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Educational Process at the Federal University as a Basis to Implement Innovative Practice-Oriented Educational Technologies

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The article sets a principle goal – to change the traditional system of engineerring education by implementation of flexible practice-oriented and project-based educational technologies by the example of North-Eastern Federal University n.a. Ammosov

Key words: *educational process, quality management system, data analysis.*

Lack of practice-oriented highly-qualified staff is a burning issue within energy complex: work in the sphere of real economy requires specialists with a certain range of practical skills which are impossible to be acquired at the higher education institute as soon as the letter is strictly oriented to definite educational standards. Meanwhile, industrial and agricultural sectors need the other sort of specialties, profiles, and competences, as a result. In our opinion, it is possible to bring to conformity real economy needs and specialists' training applying special educational technologies, such as practice-oriented and project-based ones [1]. This process is to be flexible and should quickly adapt to meet the requirements of intensively developing sectors of real economy. Today, it's necessary to spend 4 or 5 years to train students within the scope of educational program standards, teaching them primarily theoretical issues and having only 2 or 4 weeks a year spent for practical training. Moreover, present day problems and tasks are presupposed to be solved by a team of specialists of different profiles and educational levels. It can be provided neither by the system of higher education nor by vocational one solely, even if there are all the competences required. That is only the symbiosis of different profiles and levels of education that can contribute to solving tasks in the sphere of innovations and advanced technologies.

The system of highly-qualified power engineers training in Sakha republic (Yakutia) is unique because the students who are not great in number but taught within a wide range of specialties (profiles) acquire knowledge not only about technologies of producing, transporting and distributing electric power but also of north regions' particu-

larities. The important thing is that there should be a special system of specialists training directed to getting proper practice- and project-based education, efficient refresher courses and continuing professional education [2, p.12-13]. This uniqueness also makes it necessary to achieve breakthroughs in industry and agriculture of the Extreme North.

The system of practice-oriented and project-based education is supposed to aim at working out new educational standards and, as a result, new educational programs based primarily on professional standards. Moreover, there should be special environment to build and develop professional competences essential for corporative and international work [1, c.10]. It will contribute to overcoming the barriers between real economy (business) and higher education institutions.

The problem of power engineers training is not only an issue of power engineering sector but also a great challenge for the whole economy which lacks highly-qualifies specialists. A power engineer should also know particularities of different industries, public systems, agriculture etc.

In our point of view, the most effective environment to train power engineers at North-Eastern Federal University (former Yakutsk State University n.a. Ammosov) has always been that of Student Educational and Scientific Laboratory "Energy" (SESL). For students SESL became a prototype of future professional and social activities [3, p. 36-39].

An essential function of SESL is continuous development of student that implies gradual shift from school instruction modes typical at the beginning to the advanced learning activities relevant to professional and social activities. As a result, students who worked on 1 or 2 mutual projects turned out to be involved into interpersonal and team relations [1, p.11].

The students of SESL are taught not only by teachers but also by influential scientists of Yakut Scientific Center of the Siberian Branch of the RAS, Larionov Institute of the Physical-Technical Problems of the North of the Siberian Branch of the RAS. There are also top managers of some companies such as "YakutskEnergo" PC SC and "SakhaEnergo" PC where students solve not only scientific tasks but also real industrial problems. Thus, students gain necessary experience within their profession.

This educational environment produced its results.

The students of SESL became prize-winners of Lavrentyev competitions, got diplomas at Russian and International conferences; students' diploma projects were the best at The Competition on Diploma Project of The Russian Federation, section "Power Supply". Last year three students got scholarships of the Government and the President of the Russian Federation, the other three students became laureates of V. Potanin Scholarship.

The next stage of energy education in the Republic was creation of educational platform for engineering [1, p.10] to teach students power-supply system modeling. It was Student Innovative Planning and Design Office (SIPDO).

Creation of SIPDO and SESL which dealt with development and implementation of innovative technologies in energy saving let the department win a federal grant for the innovative educational project "Education-Science-Production Complexes to train priority sectors specialists for economic and social improvement of North-Eastern Russia" within the lot "Energy saving technologies implemented into industrial and public infrastructures of North-Eastern Russia throughout educational process". The aim of the project was achieved – they laid down the foundations of innovative system of training highly-qualified specialists who are in demand at regional labour market and who are competent in power supply and resource-saving systems of northern regions.

Applying practice- and project-based technologies and involving students into problem solving [1, p.12] one should be aware that the projects

students work on, first of all, are real and in the second place, are innovative and of breakthrough nature. Only such active teaching methods can make students create real projects anticipating professional activities.

The competence of teachers who work with students is determined by the quality of engineering activity products including those produced in cooperation with specialists of industrial, scientific and research sectors [1, p.13-14]. Implementing standards 9 and 10 of CDIO teachers of NEFU in cooperation with St. Petersburg National Research University of Information Technologies, Mechanics and Optics, manufacturing enterprise CJSC "Optogan" and Weihenstephan –Triesdorf University of Applied Science, Faculty of Horticulture and Food Technologies participated in the competiton according to the Decree of the Government of the Russian Federation № 218 "On measures of governmental support for cooperation between Russian higher education institues and organizations implementing complex projects of high technology production" of April, 4, 2010.

The mutual project "Intelligent systems of energy saving greenhouse agriculture with the use of LED lighting" was approved in 2013 and received financial support for the next three years. Working on this progect one can not only regard the sharp issue of greenhouse agriculture with the use of modern energy saving technologies but also demonstrate the algorithm of team work to carry out breakthrough projects to students, undergraduates and postgraduates.

The project aim is to develop energy saving intelligent greenhouse systems on the basis of high-power LEDs usage. Innovation of the project is caused by three reasons: 1) multi chip-on-board LED lighting with original emission spectrum; 2) module principle of lighting that supplies light for different planting systems (upper supplementary lighting, inside cenosis supplementary lighting, multi-level systems of lighting etc.); 3) multi-protocol management of lighting and climate-forming equipment applying adaptive algorithms.

The main target of the project is to increase energy effeciency of argiculture greenhouse production. Taking into account the fact that Russian greenhouse enterprises are planned to be multiplied by 2,5 within next five years the project is expected to contribute to global energy saving in agriculture of Russia thus improving market competitiveness of Russian agriculture products.

The project work at NEFU is provided by six groups of students, undergraduates and postgraduates of four university institutes: Institute of Physics and Technologies, Institute of Mathematics and Information Science, Institute of Engineering and Technologies, Institue of Natural Sciences working on particular aspects within one complex project under the direction of university teachers and specialists of industrial enterprises. At the very beginning of work it turned out to be necessary to create an interuniversity lab in cooperation with CJSC "Optogan" and the department of the University. Taking into account regional peculiarities of the Republic, hardly predictable market demand in specialists and lagging educational response to the market situation, such department is considered to be able to react to enterprises' needs training undergraduates for the specialties in up-to-date regional need. It's obvious that these highly- and narrowly-qualified specialists are to be few in number but be easily recruited.

There is another important problem that is solved while working on this complex project is that of practice-oriented and project-based educational technologies implementation [1].

The principle target is to change the traditional system of engineering training. It is necessary to create efficient and flexible practice-oriented and project-based educational technologies which will provide continuous training starting with vocational education, then passing to higher professional education and turning to professional standards. The task can be solved only if top man-

agers of both real economy and educational sectors are particularly interested in the enterprise and eager to develop and implement new forms of business and state (federal) education interaction following project-based educational programs.

To make a conclusion, innovative practice-oriented and project-based educational technologies are implemented in the most effective way while working on breakthrough projects carried out by students, undergraduates and postgraduates in cooperation with university faculty and real economy specialists supported by the government.

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