Implementation of Pedagogical Innovations in the Electronic Educational Environment of the University

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Abstract

The relevance of the study is caused by the need to improve the training of university students on the basis of unification and amalgamation of various innovative tools and technologies into a single high-tech electronic educational environment. The article is devoted to a brief overview of innovative concepts of e-learning. Theoretical and empirical research methods were used in the study. The main content of the study is the analysis of innovative concepts of the development of modern e-learning: Personal Learning Environments, M-learning, BOYD, MOOC. The basic characteristics of these concepts, the benefits of their implementation, the basic requirements for the organization of educational process with their use are discussed. The model of implementation of pedagogical innovations which contributes to the development of smart-learning in electronic educational environment of the university is introduced. Due to the relevance of the issues discussed in the work, it may be interesting and useful to teachers and tutors of higher and secondary educational institutions in both theoretical and practical aspects.

Keywords: *pedagogical innovations, e-learning, electronic educational environment, higher education*

1. Introduction

At the present time informatization of education is declared as one of the priorities of the state policy. Consolidation and active implementation of automated systems for educational purposes, creation of a single electronic educational environment of universities alter the educational process irreversibly, influencing its content and pedagogical techniques. Organizational aspect is also undergoing significant changes - new forms of getting an education such as e-learning are developing.

Due to the reform of education learning and teaching process has undergone a number of changes and updates, that has led to the introduction of the term “innovation” to pedagogical practice. The concept of long-term socio-economic development of the Russian Federation for the period until 2020 identifies the following directions of development in the field of education:

- greater use of information and communication technologies for the development of new learning and teaching forms and methods, development of distance learning and media education;
- introduction of innovations into basic education, including structure updating of the educational institution networks in accordance with the objectives of innovative development.

According to the State Program of the Russian Federation "Development of Education" for 2013-2020, the support of innovations and innovative teachers, professional communities, educational organizations and their networks is one of the priorities of the state policy. A new educational paradigm orients educational community to provide various and alternative education systems and institutions, flexibility and dynamism of learning and teaching process in higher education, its adaptability to the social circumstances, a wide use of modern learning and teaching technologies in higher education.

The effective functioning of a modern higher education system is impossible without high quality electronic support for students, which is determined by the purpose of the educational process and the nature of the professional activity of future specialists. One of the possible ways to improve educational process is the unification and amalgamation of various learning and teaching tools and technologies into a single high-tech electronic environment of educational institutions.

2. Methods

The study is based on the following set of methods:

- *theoretical research methods*: the study and generalization of domestic and foreign experience in the implementation of pedagogical innovations in electronic educational environment of university in the context of modernization of education; methods of scientific analysis and theoretical modeling of the phenomenon of innovation, systematic approach to the analysis of pedagogical phenomena, analysis of scientific works on didactic, pedagogical, psychological and technical problems connected with e-learning and electronic educational environment; structural and functional analysis of the object and subject of the study; analysis of current education standards, curricula, study programs and other documents used for the study of the nature of activity of specialists and requirements for their knowledge and skills;
- *empirical research methods*: educational measurement (observation, questionnaire, survey, interview, testing); comparative benchmarking, different types of diagnosis and examination, the study of teaching experience in designing innovations; statistical analysis of the results of the research, experimental teaching.

The methodological foundation of the research is as follows:

- works on innovations in the field of education (K. Angelovski, I.F. Isaev, L.N. Gorbunova, V.S. Lazarev, I.J. Malkova, G.N. Prozumentova, L.S. Podymova, A.N.Khutorskoy, E.N. Shiyanov, A. Nicholls, E.M. Rogers and others);
- the study of innovative processes in education (A.A. Arlamov, M.S. Burgin, S.M. Godnik, L.D. Gireva, V.I. Zagvyazinskii, V.I.Quant, I.B. Piskareva, L.S. Podymova, S.D. Polyakov, O.G. Homeriki and others);
- works on personality oriented approach, personalized learning (E.G. Gelfman, I.Y. Lerner, V.J. Lyudis, M.I. Mahmutov, A.M. Matyushkin, E.S. Polat, G.N. Prozumentova, M.A. Kholodnaya and others);
- works on the development of professionalism and professional competence of students (S.M. Godnik, I.A. Kolesnikova, V.S. Lazarev, P.I. Podkasisty, A.I. Prigogin, L. Friedman, G. Grant, D. Posner, J.A. Moon, P. Russeland others);
- the study of the design, modeling and creation of educational environments (O.S. Gazman, M.V. Klarin, I.V. Robert, N.K. Sergeyev, V.I. Slobodchikov, V.A. Yasvin and others);
- the study of the design and development of e-learning (V.P. Bespalko, P.J. Galperin, L.B. Itelson, B.S. Gershunsky, A.A. Polyakova, I.V. Robert, V. I. Soldatkin, I.A. Talyzina and others);
- works on the development of mobile learning (E. Georgieva, A. Smrikarov, A. Kay, M. Sharples, D. Atgevel, D. Traxler and others).

3. Results and Discussion

At present innovative processes in education are studied in three aspects: social and economic, organizational and managerial, psychological and educational.

Social and economic innovations include innovations in planning and motivation, remuneration of labour, improvements in vocational training and upgrading skills of educators. They are not directly connected with pedagogy, however, they influence the entire education system and are revealed in the increasing level of education and culture.

Organizational and managerial innovations include the development of new forms and methods of work organization, affect the structure and managerial methods of educational institutions, focus on improving learning management system at the federal and regional levels.

Psychological and educational innovations include innovations in the methods of teaching and learning, organization of educational process, educational psychology, contribute to a significant expansion of teaching and learning methods and techniques. Solving the problem of improving the quality of education, particularly of higher education, there is an intensive introduction and implementation of innovative learning and teaching forms and methods that allow to provide online training, develop important competences for future professional activity.

The result of the implementation and extensive use of innovations in education is a developing modern education system that provides continuous access to new information and contributes to lifelong learning.

Innovations in learning and teaching technologies, tools and resources are pedagogical. Various scientific sources consider *pedagogical innovations* as:

- innovations, targeted progressive changes, that bring new elements to educational environment and improve the characteristics of the individual parts, components and the very education system in general (Simonenko & Retivykh, 2003);

- innovations in teaching activities and technologies that contribute to the improvement of their efficiency (Khutorskoy, 2005);
- Updating, modifying existing learning and teaching techniques used in educational processes (Sopetchenkova, 2010);
- Introduction of new aspects to goals, content, methods and forms of learning and teaching, organization of deeper cooperation between teachers and students (GOST, 2011).

According to the authors (Lavrentiev & Lavrentieva, 2002), pedagogical innovation is theoretically based, targeted and practice-oriented innovation, which is carried out at three levels: at a macro level, meso-level and micro level. At the macro level innovations affect the whole system of education and lead to the change in educational paradigm. At the meso-level innovations aim at changes in educational environment of the region, in particular schools. At the micro level innovations focus on the creation of new ways of structuring educational process, the development of new learning and teaching technologies, forms and methods.

Common point of these definitions is new elements of educational process that lead to the changes in the content, methods and forms of learning and teaching. The main target of pedagogical innovations is the development and implementation of educational technologies that enhance the quality of learning and teaching by improving both content and the learning process management.

The introduction of innovations to education is conducted through communication and information technologies, the purpose of which is to ensure the achievement of effective results in educational activity. The example of such innovations is electronic educational environment (EEE) of educational institutions.

EEE is the system of tools and resources to ensure conditions for educational activities on the basis of communication and information technologies (GOST, 2011). EEE provides new opportunities in educational process, including a combination of high economic efficiency and flexibility of educational process, the wide use of electronic resources, a significant expansion of traditional and introduction of new, more efficient forms of learning and teaching. EEE of higher education institution should afford to implement all the conceptual approaches of the federal state educational standards of higher education and be an effective means for the implementation of e-learning. The main principles of the functioning of EEE are accessibility, interactivity, openness, systematic character, integrity, multifunctionality, user-orientation. The goals of the use of EEE in the educational institutions include: the creation of common educational space on the basis of modern communication and information technologies, information support of educational process, as well as the creation of an IT platform for communication between teachers and students. One of the main features of EEE is its high-tech character.

High-tech electronic educational environment is a promising education system, in which information and communication processes run in traditional, virtual, electronic formats, providing the solution to scientific, educational, social and cultural problems (Herzen University, 2014). Most researchers consider EEE as the way of improving the didactic theory and practice according to changes in social and economic conditions. They describe a model of pedagogical process in which didactic possibilities of innovative technologies are implemented. These technologies allow to organize effectively individual and group work of teachers and students, integrate various forms and strategies for acquisition of knowledge, develop a focused independent cognitive activity of students.

EEE of the university is a network environment for the implementation of e-learning, which includes tools for preparing and delivering educational content and learning management tools. In accordance with the Federal Law «On Education in the Russian Federation» special requirements are imposed to the creation of electronic educational environment, "... including electronic information resources and electronic educational resources, information technologies, telecommunication technologies, appropriate technological tools and ensuring the provision of the complete course, regardless of the location of the students" (The Law, 2012). Thus, the widespread introduction of e-learning is not only innovative educational technology, but also the creation of conditions for the socialization of different categories of students, regardless of time and place of their location, state of health. In this regard, there are several promising ways of implementing educational innovations which are connected with the development of modern e-learning on the basis of high-tech EEE of the university.

4. Provision of Personal Learning Environments (PLE)

PLE are tools, communities and services, on which individual educational platforms for students who manage their own learning and set educational goals independently are based (Karpenko & etc., 2015). The transition to the personalized learning is connected with the development of a knowledge society:

- from the paradigm of "teaching" to the paradigm of "learning";

- from delivery of students to knowledge to delivery of knowledge directly to students;
- from adaptation of students to the educational environment to personalized learning.

Personalized learning in electronic educational environment is the adaptation of the learning process to the individual characteristics of a student through the creation of individual learning pathways (pedagogical scenarios), which contribute to the improvement of learning quality and efficiency. In the context of EEE a pedagogical scenario is a learning model which consists of a description of the learning goals and outcomes, ways and methods of presentation of learning material. The design of the model proposes the determination of the structure of learning content, correlation between its components, including theoretical, practical, control and reference components, as well as ways of learning process management (Toktarova & Panturova, 2015) (Figure 1).

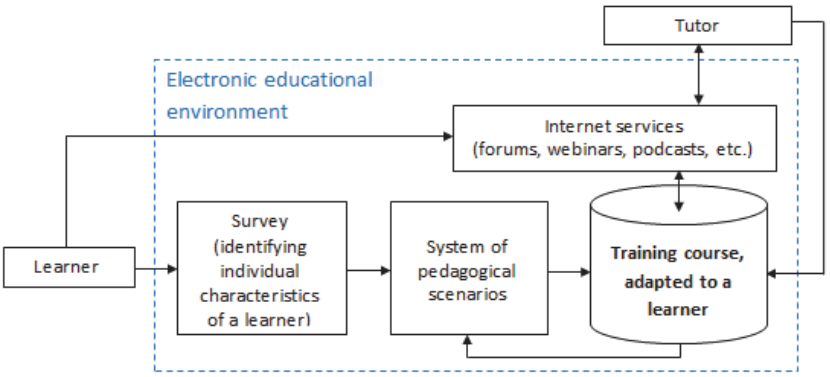

Figure 1. The scheme of communication in EEE on the basis of pedagogical scenarios

At present adaptive learning is a modern automated version of personalized learning. In particular, adaptation involves the analysis of individual features and entry-level training of a student, interactive learning process, evaluation of criteria for measuring progress to go on to the next level of learning. The system of adaptive learning, which aims at improving the learning quality of students, consists of adaptive planning, adaptive testing, and / or adaptive presentation of educational content. The degree of adaptation of Personal Learning Environments to a learner determines the effectiveness of educational process.

5. The Development of M-Learning and BOYD

In accordance with GOST R 52653-2006 mobile learning is considered as e-learning through mobile devices (smartphones, tablets, netbooks, laptops etc.), which is not limited by the location of the student. The relevance of m-learning is due to many factors: new society's needs in technologies of modern education, the development of a market economy, improvement of learning and teaching forms and methods.

The introduction of mobile technologies into education allows participants of educational process to move freely, expands the scope of the learning process outside the institution, lets people with learning disabilities learn, does not require a personal computer or paper textbooks. This technology is economically viable, study materials are spread easily among users thanks to modern wireless technologies, information in a multimedia format contributes to better learning and memorizing material, greater interest in educational process.

M-learning provides access to specialized sites which contain e-learning courses, tests, practical tasks and additional learning materials, as well as the continuous exchange of information between students and teachers at all learning stages. Online access to information enhances the efficiency of the development of learners' competences by expanding the scope of their practical activities. Students can choose their own learning content tailored to their interests, as a result, mobile learning becomes focused on the student's individuality. In addition, learners have also an opportunity to study at a convenient time, all necessary conditions for increasing the activity and taking the initiative are created. Mobile learning involves the use of adaptive electronic textbooks, training courses and files with educational information. Educational electronic tools can be developed specifically for the mobile phone platform due to modern technologies.

Mobile learning tools have contributed to the development of BYOD technology (Bring Your Own Device), the main advantages of which are:

- providing with prompt access to educational resources and web services regardless of time and location of the

student and the teacher;
- possibility to store personal data and necessary learning materials in mobile devices, instant Internet connection from a mobile phone;
- increase of effectiveness of the use of IT resources due to reducing the costs of supplying mobility and user orientation of the device.

BYOD involves the use of personal mobile devices in educational process to get an access to common and specialized network resources and services of the educational institution and to the Internet. This approach involves the introduction of technologies and services focused on providing personalized access to information and reference resources via mobile devices to educational environment of the university, distributed online access to content, supplying students, teachers and scientists with academic mobility.

The success of the implementation of BYOD as a component of IT- strategy of a higher education institution is due to the following prerequisites (Ivanchenko & ect, 2013):

1) high level and dynamics of the spread of mobile devices in educational environment and sustained interest in their application;
2) substantial cognitive potential of the participants of educational process, who are flexibly and adequately responsive to changes in the established organization of educational process and easily adaptable to new approaches and technologies;
3) easy transformation of learning materials to the media content and the content for interactive mobile services;
4) technological and methodological integration of mobile services and content in the infrastructure of educational and scientific-research environment of the university.

The use of BYOD approaches, combined with the principles of e-learning, makes it possible to creat a multi-platform mobile educational office for students, which will allow to implement a freer form of study, new versions of the design and use of high-tech electronic educational environment of the university.

The quality of educational process depends on the technical tools and devices. The software running on mobile devices interacts directly with the user, provides a link between students and education system and affects both the user's perception of the learning process as a whole and its final quality. Creation of qualitative educational mobile application is a complex process that involves running a large number of different operations and solving a variety of tasks. There are a number of modern tools and technologies to achieve a high level of organization of the application development process. In this connection, there are new requirements for the design and development of educational mobile applications to implement them effectively in the educational process (Toktarova & etc., 2015).

While developing m-learning tools, the following points should be taken into account:

- requirements for mobile learning content, which must be supplied by small, capacious, relevant portions which cover a specific issue. It is necessary to make the content effective for various mobile devices and easy-to-use everywhere;
- requirements for the technical tools and devices of mobile learning (Kuklev, 2010): portability and availability, individual adaptation to a person, unobtrusiveness, possibility to communicate with a teacher, usefulness and ease of use.
- requirements for the organization of mobile learning (OELPC, 2009), which include the availability of means of communication (e-mail, forums, video conferences), and the provision with necessary learning content to make the educational process effective.

6. The Implementation of MOOC

Massive open online course (MOOC) is based on the use of new multimedia technologies, electronic resources, remote access to Web services and collaboration at a distance. This program is studied in the works of V.N. Kukharenko, A.V. Kalmykov, E.D. Patarakin, S.A. Shchennikov. The basic features of such courses are as follows (Bugaychuk, 2013):

- a large number of participants;
- always open registration regardless of the time of its beginning and end;
- participants are more active outside the main site on other nodes of the network, such as personal blogs, other websites and social networks;
- after the end of the course information remains available online and continues to spread, other users can work with it;
- teachers and students work in collaboration. The teacher acts as a mediator, counselor and mentor. The teacher helps students with the selection of information and its statistical processing;

- there are several types of participation in the course: an active participant, a participant of several topics and an observer;
- a learner should have a high level of motivation and self-control;
- participants set their own learning goals and individual learning pathways.

MOOC employs teachers from the best universities, has a timetable, schedules, deadlines, multiple feedback channels, free and global character. Unlike traditional learning each student has an individual learning pathway that includes video lectures, tasks and exercises, group work and discussion. It has a flexible, but sufficiently exact schedule.

MOOC can be used in educational process of the university for the following purposes:

- organization of independent work, teaching basic non-core subjects;
- professional development of teachers through training at MOOC of the best universities in the world;
- further study and development of the MOOC technology in collaboration with students.

The model of the implementation of the above described educational innovations in electronic educational environment of university is presented in Figure 2.

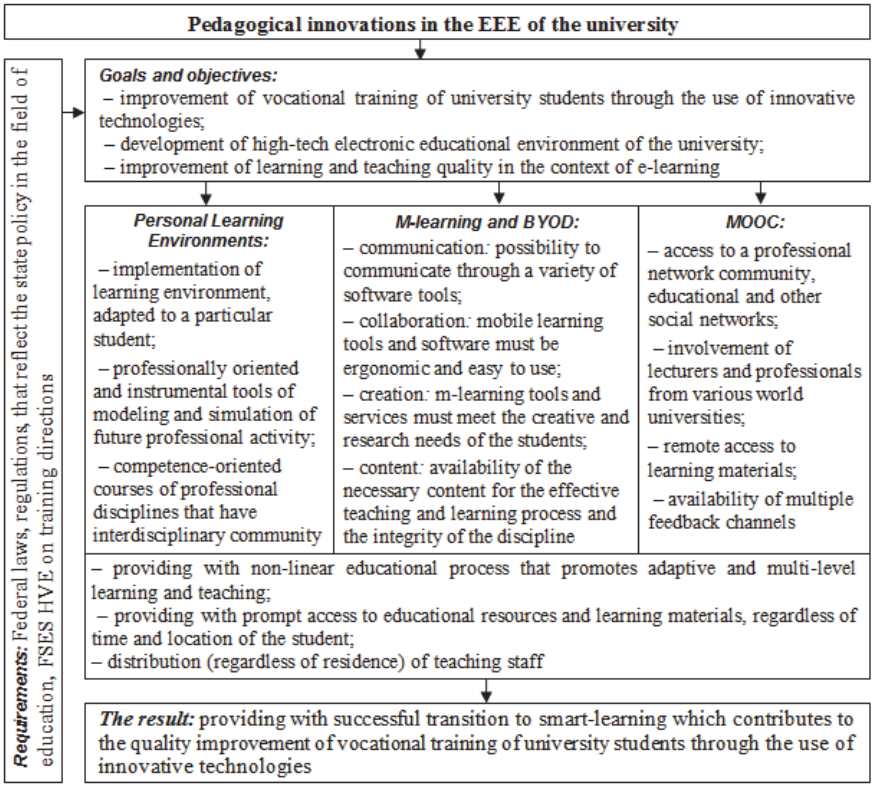

Figure 2. The model of the implementation of the educational innovations in EEE

The result of the introduction of this model to educational process of the university will be the implementation of smart learning. Smart learning involves the creation of intellectual environment of continuous development of competencies of learners, which includes the activities of formal and informal learning process, the result of which is the acquisition of new skills. In other words, smart-learning is a flexible learning in an interactive learning environment with the use of content from all over the world in free access.

The following main characteristics of smart-learning are described in the works (Dmitrievskaya, 2011):

- compatibility between software designed for different operating systems that enables the implementation of the continuous educational process and the integrative educational information;
- independent of time and place, mobility, ubiquity, continuity and easy access to content;
- autonomy of the teacher and the student due to the use of mobile devices;
- identifying different motivational patterns;
- interrelation between individual and organizational goals of employers and educational institutions;

- assessment of changes in competencies - the effectiveness of educational process is measured not so much by the acquired knowledge as the ability to apply it in practice;
- flexible learning according to student's learning preferences and potential (possibility to adapt educational process to individual characteristics of a student, such as background knowledge, experience and skills, learning style, physiological and psychological state at any given time of studying).

In the context of smart-learning the teacher can develop an individual approach to each student. Moreover, the student can participate in the development of particular disciplines. In fact, students make the curricula by themselves, the teacher only helps them. New educational content will enable students to acquire skills and knowledge in accordance with the competency model. This innovation provides the flexibility of learning in interactive learning environment, personalization and adaptation of training, students are given the opportunity to acquire professional competences on the basis of a holistic multidimensional vision and the study of disciplines taking into account their multidimensional character and continuous content updates.

7. Conclusion

Thus, the introduction of smart-learning will allow to implement adaptive education programs, collaborative learning technology, personalized learning at a new level, will provide geographically independent access to the learning process that contributes to the improvement of vocational training of university students through innovative technologies.

Promising ways of developing the ideas of this research consist in the analysis and development of various methodologies of the design of educational innovations which aim at the implementation of systemic changes in educational process of the university in the context of smart-learning.

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