



Worldwide trends in the development of education and academic research, 15 - 18 June 2015

Integration Strategies of Academic Research and Environmental Education

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Abstract

Modern development trends of knowledge-intensive industries determine the necessary reduction of time of the market waiting for technological novelties, which is achievable due to promotion of knowledge and innovations in an educational environment of large centers of higher vocational education formed in a new way. An efficient mechanism of solution for this task must become innovation educational projects at universities integrated with academic research. The paper deals with the prospects of using GIS-technologies and remote sensing ones as the main directions of implementing the innovation project in the sphere of environmental education. The main directions of perfecting the system of environmental education are grounded. In order to ensure the development of innovative thinking in future professionals, it is suggested to implement an integrated system of teaching, knowledge generation, project and innovative work of bachelors and master's degree students, their participation at the market of knowledge-intensive enterprises. The innovative approach to management of scientific and academic activity of the university is considered based on cluster organization of its activity. The paper suggests new models and technologies in the system of teaching that rely on the obtained experience of implementation of environmental education tasks and integration of modern technologies into it.

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Peer-review under responsibility of: Bulgarian Comparative Education Society (BCES), Sofia, Bulgaria & International Research Center (IRC) 'Scientific Cooperation', Rostov-on-Don, Russia.

Keywords: learning strategies; environmental education; system of education; GIS-technologies; technological corridors

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1. Introduction

For a long time there was a clear separation between education and science both in normative and institutional aspects as well as in financial, organizational and managerial ones. The autonomy of these spheres became a significant obstacle on the way of higher education development. Transition to a new type of society – postindustrial one – is now visible in the most developed countries of the world. It is conditioned by the trends of increasing role and importance of knowledge, innovations, and scientific achievements in the development of human civilization. The situation in most Russian higher education institutions is yet substantially different from the practice of the world's leading countries which is characterized by concentration of the main potential of fundamental science in universities where all the demanded applied research and development are performed. Key issues that constrain innovative transformation in the post-Soviet countries include lack of maturity of structures that allow integrating the education and academic research with further access to the level of production. In connection with this, the promising achievements and developments in the field of high technologies often get no application in the economy. The development of intellectual capacity becomes a significant dominant in technological breakthrough which should be contributed to by innovative educational projects. In this case a student becomes the focus of educational strategies that suppose practice-oriented system of training of competitive professionals.

Under current conditions, when science becomes a productive force, training in scientific methods and organization of higher education institution research become essential elements of modern education. The synthesis of theory and practice is an important element of teaching and learning strategy (Edwards, Weinstein, Goetz & Alexander, 2014; Holley & Dansereau, 2014). In the XXI century, it is highly important for students to be involved directly into the education system and to play a key part in the process of teaching and learning (Beltran, 2003). Due to the fact that in a student's learning process, different lobes of the brain are involved (Jensen, 2004), the development and selection of a certain training strategy seems a particularly important phase. Among several classifications of learning strategies Beltran's (1996) proposal seems to be the most promising. He outlined the main types of strategies: 1) support strategy (motivation, attitude and action); 2) strategy of the process (that is selection, organization and processing); and 3) strategy of implementing the knowledge (that is creative and critical thinking, restoration and transfer of knowledge). The essence is as follows: students have to understand the information, adopt it and make it meaningful. This determines the special value of learning strategies and in the process of their implementation various cognitive styles, abilities and skills should be worked with (Muelas & Navarro, 2015). However, as it was pointed out by Tulbure (2012), compliance of learning strategy with the preferences of learning style remains a controversial subject of research, so the understanding of this issue will be of use both for students, young researchers and for the teachers whose efforts are aimed at re-evaluation of approaches to learning in order to improve student's achievements. These provisions are fully applicable to the system of environmental education. In particular, efficient teaching of professional environmental disciplines is impossible without the experience of the practical application of methods associated with environmental assessment and in-depth analysis of experimental research. Theoretical and practical experience related to acquisition of new knowledge about the environment can be a tool for improving both lecture and practice materials (Shilova, 2013; Koptina, 2014).

2. Objective, methodology and research design

Being aware of the necessity of further theoretical generalizations in the system of high school scientific and educational activity on the basis of a focused systematic approach, the authors have set the following goal: to provide grounds for the most promising strategies of academic research integration with the help of such organization form as polystructural university clusters capable of ensuring the stable connection in the triad "science – education – production".

Achieving this goal has involves meeting the following objectives:

1. To reveal optimum structure and the potential of university clusters as integrated academic and research structures.
2. To provide grounds for the most promising components of environmental education.
3. To identify opportunities for application of GIS-technology in upgrading the environmental education.
4. To outline ways of improving the environmental education in the system of National research universities.

In order to reveal the potential of innovative education which in fact is system-forming and integrates the educational process and scientific research, the logical combination of multiple levels of methodological knowledge

4. Conclusion

Innovative change against formation of a new economic structure is hindered by underdeveloped structures capable of ensuring the integration of education and academic research with further access to the level of production. Because of this, promising scientific achievements and developments in the field of high technologies rarely find their application in the economy. Innovative educational projects which are efficient if implemented in the major centers of higher vocational education should lead to fostering the human capital, advancing the knowledge to the market and accelerating the introduction of innovative production patterns, first of all, for development of high-tech industries.

A formed network of National Research Universities gives us hope for their targeted transformation into educational, scientific and innovation clusters in order to fulfill the complete innovation cycle: idea – development – marketing – production – innovation – the consumer (market). Creation of information and research infrastructure for technology transfer center uniting specialized university departments working with students until graduation, a business incubator, student engineering design offices and centers of scientific and technical creativity of students; organization of remote access to lecture halls from the Centers of shared use; regular use of multimedia and video conferencing means for educational objectives of the project – all this allows improving the quality and efficiency of the educational process, ensuring the access of graduates to the segments of the labor market in demand, and expanding educational opportunities during intra-university, regional, national and international academic and scientific events. Academic research is a source of information, which if integrated into educational technology can significantly improve the efficiency of the educational process, especially in its practice oriented aspect.

Academic research is a source of information that if integrated into educational technologies is capable of considerably enhancing efficiency of the educational process, especially in the practice-oriented aspect of the latter. The obtained experience of creating and implementing (with the authors participating) a polystructural university cluster at one of the Russian universities during the process of environmental education implementation has clearly demonstrated that all the integration processes became activated at intra-university, inter-university levels, as well as in the innovation circle of smaller innovative university enterprises, with business partners.

The environmental education as a basic mechanism for reproduction and an integral part of the ecological culture should be provided with a harmonious combination of several aspects: axiological, educational, substantial and motivational. The structure of educational process due to its necessary innovation improvement has to be rationalized by wider use of high technologies, such as were shown on the example of the environmental direction – GIS technology and remote sensing of the Earth.

The basis of university environmental education model is proposed to be an integrated system of training, knowledge generation, design and innovative work of students and their participation in the market of high-tech business for developing the innovative thinking of the future professionals. Successfully tested individual educational paths can become components of this system that during scientific and educational projects have to open up prospects for high-tech business, as well as models of "technological corridors" as an innovative system "new knowledge – labor potential – the labor, goods and services market", which can provide training of staff in the subject area with skills of professional high-tech solutions.

In order to achieve a higher quality of environmental education using high-tech equipment, new methodological and technological approaches to the organization of the educational process suitable for replication are recommended. They are the formation of a coherent system of students' basic training in geoinformatics for their participation in the design of innovative work, technologies of team work in order to form the professional competencies of graduates; technologies of students' design and innovation activity in Centers of shared use of high-tech equipment.

Thus, the integration of education, academic research and production is a structure-forming component for the new model of higher school – one ensuring the interconnection of fundamental educational values and opportunities of flexible meeting the needs of regional and national economies in the professional staff in promising scientific areas and high technologies, including ones of environmental safety and environmental protection.

Acknowledgements

Results were obtained in the framework of the state assignment of the Ministry of Education and Science of the Russian Federation No 5.78.2014/K.

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