

Innovative technologies as a means of the development of future engineers' professional mobility abroad

M B Balikaeva^{1,a}, E L Chizhevskaya^{2,b}, G Ya Grevtseva^{3,c}, I O Kotlyarova^{4,d}, M A Volkova^{5,e},

^{1,2} Tyumen Industrial University, Lunacharskogo 2, 625002 Tyumen, Russia

³ Chelyabinsk State Institute of Culture, Orjonikidze 36a, 454091 Chelyabinsk, Russia

^{4,5} South Ural State University, Lenin Ave., 76, 454080 Chelyabinsk, Russia

^amarinabalikaeva@list.ru, ^bchizel76@yandex.ru, ^cyakupovna@rambler.ru,

^dkotliarovaio@susu.ru, ^evolkovama@susu.ru

Abstract. The article discusses the relevance of innovative technologies in development of the future engineers' professional mobility. In the publication the types of innovative technologies are presented in the universities of Germany, the US, Britain, France, Norway, Poland and other countries. The principles and functions of the innovative technologies are defined in some universities abroad. The forms of innovative technologies contribute to the qualities formation at the basis of the future engineers' professional mobility.

1. Introduction

The innovative technologies become the trend to improve the education of the modern mobile engineer. The leading professors of the best American universities believe that the innovative technologies are a necessary fact of future engineers in their professional training system. Its part is the use of the innovative technologies. It is essential to integrate the innovative technologies in research work, to create conditions for active students' participation. The researchers share this opinion in Western Europe and the United States. Modern integration approaches and innovative technologies in Russia and abroad have some similarities. In both cases, this phenomenon is a relevant, complex planning problem of organization and management to improve the future engineers' training quality using innovative technologies. Their principles are a teaching and researching a combination, an integration, a classroom and out-of-classroom study forms combination in higher school. In this connection the requirements system includes the innovative technologies aimed at the creative development of their personal and professional qualities. They are a part of the professional mobility.

The analysis of philosophers, educators and psychologists views and the own experience of theoretical research allows me to consider the professional mobility definition as an integrative quality in the production conditions on the basic components of professional culture covers (key competencies and qualifications) and professional competency (high intelligence, creative skills, professionalism). It reflects in man's ability to move horizontally and vertically on the social professional structure of society and to change a social, economic and professional (including status) position. It captures the motivational, cognitive, competency-based and operative components, reflecting a certain level of general cultural, general professional skills and competencies [1].



2. Discussion

The innovative technologies in higher education abroad are closely related to the education content and its aim [2]. The aim of future engineers' education is to develop the continuous self-education after graduating from higher school, the formation of future engineers' productive creative thinking, the development of logical analysis skills and abilities of full information consumption, the educational content orientation on the professional mobility specialist's model. The effectiveness of future engineers' the professional mobility depends on innovative technologies.

Universities use all opportunities for the first year future engineers' involvement in independent research work using the innovative technologies. Some experience in this regard has already accumulated in many higher schools abroad.

For many years, there are seminars at the Dresden Technical University in the form of scientific debate on searching and finding the best argument. Students look for the best arguments to prove the correctness of the thesis. Scientific debate shows how students have mastered the necessary knowledge. As a part of the educational process in many universities in Germany the events are held where "students teach students". These events have a significant impact on didactic training quality and structure. It confirms the experience and the results of educational research [3].

Any full preparation for the seminar is actually the microstudies requiring at least four hours of productive and creative activities with the latest scientific periodicals and Internet sources. There is this form in the universities of the USA and Germany. This preparation is a "weak" students' term paper in some Russian universities. However, the students do once a week on four subjects at least.

There are special courses for the first year students. The aim of this course is to facilitate the transition from school to university. Some interest from this point of view it is a model of the practical training orientation at the Higher Technical School in Darmstadt (Germany). This model includes the future engineers' introduction in the future career occupation, business games, excursions, etc. during the first year of study [3].

In the US the method of small interdisciplinary research groups is widely spread. It has an on-line support. Post-graduate and undergraduate students have the opportunity to exchange views in their groups to find and formulate new, original ways of solving problems. For example, the training process is very individualized in american universities, especially at the undergraduates as the groups are formed for a term to study specific subjects. The students have the right to choose a field of knowledge in accordance with their interests and needs. They can change their specialization and prolong the period of study at the university. No timeframe allows the students to advance in the study according to their individual abilities. Almost all undergraduates study on the individual curricula [3], [4], [5].

Every second of seminars involves students' essay (paper). Weekly each student must complete blogging (diaries) courses at the faculty website, where students have to present their view of the topic passed at the seminar. Every student has the opportunity to prepare reports, presentations at least twice a term.

The special role plays a tutorial, which can also be carried out on-line. A tutorial is a phenomenon adding the training process as one of study means using the innovative technologies. A tutorial is a stimulus for scientific collaboration between a teacher and a student. During a tutorial, they can discuss the research methods, the students' individual opportunities in the scientific work process [5].

In general, in the university practice abroad the most common on-line seminars and discussions are spread. They encourage maximum integration in the training process. At the seminars, the students use various methods of study and research activities, the basics of oratory. The organizational form choice of the US authors explains that the debate [5] helps the students understand better the problem. It facilitates the consideration of the various aspects problem under discussion, allows participants to speak critically and corrects the new information for the group opinion or decision development. The

principle "round table" allows all students to see each other and creates a relationship of equality between them and there is an informal environment among them. All these forms develop the ability to predict the actions results aimed at solving specific professional problems and achieve the professional aims, the quick adaption in a professional team, the business and professional communication skills in specific business situations.

The american higher education analysis points out that it is based on the innovative technologies. For example, the US higher education has a group of "open education", "Open University" under the influence of humanistic psychology, where students are free to define their research interests and in the dialogue with tutors to express critically a variety of the scientific positions. In american universities do not have the typical curricula. Each university develops their curriculum. It includes a part of the basic courses, a professional training core with a level indication of competencies development while a significant part of the special and general training courses has a choice form [3].

In US universities, a flexible combination of asynchronous (individual) and synchronous (joint) study is widely used. Many universities in the US and Western Europe use actively the blended learning. The blended learning involves a combination of the different training management techniques and schemes: classroom study, distance study, synchronous distance study [3], [6], [7].

There are some innovative technologies in the universities of the US, Canada, Germany, France and others. The E-learning involves different ways of study using the innovative technologies: distance study, mobile study using mobile devices, virtual study [6]. The E-learning allows students to personalize the training process, develop the skills of knowledge independent acquirement and application, orientation in the flow of information. The most advanced e-learning center is the Massachusetts Institute of Technology (MIT) in the United States. Over 100 million people use the e-learning all over the world [6].

More attention in many universities abroad has been paid to the production process and higher school connection. In Germany the «dual system" and the project method are widely used in the training process [2], [5].

The students simultaneous study is in the walls of the institution (two or three days a week) and in the enterprise (other days). This system is widely used in Germany and the United States. In 2012 over 64,000 students, 1,384 students study programs were invited to the dual system study in German universities [8]. In the Harvard Business School (HBS) this system is called the "field" study (Field Studies) in the leading business companies in the USA. Students write their own business plans for the creation or development of new enterprises [5]. Students have the right to choose a project that will allow them to use the tools and techniques studied in the classroom, to develop the project management skills, to get the real experience of business communication and to improve the ability of collecting and analyzing information, to obtain the industries direct knowledge. The research work on the project is the study in the problem-orientation courses using the innovative technologies. The problem-based study is a combination of students' independent study in the small study groups, which introduce the research and scientific work.

Annually in France, about 35,000 students start distance education, for which the State Center for Distance Learning (CNED), established in 1986 and subordinated to the Ministry of Education, is responsible. Now the Center offers courses and trainings at different levels (licensee, master's degree) and covers the most demanded areas (business, accounting) [9].

One of the programs that the Center actively uses is the "electronic campus". The program provides the opportunity to use various services available in traditional campuses.

Since 1990, Norway has a network of higher education institutions for distance learning. In 2004, this network became a part of the Norwegian Open Universities (LEU), supported by the Ministry of Science and Education. On its website, LEU hosts an extensive database with options for finding educational courses for both distance and inpatient training.

Distance educational programs using ICT are an alternative to traditional courses offered by all educational institutions. There are programs of this type almost in all universities of Norway. As for programs of a certain professional orientation, they have a form of video conferences and a contact

with the instructor. In private institutions of distance education, the main aim is to develop offers that meet the requirements of different groups of students, and use flexible methods and forms of education. Most of these courses give an opportunity both to upgrade qualifications and to get a new profession. More than two thirds of such courses cover the following areas: economics and management, technology, communication, social services and health. Private universities of distance education in Norway have been pioneers in the use of television transmissions, videoconferences and the use of computers throughout the education system. Moreover, they have accumulated experience in the organization of distance schools, the development of effective educational modules and a feedback system. The subjects of the offered courses are wide ranging from hobbies to university disciplines [10].

The countries of Eastern Europe have recently begun to learn from the development of effective distance learning. The platform for using e-learning in Polish universities [11] presents possible ways of using e-learning in higher educational institutions. The presentation of the educational material on the network in the form of articles, essays, studies, links to other Internet sources. This form is absolutely passive, because it does not differ from traditional access to educational material except the necessary materials in an electronic database, electronic sources.

Online support: this form of e-learning is used as a more interactive way, as it provides access to discussion forums, chat rooms, newsletters and uses e-mail.

Asynchronous trainings also include mechanisms for monitoring and evaluating the sessions conducted by the instructor-head of the courses. The same tools and methods are used as an on-line support.

There are synchronous trainings through a computer network using the following techniques: teleconference, videoconference, chat or thematic video. Some courses of this kind use a virtual board, or other tools of group work.

In addition to e-learning technologies there is an introduction in higher education institutions as a tool for teaching m-learning (mobile learning) using gadgets as mobile phones, smartphones and tablets. It should be noted that m-learning is effective in carrying out creative, practical works, quickly searching for information, but it can hardly be applied at the stage of knowledge control.

3. Conclusion

In conclusion, it should note that creativity as a component of innovative technologies has a huge impact not only on the specific scientific progress, but also on society by developing its innovative ability.

Thus, the experience of the study practice abroad showed to our problem that the higher education abroad has developed the future engineers' professional mobility process integrated into the training process with using the innovative technologies. Each student must master a research effective style to develop the ability and willingness to the study and the improvement of scientific knowledge and its creative application in the future professional activity. The continuous research study becomes personal needs of each student using the innovative technologies. The innovative technologies impact on solving specific professional problems, achieving professional aims, the group organization of a specific professional project, the quick adaption in a professional team, business skills and professional communication in specific work situations.

References

- [1] Balikaeva M B 2017 The Interconnection between Future Engineers' Professional Mobility in Higher School Social and Cultural Environment. *Modern Jour. of Lang. Tea. Meth.*, **7** (11), pp 70–78
- [2] Spirin T 2014 Foreign and domestic experience of individualization of training in high school. *World of Sci., Cul., Edu.*, **3**, pp110-113
- [3] Martens D Schlüsselqualifikation. Thesen zur Schulung für eine moderne Gesellschaft (Stuttgart, Berlin. Köln. Mainz, 1974) 69 p

- [4] Dmitriev D Anatomy of an American university (Moscow, 2010) 224p
- [5] Mizyurova E Key points the educational process efficiency increase in higher school. *Proceed. of the high. ydu.inst. (Volga region. Humanities*, 2011) **2**, pp109-116
- [6] Starichenko B Synchronous and asynchronous organization of educational process in higher school on the basis of information technology education model. *Teacher edu. in Rus.*, 2013, **3**, pp 23-31
- [7] Novikov A The teaching forms in the modern conditions. Available at: <http://www.anovikov.ru/artikle/forms.pdf> (accessed 10 February 2018)
- [8] Solominsky E Features of higher education in Germany with the Russian professor eyes (an interview with E. Patrick). *Higher edu. in Rus.*, 2014, **2**, pp131- 141
- [9] Dobrynin M A, Sukhoi S N 2007 Distance Learning in France. (Minsk: Belarusian Digital Library LIBRARY.BY)
- [10] Distance courses in Norway. Available at: <https://www.academiccourses.ru/Kursy/Norvegija/> (accessed 6 February 2018)
- [11] Distance education in Poland. Available at: <http://global-edu.ru/foreign-education/remote-education-in-poland/> (accessed 6 February 2018)