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Educational Process Management with Innovative Information and Communication Technologies

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Abstract

In the paper the concept of interactivity process in education is considered, innovative education is defined, the criteria of quality development are introduced, innovative communicative technologies set as an instrument of the education organization is developed, different definitions of competency-based education are presented.

1. Introduction

Development processes in Russian system of higher education, undertaken during the transition to a Bologna process in order to integrate in the European educational community and the related changes in socio-economic conditions of its functioning put forward new demands as to structure and content of university educational activities. The current economic situation of Russian universities is characterized by the lack of funds needed to modernize the educational process, but innovative development is determined by the federal imperative of ensuring competitive quality of educational services. Worldwide modernization of vocational education due to the increasing demand for highly skilled professionals has increased internationalization in vocational education and research, active use of scientific knowledge in economic and industrial activities, resulting in the establishment of new forms of knowledge, new ways of managing human resources in vocational training and new solutions to the problems of the economy of various countries, Russia is no exception. Working in such conditions and due to socio-economic changes, the system of higher education is to use innovative information and communication technologies for the introduction of knowledge, in order to educate a professional who is in demand in the labor market after graduation. Now the challenge of its development is to adapt to the ever-growing demands by using the mechanism of up-to-date development of competitive graduates possessing professionalism, rational thinking and common sense.

2. Innovative Learning Strategies

Russian system of education is facing a crisis regarding quality of education due to economic problems in the country. One model for improving quality is competency-based education, in which an institution clearly defines the specific competencies expected of its graduates. [1] Competency-based or competency-focused models that currently exist can be used to provide a rigorous, personalized education for higher school students. It can be achieved by modifying the existing standards and assessment modes or by complete removal of credit-based, instructor-led and credit-hour based

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system. Competency-based education can be developed through a stronger focus on innovative ways of teaching and learning. A competency or learning outcome can be defined as "the ability to demonstrate a system or sequence of behavior that is functionally related to attaining a performance goal" [2] To define learning outcomes in terms of competencies, "such goals describe not only what is to be learned but also the specific levels of performance that students are expected to master" [3]

A competency is also a specific skill, knowledge, or ability that is both observable and measurable. Competency based education is an alternative to the credit hour-based system of credentialing. Student progress is based on demonstration of proficiency and/or mastery as measured through assessments and/or through application of credit for prior learning. In competency based education programs, time is the variable and student competency mastery is the focus, rather than a fixed-time model where students achieve varying results. In competency based education, as distinct from competency based learning, the focus is on academic programs, practices, and policies. [4]

Competency-based education is an outcomes-based approach to education where the emphasis is on what comes out of postsecondary education—what graduates know and can do—rather than what goes into the curriculum. With a competency-based approach, teachers do not begin preparing a course syllabus by identifying content and readings. Instead, they begin by identifying competencies and then select the content, readings, and assignments to support student attainment of those competencies. [5] This can provide students a new, creative and innovative way to relate their own personal projects to the curriculum. Students can build skills towards their own projects and can become more motivated into completing their project.

Organizational structure of innovative educational institution (Table 1) defines three key areas of activity - education, research and production. Education provides delivery of systematic knowledge and skills, and it is the main mechanism of development of skilled experts and professionals whose role is to make up the backbone of the economy at the current stage of its development. Science provides the generation of fundamental knowledge, applied research and development is to ensure a change of technological basis of the production sphere. Production's goals are to make high-tech products, designed to ensure the country's competitiveness in the world market.

Table 1. Innovative policy in the sphere of higher education.

Innovative education policy	Factors of influence on effective introduction of innovative educational technologies in the system of higher education
Introduction of innovative educational technologies into education practice	university professors willingness to apply a student-centered approach demanding teacher training in the field of innovative teaching technologies; teachers' willingness to restructure their courses according to principles of constructivism so that to include innovative learning activities in teacher's scientific and methodical work plan, in order to acquire a systematic and controlled character; – teachers' ability to apply new information technologies for the implementation of a student-centered approach and the principles of constructivism in education, and the creation of institutions of higher education using information technology pedagogical innovations.
Implementation of the system of multi-level education	– university faculty and administration willingness to use a new paradigm of training (bachelor, master and PhD students) in the number of majors; – efficiency of cooperation and integration between Russian and European universities in the implementation of education modernization programs; integrated educational environment formation in Europe is at the heart of all activities implemented within the framework of the Bologna process.
Higher education quality improvement	content of basic educational programs of high school; qualifications of the university faculty; young people motivation and vocational guidance; availability of modern teaching and laboratory facilities, including experimental, methodological and information support of educational programs and research; availability of effective access to information resources needed for educational and scientific practice; availability of quality infrastructure of educational work and leisure (buildings, sports facilities, dormitories, catering and leisure).
The transition to credit system of evaluation	university faculty willingness to analyze and modernize programs of academic disciplines in accordance with the general approaches to their development and evaluation; cooperation between Russian and foreign universities in the development and implementation of the common principles of design and evaluation of educational programs.
Interdisciplinary educational programs implementation	faculty and university departments willingness to cooperate in the implementation of interdisciplinary educational programs; the degree of development of interdisciplinary research in universities.
Implementation of liberal arts programs	– faculty and departments willingness to cooperate in the implementation of liberal arts programs; – the level of liberal arts programs methodological support; – cooperation between Russian and foreign universities in the formation of a unified educational environment for liberal arts teaching.

The research in this field of education has noticed that the combination of successful educational, research and innovation activities in Russian universities have become the determining factor in their quality of training; competitiveness of world labor market has become the incentive to develop innovative learning strategy known as "life-long learning". Relevant to training quality is the use of innovative technologies in the organization and management of educational activities, which include encouraging universities in the organization of educational process; expansion of multi-channel financing of universities; differentiation of universities through the levels and areas of training; determination of the status of elite higher education; establishment of credit system in higher education; formation of a system of continuing education; the development of open and distant education organizations; increasing the role of science in the education process; structuring of educational research and innovation systems that identify areas of cooperation with industries and regions; integration of higher education system into international system of higher education; creating a system of quality control in higher education institutions independent of the institutional bodies. [6]

At the moment, there is no meaningful uniqueness of the concept of 'innovation in education.' [7] This is primarily due to the fact that every Russian university has its own characteristics, traditions, including attitudes to innovations meaning a set of innovative educational technologies used in a particular university. However, the main objective of higher education innovation policy is a systematic and consistent implementation of continuous innovation system, providing advanced development of higher education system in accordance with the objectives of socio-economic and cultural demands of the state, government and society. Russian universities innovative experience has been accumulated in two ways: firstly, the conceptual basis of innovation in education, and secondly, the description of the application and the effect of individual innovations in the educational process. This situation reflects the bipolarity study of the process of innovative technologies application to ensure the quality of graduates training; on the one hand, there is a philosophical and theoretical approach to the problem; on the other there is the rationalization of the educational process through the use of different factors. Innovative higher education has become necessary as education based on the knowledge acquired with the use of innovative educational technologies. This way new and scientific knowledge is obtained by means of invention, the integral synthesis of art and other methods. The process of using innovative technologies to ensure training quality is a logical sequence of technologies, methods and ways of converting new knowledge into technical or social reality.

Organization of information resources, which summarizes all the available information on the various issues are having an increasing influence on the intellectual and economic life of society. [8] In the process of information society development, information resources have become the subject of information technology activity. Currently, requirements to the information are as following: accuracy, timeliness, completeness, selectivity, low-cost, openness, integration and expansion. [9]

3. Educational Process Management

Management of the modern educational process requires the teacher's widespread use of interactive learning technologies that can help bring the educational process to the organizational and work situations of the personnel daily life. For example, in relation to management disciplines the acquisition of theoretical knowledge, the formation of skills needed in practice should be taken into account. Therefore, in the course of specialists training the methods in which students get to know the material included in the study, after that they are encouraged to implement the knowledge they have got, to experience success and thus to motivate their further behavior are primarily suitable. Requirements mentioned above are best suited to interactive learning technology, which does not only dramatically improve remembering, but also contributes to material identification, implementation and professional activities. The definition of interactivity is treated as an interchange between technology and students - a process they call "feedback". Gilbert and Moore [10] use the term "interaction" and "interactivity" interchangeably. Interactive learning actively engages the students in dealing with the material. Lectures and seminars are changed into discussions, students and teachers become partners in the journey of knowledge acquisition.

The three types of interaction are:

- interaction between a student and electronic educational resources,
- interaction between students and teachers,
- interaction between students.

Interaction between a student and electronic educational resources. This is a significant criterion of learning, without which there can be no education, since it determines the process of intellectual interaction directly with the subject of study, thereby bringing changes to the learner, expanding his\her prospects and increasing his\her intellectual level.

Interaction between a student and electronic educational resources partly reflects what is called "internal didactic conversation" when learners "talk to themselves" about the information and ideas they have encountered in a textbook, TV shows, lectures. Currently, students already have educational tools such as educational radio and television programs, audio, video and computer programs. Nowadays, interactive videodisc is widely used in the field of didactic interaction.

The interaction between students and a teacher. During this interaction, teachers try to achieve the same goals as all other professionals working in the field of higher education do. First they develop a curriculum, i.e. syllabi, and they tend to stimulate and to maintain the students' interest in educational material, to stimulate students' motivation to learn, to reinforce and retain the interest, sometimes by encouraging self-motivation development. Then, teachers excite students' attention toward certain subjects to provide information, demonstrate the application of skills or specific modeling approaches and values with the use of electronic educational resources. Next, the teacher shows how the student can apply the knowledge obtained in the form of practical application of skills or abilities to dispose new information and new ideas. Teachers assess students' work to determine the effectiveness of the educational process and, if necessary, change the learning strategy. Finally, the teacher arranges a discourse or supports each student, and the degree and nature of this support depends on the level of the student's knowledge, personal qualities of the teacher, his\her beliefs and other factors. Individual approach to each student is a significant advantage of this method. The teacher develops a dialogue with each student, thus drawing attention to the motivational aspect of one student and understanding the reasons for misunderstanding the others.

The interaction between the students. A new form of interactive education that challenges critical thinking is the interaction between students in the group in the presence of a teacher or in his\her absence.

The educational process in Russia during its long history has often been built within a class or any other group of students for reasons that have nothing to do with their educational needs. However, the interaction between students happening in the class or in any other educational group is a highly valuable training resource, sometimes considered obligatory. Based on the fact that in modern society, especially in business, it is extremely important to have skills of effective interaction in a group, project methods focus on teaching students these skills by applying the appropriate training. The student either alone or together with a teacher can learn the principles of leadership and group relationships, for these purposes it is necessary to use methods of interactive education using video and computer interaction. However, at

the stage of practical application of knowledge and its assessment the acquisition of team spirit becomes the most valuable for the learners and for their teacher. Thus, students have the opportunity of individual interaction with the teacher electronically, as well as communication within the group, for example, using an asynchronous e-mail.

An important characteristic feature of interactive learning technologies in modern educational process, which is also characteristic of the field of education in general, is the awareness of the benefits of duties sharing in the learning process. Due to the rapid spread of telecommunications development in education, the principle of training specialization and the use of communication means should be widely applied in all three types of interaction described above. Teachers need to organize programs so as to maximize the effectiveness of each type of interaction and to ensure that these programs are consistent with the type that is best suited for different tasks in teaching different subjects, as well as for students' needs at various levels of learning.

The main drawback of many interactive teaching programs is their commitment to only one type of learning tools. This approach allows the use of only one type of interaction. For example, correspondence can achieve excellent results in the interaction of "student-electronic educational resources" type and good, although not as quickly manifested results in the interaction of "student-teacher" type, but does not provide interaction between students. Teleconference is best suited for interaction "student-student" type and some types of interaction between a teacher and students, but often uses lecturing incorrectly that is more suitable for printing tools or materials. In contrast to lecturing, teleconferencing can stimulate and facilitate interaction of "student-student" type, until recently this type of interaction could not be used in distance learning.

4. Methodology

Since the intent of this research was to gain insights into how students received knowledge and leaning experienced with the help of competence-based approach at a particular higher school institution, a comparative case study was used Methodology of the research in general was a compilation of holistic theory explaining existence of interrelated phenomena in the modern world, activity approach developed by the Russian psychologists (L. Vygotsky, A. Leontiev, P. Galperin), and competence-oriented approach in education (I. Zimnaya, A. Verbitsky). Holistic theory states that everything in the universe is made up of integrated wholes that cannot be reduced to the sum of their parts [11]. There are many philosophical and practical derivations of holistic learning theory; however, one unifying principle is

that everything in the world (or in the universe) is interconnected. Holistic learning theories see each human entity as a system of interacting dimensions and not as simply a body with a brain and spinal cord. As such, holistic educators seek to educate the whole student. They strive to help students grow toward their full potential in all dimensions: intellectual, emotional, social, artistic, moral, psychological, physical, aesthetic, creative, intuitive, spiritual, and others. Students are neither empty vessels to be filled with knowledge nor "tabula rasa" to write on. In fact, most people learn, solve problems, and make decisions using the full dimension of their being. It is in these fuller dimensions that some of the greatest innovations in human history have come about. Holistic learning theory would incorporate all of these traits in helping students learn the knowledge and skills necessary for them to fully develop and successfully act upon their worlds [12].

The purpose of the study is not to generalize results to a larger extent (not the entire student population of Russia), but to present a description of the phenomenon under study at a particular higher school institution from which other researchers can draw inferences.

5. Results

The participants in this research were undergraduate university students who met the following criteria: 1) native-speakers of Russian; 2) undergraduate students; and 3) having been taught using traditional approach to teaching and learning.

There were two groups of participants, one group was a part of an experiment, another group was taught according to traditional requirements. Comparative study was done at the end of the course. Qualitative and quantitative methods were used to collect data and the appropriate ethics approvals to conduct research with human participants were obtained. Three multiple choice tests were administered at the end of the course to triangulate data and provide validity and credibility of case study research.

At the beginning stage of the case study, students of Southern Federal University, Taganrog, Russia participated in the experiment (114 people). Analysis and comparison of the data received indicate that the majority of students (40.9%) show an elementary level of competences, 31.8% - an average level, and only 27.3% show a high level. In general, the results show that students were exposed to a common set of subject knowledge, not leading to the development of significant abilities, possessions or personality traits. There were two stages of the experiment: diagnostic and control stages. The results of the experiment subjects (the same groups of students) were recorded before, during and after the course of study. To obtain valid and credible data two control (56 students) and two experimental groups (58 students) participated in the study. Four different instructors delivered classes and tests in these groups.

The following Table (Table2) shows the characteristics of the subjects in this study.

Table 2. Date comparison of experiment and control phases of the experiment.

Competences development (%)				
Development levels	**Control group (N=56)**		**Experimental group (N=58)**	
	beginning of the experiment	**end of the experiment**	**beginning of the experiment**	**end of the experiment**
elementary	39,8	27,3	40,9	10,2
advanced	46,3	45,4	31,8	43,4
high	13,9	27,3	27,3	46,4

Control group

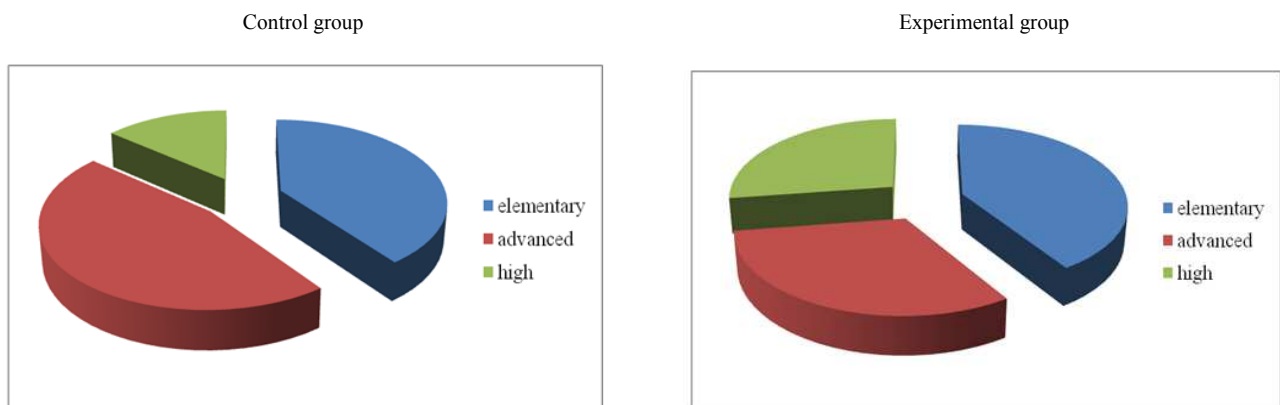Experimental group

Chart 1. Diagnostic stage of the experiment showing competence development in the beginning of the experiment.

Control group   Experimental group
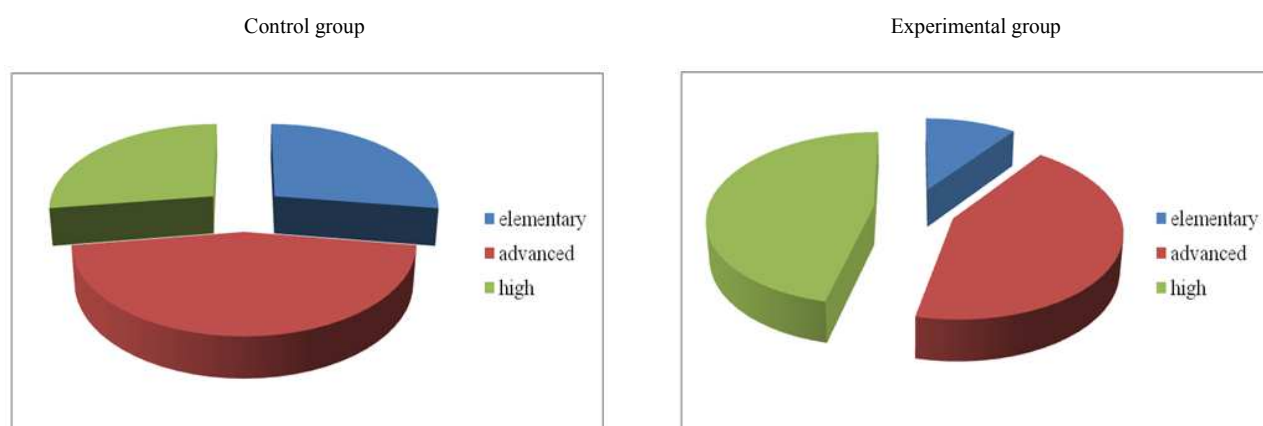

Chart 2. Diagnostic stage of the experiment showing competence development in the end of the experiment.

Experiments in management of educational process in higher school education prove that interactive educational technologies are effective tools of information support of students. Their use helps activate students' independent study and development of competences. The use of interactive educational technologies helps maintain a high level of students' training, and the instructor provides the opportunity to focus more on individual and independent study.

As a result of the experiment statistical data prove the importance of differences between the initial and final results of the experiment confirmed the validity of the Fisher angular conversion (φ *; P)

H_0: p1 > p2

H_1: p1 = p2, where

P1 - the probability of identifying an estimate in the beginning of the experiment,

P2 - the probability of identifying an estimate in the end of the experiment.

Data about the significance of differences between the initial and final results of the experiment help test the significance of the differences formula φ calculation. (Table 3)

In general, the experimental groups differed significantly from the control one and better results for primary end point indicate the effectiveness of the experimental work and verify the authors' chosen strategy for the modern educational process on the basis of interactive educational technologies.

Table 3. Result significance of differences check on experimental and control stages.

Competences development (%)						
Development levels	Control group(N=56)			Experimental group (N=58)		
	Beg. exp.	End. exp	The significance of differences (φ*; P)	Beg. exp.	End. exp	The significance of differences (φ*; P)
elementary	39,8	27,3	1,560; P<0,10	40,9	10,2	4,603; P<0,01
advanced	46,3	45,4	0,160; P>0,05	31,8	43,4	1,480; P<0,10
high	13,9	27,3	2,003; P<0,05	27,3	46,4	2,523; P<0,01

6. Conclusion

In the conclusion it should be added that innovations in higher education on the basis of telecommunications technology advances will significantly improve the use of existing sources of educational material, thus reducing the cost the infrastructure modifying and ensuring its effective application in the learning process. And the use of interactive learning technologies in the management of the educational process will increase its efficiency by opening new horizons and allowing the adaptation of the educational process to the specific needs of individual students. Interactive learning

technologies choice is defined, above all, by the content of teaching materials and learning objectives. Integrated use of interactive teaching and learning technologies is reflected in the innovative system of higher education for two reasons:

1) it is needed for future work of managers and executives as a part of their professional competence and the practical knowledge, including the method of assessment and instruction;

2) it is used for professionals training in determining students' future career opportunities.

As a result of this approach modern universities have become centers of innovative interactive technologies affecting

development of new industries or new trends in production. Under the influence of innovative mechanisms scientific and technical knowledge have become the basis for the post-industrial civilization. In this context, modernization of higher education focuses not only on the traditional values of science, but also on the value of the integral system of various fields of knowledge, values innovation as a way to acquire and develop new technologies.

References

[1] Klein-Collins Rebecca (2012). Competency-Based Degree Programs in the U.S. CAEL.

[2] Bradley Martin J; Robert H Seidman; Steven R Painchaud (2012), Saving Higher Education. Jossey-Bass**:** San Francisco, 28.

[3] Ewell, P. T. (2001, September). Accreditation and student learning outcomes: A proposed point of departure. Washington, D.C.: Council for Higher Education Accreditation, 6-7.

[4] Clarifying Competency Based Education Terms. American Council on Education.

[5] Soares L. (2012) A 'Disruptive' Look at Competency-Based Education Center for American Progress.

[6] Innovative Policies in Higher Education Sphere. Factors Influencing Efficiency of Innovative Policies. URL: http://comparative.edu.ru:9080/

[7] Rogodgin S.A. (2005). Traditional and Innovative Educational Approaches Combination as University Development Success Ensuring. University Management: Application and Analysis (6), 44-48 (in Russian).

[8] Alikina A.V., Katanova T. N. (2006). Several Approaches to Information Technologies Application in the High School Teaching. Information Technologies in Education Journal. Volgograd, 19-42 (in Russian).

[9] Evdokimov V.V. et al. (2001) Information Science in Economics. St. Petersburg: Peter Publishing House, 13-34 (in Russian).

[10] Gilbert, L., & Moore, D. R. (1998). Building interactivity into web courses: Tools for social and instructional interaction. // Educational Technology*, 38*(3), p. 29-35.

[11] Johnson Andrew P. (2014). Education Psychology: Theories of Learning and Human Development. National Science Press. www.nsspress.com

[12] Rauner, F. (2007). Practical knowledge and occupational competence. European Journal of Vocational Training, 40 (1), 52–66.