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Innovations in institution of higher education as a tool of economic and social development of the region (experience of project-based education technology implementation in SibSIU)

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Abstract. The article substantiates the need of a new model of education process in the university, providing its integration into the regional economy and social sphere. The main assumptions of project-based education introduction into institutional practice are referred to, the scope and special aspects of implementation of the named education technology as a tool of innovative transformations in the Siberian state industrial university are provided.

1. Introduction

Today in the debate on the prospects for higher education development the most acute topics are the ones disputing conditions of universities innovative transformation. Changing the role higher school requires complete rethink of parameters of education environment, including conformity of educational technologies to the challenges of innovation, technological and social development on regional and national level. It became obvious that efficiency of university education model is seen in improving the level of graduate's knowledge and skills, providing successful performance of professional tasks in the world of socioeconomic and political transformations [1, p. 38].

Siberian state industrial university (hereinafter referred as SibSIU) persistently develops and implements the model of an educational integrator for innovative development of the Siberian region, which claims a set of problems to be solved: the first is aimed at university scientific and technological development, the second targets a stable interaction of the university with regional authorities, clusters, industries, and the third demands for modern education technologies to be introduced into educational process. Taking into account the tasks listed, a decision was made by the University Methodical Board to introduce a new approach into curricular management. Project base education technology was chosen as a technological foundation for the model of the university transformation into a center of innovations genesis.

Making emphasis on innovative nature of project based education technology, it is necessary to clarify that the very idea of project base education is not neither of novelty nor of originality, since it has already been fully and comprehensively described in national literature, and the content and forms of it has repeatedly been tested and evaluated from the point of view of pedagogical conditions of its implementation [2, 3, 4]. At the same time, implementation of project based education technology as a mean of innovative transformations in education has not been subjected to specific pedagogic study, and its application toolkit, in regard of the requirements of federal state educational standards, is not

currently described. Moreover, it was established that "education technology as a system can have different states, when values of its' parameters can vary significantly depending on purpose and conditions of its application" [5, p.38], while "under different conditions, any modeled education technology of all its possible states, can practically take only their limited number for successful performance, this is restricted by its main purpose [Ibid.].

Consequently, project based education model as a set of consequent stages of the competences design in regard to specific degree program or a group of degree programs in multidisciplinary university can be considered innovative.

2. Project-based approach institutional implementation. Discussion and assumptions

The process of implementation of project based education at Siberian state industrial university required preliminary stage at which the Methodical Boards met, and the concept of project based education was discussed. In discussions, peculiarities of existing university education environment were determined as factors of innovative transformations stimulation [5, p.49], i.e. the role of project technologies in professional education of the student was clarified, feasibility and efficiency of their application in Siberian state industrial university were determined, criteria for project based education results evaluation were identified, elements of degree programs aimed at the new technology implementation were designed.

Forum of employers of the South of Kuzbass was held in the SibSIU in February 2016, following which employers requirements for the quality of university graduates in regard to capacity of project based education technology were determined.

As a result of this stage, conditions for project based education introduction in SibSIU were determined, the choice was made taking into account the following ideas of innovation:

1. Project based education expands and transforms university responsibilities, which contributes to effective solution of the key tasks of regional university development [6]. This education technology is the mechanism that ensures integration of educational operation of the Siberian state industrial university into regional economy and social sphere.

2. Project based education provides an interactive education environment, the leading element of which is simulated reproduction of various situations, forms and patterns of professional operation. Such forms contribute to professional development and professional self-determination of the student, raising quality of his education [7].

3. Project based education technology allows us to develop a brand new structural and functional model for students' competences design in multidisciplinary university.

4. Development of new teaching and methodological aids as a result of introduction of innovative educational technology provides an opportunity to improve education process in the Siberian state industrial university. Practical experience of teachers in education innovations implementation provides prerequisites for initiation of other pedagogical innovations.

Let us consider specifics of each of the presented innovation positions.

As the practice of educational standards requirements implementation shows, today there is a need for transformation of the field of university responsibility. Introduction of project based education makes it possible to bring SibSIU to fundamentally new positions in the education market, such as a position of core discussion platform, with focus on discussion and generation of solutions to key problems of city and regional development. In other words, project based approach as an education technology serves as a tool for the SibSIU positioning as a regional multidisciplinary university, providing points of growth and conditions for evolutionary development of the Kuzbass economy, social and cultural environment. It is obvious, that application of project based education technology transforms the SibSIU into an innovative platform for profession-oriented projects accumulation, which ensures:

- academic staff involvement in solving acute problems of regional economy;
- popularization of university R&D and its positioning as a community of respected and highly demanded experts;

- university information transparency, strengthening ties between the university and employers.

The expected results in regard to the SibSIU transition into the regional university are as follows:

1. Generation of a spot of attraction for talented youth and nurturing future leaders of regional economy within a territory of advance development of youth creativity.

2. Developing system of continuous education based on implementation of project based education programs for all categories of regional customers.

3. University transformation into the center of integration network of knowledge-based and inter-sectoral innovations.

4. Building positive image of university in regional community, expanding geography and the domains of its influence.

5. Transformation of university management based on innovative tools of cluster and sectoral development.

Another equally important effect of project based education is generation of conditions for professional development and professional self-determination of university students. The task of professional development of a university graduate has been solved in the context of tasks aimed at building contextual professional education, focused not on transfer of knowledge, but on finding knowledge and its application in situations simulating real professional operation. The main goal of professional education rethinking is to find ways for future professionals to develop a pro-active position [8].

Project based education as a person-oriented technology promotes professional development and activates professional self-determination of a student. The very essence of professional development evidences this statement, as it has been recognised as an integration of cognitive and professional motives. This process involves certain stages, each of which is specified by certain psycho-physiological and socio-psychological characteristics that ensure successful implementation of professional operation.

In the context of university educational environment, project based education forms personal professional motivation, it stimulates the needs, attitudes, interests and motivates person to study and master future profession. Along with the research (cognitive) side of the project task solution, there is always an emotional (personal) and creative one. It is the emotional and the creative components of project based education that determines significance of the student’s results and opportunities for their achievement.

Education management through the project based education makes it possible to transform education case into the situation of a student's personal development. At the same time, education project acts as a mean of professional and personal development, project base education facilitates acquisition of personal experience and relevant professional competencies as well. Project based education is a mechanism that directs student’s professional orientation, as it contributes to development of professional self-awareness, to manifestation of sense of student’s belonging to a particular profession, and desire to develop professional competences, and form a special system of professional values. Due to its novelty, feasibility, viability, and opportunity to evaluate goals set by professional community, project based education is assigned a pedagogical category that works to build professional competence of an engineer [9].

Project orientation of education is aimed at development of students’ project culture, which is professionally significant quality of the individual, including a value-based attitude to project operation, acquisition of project knowledge and skills on individual creativity level, ambition to transform reality and develop personal project abilities [10, 11].

Consequently, implementation of educational projects fills university education with sense of professionalism, helps to master future professional sphere of operation in integrity and dynamics, thereby forming alertness for future professional.

The third innovative idea concerning implementation of project oriented education states that this technology allows institution to develop the brand new structural and functional model for students’ competencies development in multidisciplinary university. It transforms education process into a

management of competencies acquisition. In this aspect, advantages of project based education as a model of competence approach implementation are obvious:

1. It makes search of different ways of solving set of educational tasks the main component of education instead of knowledge acquisition.

2. It is aimed at propagation of self-motivated independent work of students, the main purpose of which is to solve the task (theoretical or practical) through a product generation. The expected final result of such transformation of educational process is high independence of graduates, acquiring ability to organize their own professional operation and seek new tools for professional functioning.

3. It is an individual and an operation-oriented technology, since it involves students into creative educational and cognitive activities as subjects of their personal and professional development.

4. It simulates individual or collective professional operation. Efficiency in competencies development is achieved through approximation of education process to practical professional activities. The main result that a student receives through the project educational activity is acquisition, consolidation or development of knowledge significant on practical level, skills required in chosen professional sphere and experience of self-management.

5. It facilitates restructuring of interaction between an academic and a student, it requires absolutely different alertness of an academic and a student to their new roles, determined by competence based approach.

6. It provides for the implementation of various forms, methods and techniques aimed at developing creative, research and analytical abilities of students.

7. Embedded in education operation, it radically changes all the components of education process by expanding students' self-dependent work, introduction of modern forms of its management and quality control.

Meanwhile, despite the advantages, listed above, project training has not yet found sufficient theoretical justification and introduction in practice of higher education within the competence approach on national level. Transformation of educational standards of higher education, change in education programs content did not directly affect the forms of pedagogic interaction. According to our observations, traditional education system still prevails in higher education, which, as is known, is reproductive or cognitive in nature and does not contribute to implementation of competence approach in higher education introduced by the federal state standard of higher education.

The reasons for not using innovative technologies are objective: in structure of education content, results are recorded in form of graduate student competences acquisition, but systematically organized student's activity necessary for that acquisition at a specific level, is not indicated. Thus, the same education results can be achieved in various ways. In addition, one competence may be acquired during study of several disciplines (modules), thus having an integrative and interdisciplinary nature.

In our opinion, system default and uncertainty of methodological tools in achieving education outcomes leads to the situation where curricula are designed in a formal way. Introduction of project based education technology allows the system approach competencies acquisition to be provided, since its model provides for new content and structural components of education process correlating with project based education logics, including step-by-step assessment of achievements and results.

Finally, we turn to the idea, which completes the list of innovations presented above, essential for implementation of project based education. As it has already been noted, development of new teaching and methodological products and other results of introduction of innovative education technology, has enabled improvement of education process in Siberian state industrial university.

Taking into account innovative ideas listed above, the SibSIU academics have developed the concept of project based education and have determined sequence of deliberate institutional changes in education process; definitions of new competencies, target levels of their development have been stated, "projects portfolio" has been generated.

Since 2016, the "Project Activities" module has been introduced into the curricula of all degree programs, the module belongs to compulsory disciplines of variable part of curriculum. This module forms a certain structural integrity of degree program, is comprehensive because it logically overlaps

content of other disciplines and is aimed at development of “universal” competencies (indicative base of activity) associated with project implementation. The goals and objectives of disciplines of the “Project Activities” module correlate with a concrete practical result – implementation of various types of projects. Students' activities results were presented within the academic calendar, during weeks of projects demonstration.

This comprehensive concept corresponds to the activity paradigm of competence approach, contributes to overcoming fragmentation, consolidates education process and stimulates development of student’ individual educational path. Since the competencies related to the project activity are formed during the entire education process, forms of control of level of its development have been established for each stage, and for its final evaluation within the framework of final state attestation.

Particular attention is paid to methodological parameters of the “Project Activities” module, such as list of competencies, discipline workload, forms of control. Since this discipline begins in the first year and is of propaedeutic function, lectures content has been defined, interactive forms of workshops, as well as forms of self-study, corresponding to freshmen level have been developed.

Thus, the model of project based education was stated in the following documents regulating the university education process:

- degree programs descriptions;
- curricula and programs of disciplines of the “Project Activities” module;
- means of evaluation;
- guidelines for academics and recommendations for students’ self-study.

Teaching aids and methodological materials were tested through the pedagogical experiments, participants of which were academics themselves. Methodological challenges revealed throughout the experiment enabled development of methodological instructions for workshops. As a result of team work, a freshmen “Project Activity” course was introduced into the curricula of all the degree programs of the SibSIU and is now being successfully implemented.

Project based education has been introduced as a structural and educational component in all degree programs of the university, the entire academic staff of the SibSIU is involved in implementation of innovative education technology. For dissemination of experience of project based education implementation in the university, various ways of presenting the results of innovative education activities were used: they were reported in forums and conferences, presented at competitions. In addition, the SibSIU has launched “Education projects accelerator”, as a form of corporate system of faculty professional development in the field of project education technologies design. This form of interaction facilitates full accelerated immersion of the academic staff in project activities as participants of real interdisciplinary project teams. Information on each project progress was published on the university website and through social networks.

Students’ and academics project activities results were presented at specially arranged events. Thus, based on the results of the “Project Activities” course acquisition in the first semester, first year students had independently prepared video projects “My future profession”. To select the best project, an open online vote was arranged on the university web page.

3. Conclusion

Evaluation of project based education implementation efficiency has not been conducted so far. The intermediate results are as follows:

1. Curricula content of degree programs has been optimized, continuity of project activity throughout the framework of degree programs has been revealed for different degree levels, such as bachelor’s, master's, engineer’s and Phd programs.
2. Mechanisms for interdisciplinary integration in education process have been generated.
3. Innovative education products have been developed (consistent study package for the “Project Activities” module, and “Projects Portfolio” has been generated).
4. Index of academic staff activity in application of innovative education technologies has been increased.

5. Opportunities for various forms of students' self-study have been arranged.
6. Level of education process participants' satisfaction has been raised.
7. Education process transparency is provided, new mechanisms of the university interaction with the employer have been formed.
8. A strategy of the SibSIU positioning as a university of innovations has been manifested.

References

[1] Loshchilova M A and Dobrycheva I V 2016 *Professional Education and Employment of Youth: XXI Century. Issues of Advanced Education of Personnel for Russian Economy (Regional Aspect). Proc. Int. Sci. Conf.* (Kemerovo) pp 38–41
[2] *Mieryn L A*, Bykova N N and Zarukina E V 2015 *Modern University Education Technologies: Manual* (St. Petersburg: St. Petersburg State University of Economics Press) p 169
[3] Blokhin A L 2005 *Project Method as a Person-oriented Pedagogic Technology: Dis. ... cand. sci. (Pedagogics)* (Rostov on Don) p 154
[4] Emelyanova N V 2011 *Bulletin of Higher School* **3** 82–84
[5] Bordovskaya N V 2016 *Modern Educational Technologies: Manual* (Moscow: KNORUS) p 432
[6] Stepanova S N 2012 *Transformation of the Idea of University in Transforming Education Space* (Tomsk: TML-Press) p 128
[7] Khitrintseva A V 2010 *Academic Journal of Western Siberia* (Tyumene: M-center) pp 6–7
[8] Bagdasaryan N G and Gavrilina EA 2010 *Higher Education in Russia* **6** 23–26
[9] Tsygulyova M V 2010 *Bulletin of Tomsk State Pedagogical University* **10** 56–62
[10] Markov A P 2003 *Bulletin of Kazan State University* **1** 56–60
[11] Stenina T L 2011 *Development of Students' Project Culture* (Ulyanovsk: Ulyanovsk State Technical University Press) p 243