implementation of all forms of the learning process

students; synchronous and asynchronous learning; development of mobile learning, BYOD technology, MOOC concept

Table 1. Continued.

<i>Component</i>	<i>Essence and characteristics of the component within the context of teaching innovations</i>	<i>EE role in the implementation of the component</i>
Teaching resources	Use of new teaching tools to solve any learning tasks; presence of a wide class of variable resources and software products which allow organizing the learning processes to different extents of complexity, simplicity and comfort, provision of learning materials of the course in different forms and formats depending on student's preferences (text description, video materials, audio lectures, etc.); wholeness of learning and communication arrangement by means of tools integration with different systems and services of e-learning; sustainability and reliability, which allow providing an efficient operation for a great number of students	EE is a tool of learning and information interaction
Means of interaction of the participants of the educational process	Enhancement of student's role as an actor of learning activity; increase of need in self-education, self-development, self-determination with understanding personal responsibility; change of teacher's character and role - the development of tutoring institution; openness and refusal of traditional role interaction, freedom of criticism, dialogueness and/or polylogueness, reflexiveness	EE is a tool of information and cognitive interaction

Conclusion

In the whole, teaching innovations are characterized by a definite degree of influence on the qualitative features of the didactic components of the educational system. Within the framework of the instructional design of the modern information educational environment it is necessary to take into account types and structure of innovations, levels of implementation and stages of their life cycle. New-generation EE development promotes implementation of smart-learning, the concept of which means self-paced study and continuous development of competencies of the participants of the educational process based on the interaction, experience exchange and constant update of the content; quality improvement of professional preparation of HEI students with the use of innovative technologies.

Prospective directions to develop the ideas of the given research are the analysis and elaboration of design methodology of teaching innovations within the framework of e-learning taking into account the necessity to implement the provisions of up-to-date Federal State Educational Standards of Higher Education.

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Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Irina V. Khairova is PhD, Associate professor of the Department of Pedagogy and Methodology of Primary Education at the Institute of Psychology and Education, Kazan (Volga region) Federal University, Kazan, Russia.

Vera I. Toktarova is PhD, Associate professor and Head of Science and Innovation Department, Mari State University, Yoshkar-Ola, Russia.

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