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A full-scale program of university development directed at professional education quality improvement

Un programa completo de Desarrollo Universitario dirigido a la mejora de la calidad de la educación profesional

Olga Sergeevna GRIGOREVA 1; Rosa Leonidovna BUDKEVICH 2; Svetlana Anatolievna ASHIROVA 3; Svetlana Valentinovna YUDINA 4; Liliya Zinnatullovna RYAZAPOVA 5

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ABSTRACT:

A key concept of the paper is the practical implementation aspects of the of the development program of the Almetyevsk State Oil Institute (Tatarstan Republic, Russian Federation). The Institute prepares graduates to ensure skilled personnel for the oil and gas producing complex of the Republic of Tatarstan. A key factor of the paper is the plan of measures aimed at the introduction of innovative educational projects into the structure of the oil institute. It is proved that these measures will contribute to improving the quality of higher education, as well as more effective formation of professional competencies of future employees, engaged in oil and gas producing enterprises of Tatarstan. The aim of the research is to develop and test a comprehensive program for the development of the Almetyevsk State Oil Institute (ASOI). Another important feature is to prove that innovative educational technologies contribute to raising the level of professional competence of graduates who plan to work for oil

RESUMEN:

Un concepto clave del documento son los aspectos prácticos de implementación del programa de desarrollo del Instituto Estatal del petróleo de Almetyevsk (República de Tatarstan, Federación de Rusia). El Instituto prepara a los graduados para asegurar el personal calificado para el aceite y el gas que produce el complejo de la República de Tatarstan. Un factor clave del documento es el plan de medidas dirigido a la introducción de proyectos educativos innovadores en la estructura del Instituto petrolero. Se demuestra que estas medidas contribuirán a mejorar la calidad de la educación superior, así como una formación más eficaz de las competencias profesionales de los futuros empleados, dedicados a las empresas productoras de petróleo y gas de Tatarstan. El objetivo de la investigación es desarrollar y probar un programa integral para el desarrollo del Instituto Estatal de petróleo de Almetyevsk (ASOI). Otra característica importante es demostrar que las tecnologías educativas innovadoras contribuyen a elevar el nivel de

developing companies.
Keywords: development program, innovative technologies, professional competence, higher professional education

competencia profesional de los egresados que planean trabajar para empresas en desarrollo petrolero.
Palabras clave: programa de desarrollo, tecnologías innovadoras, competencia profesional, educación profesional superior

1. Introduction

Evidence suggests that nowadays there is a growing need for students to develop such personal qualities that will contribute to their professional and social mobility. An ability to perform certain functions plays a pivotal role in this process. Therefore, a priority task both for the higher professional education system and for general secondary education is to develop this ability (Shalashova, 2009).

A primary concern for the production sector, in its turn, is an acute need for receiving university graduates who possess not only theoretical knowledge, but who are able to self-actualize themselves in continuously changing information flows. The graduates must have all the competencies claimed by the Federal State Educational Standards of higher education of the new generation (Grigoreva *et al.*, 2014).

Nowadays educational experts of higher professional education are committed to attract school leavers who know not only the fundamentals of chemistry, but also aimed at the formation of certain abilities and skills, necessary for future professional activity. It is known that modern integration and mutual enrichment of educational systems of different countries, in which Russia actively participates, are not possible without the exchange and introduction of world experience, including the level of university freshmen courses (Vdovina, 2013).

2. Methods and methodology

The results of the instruction program (or the results of the learning program / module / discipline) play a critical role in competence approach. The results are a written statement of what a successful student is expected to be able to do or demonstrate at the end of the educational program / module / discipline. A key feature of achieving educational goals and objectives in accordance with the corresponding results of education is “the aspiration for greater accuracy in examining what knowledge or skills the learner learns exactly after the successful completion of the training program”.

The results of education perform a fundamentally different role, in contrast with other target characteristics. They serve as a tool for an increased focus of the educational process, centered around the student.

Obviously, the results of education are related to the student's achievements, and not to the intentions of the teacher. Undoubtedly, they do not often reflect the goals and objectives of education, which reveal the teacher's intentions regarding the education, upbringing, and development of the student (Solovev, 2009).

The findings of our research in the southeast of the Republic of Tatarstan demonstrate structures and vocational educational areas which need the most constructive changes and additions.

2.1 Proposals in the field of innovative educational activities of the oil institute

- The methodology of advanced education which results in the formation of professional competencies among the students who will master new and promising technologies of oil and gas production (Druzhkin *et al.*, 2013). The goal of the methodology is to promote the overall cultural development of the individual in the system of continuous professional education. Much prominence is given to the formation of an individual

moral and intellectual inner world, the formation of a systematic scientific understanding of the world and a constructive attitude to the world (Ivlieva, 2010). The predominant educational aspects also include the prevention of deviant behavior, combined with measures of effective self-development, preparing for the continuous formation of the future oil expert.

- The access to the information resources of the National Electronic Oil and Gas Library by combining electronic resources of oil and gas universities, organizations of the Fuel and Energy Complex and the Russian Academy of Sciences. One of the advantages is the combination of existing resources of the ASOI Electronic Library with the resources of digital libraries of the leading educational institutions in the Russian Federation.

- Widespread use of advanced modern software products, innovative technologies and virtual productions for educational purposes (Severinov *et al.,* 2013). Expanding the practice of applying an interdisciplinary approach to the development of educational programs.

- The independent assessment of education quality within the system of Federal Internet-exam for undergraduate students. This exam system provides a reliable quality assessment of oil industry specialists in the southeast of Tatarstan.

- The organization of network learning forms with federal, national research and leading industry universities in all areas and specialist fields. The network form of educational programs makes it possible to implement programs of international and domestic Russian academic mobility of scientific and educational workers in the form of internships, advanced training, professional retraining, and other forms. The system is sure to provide the introduction of new educational programs in universities together with leading foreign and Russian universities and scientific organizations. It attracts students from leading foreign universities to study in Russian universities through the implementation of partner educational programs with foreign universities and university associations (Vesna and Guseva, 2013).

- The development and introduction of cluster training system on the cooperative basis between the University and the oil and gas processing industry of Tatarstan (Aytuganov *at el.*, 2008). The system can act as a new matrix interaction model of the institute collaborating with the production sector. This interaction leads to the harmonization of professional training of personnel, as well as the generation and transfer of knowledge and information. Cluster training is intended for the targeted and meaningful social and educational impact on the region through the training of specialists in their field (Vasenin, 2014a).

2.2 Proposals in the field of methodological support of the educational process of the Institute

- Constant updating of educational-methodical approaches to the basic educational programs and additional vocational training, organized on the basis of the Oil Institute.

- Special conditions for the education of persons with disabilities (inclusive education).

2.3 Recommendations for the development of educational-laboratory base of the Oil Institute

- The organization and expansion of the system of joint use of unique scientific equipment by various departments of the Institute and third-party organizations of the oil and gas sector.

- The creation and expansion of the existing database on the existing high-tech equipment in the institute. A free access to the database by all departments of the

Institute, as well as by production enterprises and organizations that are potential customers of research and development in the high-tech industries of oil and gas production and oil and gas processing industry of Tatarstan.

- The introduction of problem-oriented scientific and educational centers and multifunctional laboratories based in the Institute. The upgrading of research workers' skills. The skills are necessary for the research in the field of the current problems of oil and gas production and processing, which subsequently contributes to the formation of professional competence of bachelors, undergraduates and postgraduate students of the ASOI.

3. Results

3.1. The methodology of advanced education in the university.

Advanced education is a system-forming property of the whole modern Russian education. Fundamental training, integration, provision of continuing education, distance learning, training of engineering personnel in the sphere of high technologies are at the heart of strategic engineer training (Shoshiashvili, 2006). Advanced education is based on the following basic principles and approaches: a systematic approach, i.e. considering the socio-cultural dynamics of society development; an approach of moderate rigid control; the principle of fundamental training; liberalization; humanization; integration; training specialists in the field of advanced technologies; critical rationality of scientific knowledge. The system of advanced education includes a single complex integrating the various fields of activity of teachers and students, namely, research, inventive activities, engineering design. All these activities function within the structures of the technical institute, i.e. profession-oriented, engineering design, sectoral research institutes, technical parks, related to oil refining. Much evidence suggests that a system of advanced education will be focused on integrative educational and methodological complexes of targeted training of engineering personnel, as well as retraining of teachers of technical universities, based on the fundamental approach. Because of advanced education system, the University will create special conditions for the development of the personality, stemming from the necessary structural subjective component of the system of advanced education.

3.2. The innovative project "Federal Internet-exam in the field of vocational education" (FEPO)

Is focused on conducting an external independent evaluation of the results of students' training within the requirements of Federal State Educational Standards. This project allows to assess the knowledge achievements of students at various stages of higher professional education in accordance with the new requirements laid down in Federal State Educational Standards.

The goal of the project can be defined as the creation of an interactive platform for a multilateral discussion in the field of modern approaches to the development of evaluation tools, as well as the methodology for assessing the professional competencies formed in the process of training (Grigoreva, 2012).

The Federal Internet examination in the field of vocational education will allow to implement the diagnostic technology of external evaluation of the level of competence formation in the process of mastering the content component of the main educational programs at the Oil Institute. Detailed study of the results of the testing allows one to focus on the results of each individual student, which is relevant in the implementation of a competence approach based on the formation and development of a set of general cultural and professional competencies of the University graduate.

Based on the results of participation in FEPO, the educational organization is provided with an

expert educational analysis / monitoring aimed at representatives of the rector's office, dean's office, heads of the university departments, which will adequately assess the level of professional competence of the future graduate of the Oil Institute.

3.3. The use of mass open educational programs (courses)

This use in the educational process, the organization of open educational programs in the areas of training for the oil and gas industries, will contribute to deeper assimilation of knowledge and the formation of a complex of professional competencies for the students of all courses of the Institute.

The goal of the program is to improve the competencies necessary for the professional activities of the future employee, engaged in oil and gas development and refining. The program will be harmonized with open online courses, including courses of the National Platform for Open Education (Open Education). Scientific and educational experts, heads of departments, training centers and other structural units of the educational institution are invited to create and apply open online courses in technical areas in the educational process (Open Education).

3.4. Network forms of interaction between universities

Central to the entire educational system is the analysis of various models of interaction between organizations aimed at implementing networking higher educational programs, including international level. At the heart of this process lies the formation of a normative and methodological framework for interaction. It is relevant from the point of view of increasing the competitiveness of the entire national higher education system, including ASOI. In accordance with the new version of Federal Law on Education (Law of the Russian Federation), the network form of implementing educational programs provides the opportunity for the students who use the resources of several organizations that carry out educational activities, including foreign ones, and, if necessary, use the resources of other organizations.

The participant organizations agree to use a network form for the implementation of educational programs. To organize the implementation of educational programs using a network form, such organizations also jointly develop and approve educational programs (Matushkin *et al.,* 2010).

To implement networking educational programs in the university it is necessary to conclude partnership agreements, to increase the functionality of innovation and educational centers and units, and to expand the educational and methodological councils. Of much importance are centers of professional development of teachers, regional and branch competence centers, market and employment of graduates’ services. According to their focus, networking educational programs can be as follows:

- competence-oriented programs, aimed at the formation of unique professional competencies for training qualified personnel for the oil industry. In the case of creation of competence-oriented network educational programs, partner structures (professional-oriented colleges, specialized schools) cooperate with special centers and subdivisions of pre-university training, career counseling centers, profile training classes and classrooms in order to begin the formation of unique competencies at the initial educational levels.

- scientific and innovative programs, focused on the development of applied research for the needs of oil and gas refining and oil and gas producing enterprises of the southeast of the Republic of Tatarstan. The innovative infrastructure is of much importance during the implementation of scientific and innovative network educational programs. ASOI combines its resources with the resources of educational and research centers, centers for collective use of scientific equipment. In this case, the University creates a unique informational scientific and educational environment, in which the

institution is an integral participant.

- sectoral program, designed to train highly qualified graduates in the priority areas of the oil production and refining complex on the basis of international educational and professional standards. For realization of branch network educational programs in the structure of the Institute, we create training and production centers and subdivisions, including branch (base) departments. We also organize experimental-design production and innovation-technological centers of petrochemical and oilfield orientation. Therefore, we are developing a laboratory and production base for collective training.

3.5. Cluster education

The system of regional cluster interaction between the institute and production includes the following aspects: psychological and educational support of the teaching process for increasing the effectiveness of personal and professional development of the future specialist and developing its adaptive potential in cluster production for the qualitative achievement of the predicted result of vocational training and giving the educational process a functional character (Vasenin, 2014b). This allows the suppliers of raw materials, processors, research organizations, educational institutions (ASOI) to cooperate fruitfully in order to educate bachelor and master degree students in the field of "Oil and gas business". Such cooperation, undoubtedly, will allow to achieve strengthening of oil-producing and petrochemical potential of Tatarstan. The participants of the regional cluster provide consulting, expert, engineering and research services to dozens of enterprises belonging to the cluster. In general, the creation and functioning of a territorial cluster allows removing barriers that impede the effective interaction of petrochemical enterprises and subsidiaries (Smirnov, 2010).

Therefore, the introduction of innovative educational projects into the existing structure of the ASOI will significantly improve the quality of higher professional education received by the students.

4. Discussion of the research results

The current study found that the combination of the resources of electronic libraries of oil and gas universities and companies engaged in the fuel and energy complex will significantly expand the potential for increasing reliable information sources in the development and implementation of research, organized by bachelors, undergraduates, graduate students, as well as the faculty of ASOI.

Another important finding was that the interdisciplinary approach is useful not only for senior courses' students who are taking the final state exams, but already for the freshmen courses. An interdisciplinary approach introduces the importance of merger the disciplines of the natural-science cycle, namely chemistry, with the work programs of other disciplines, thereby contributing to the formation of future professional competencies of bachelors who master the main educational program "Oil and Gas Business". It is possible to implement the approach by introducing elements of professional activity in certain topics of the discipline. If possible, this practice may be integrated further into the course of the discipline study. For example, the application of the interdisciplinary approach is justified in the study of general chemistry disciplines. Undoubtedly, a 4-year studying of "Oil and gas business" course demonstrates a strong interconnection among the following subjects: chemistry, physical and colloid chemistry, chemistry of oil and gas, ecology, complications in oil production, geology of oil and gas, field geology, geochemistry, liquefied hydrocarbon gases, reagents for treating the bottomhole zone, chemical and physics methods of water treatment, environmental safety (Barabanov et al., 2003). It is also possible to create virtual laboratory complexes, specializing on specific topics or on specific unique equipment used in the process of studying the complex of these disciplines.

The results of our study show that the participation of educational experts from almost all

departments of ASOI in the project “The Federal Internet Exam in the Field of Vocational Education (FEPO)” offers important professional development opportunities for teachers in different cycles of disciplines (natural, technical, special, liberal arts, etc.). The teaching staff of the Institute created databases of questions, developed special methodological recommendations for preparing for online testing on disciplines. The results of such tests allow us to objectively assess the level of preparation and mastering of the basic educational program in the discipline under study. The results of knowledge checks also identify gaps and shortcomings in existing work programs. The most important finding to emerge from the analysis is a plan examination tests to be enriched with studying topics that will contribute to a deeper understanding of the material and the formation of useful professional skills and abilities, necessary for bachelor students studying the field of “Oil and gas business”. As a result, we will be able to really influence the quality control system of the received education within the technical oil university.

It is interesting to note that constant updating of educational-methodological support of the basic educational programs and programs of additional vocational training is critical for the sustainable development of the Institute. This result may be achieved with the help of the introduction of the disciplines based on modern educational technologies, such as the method of “case-study” and providing search of rational decisions in real industrial situations, simulated for oil and gas field (Kutuzov *at el.*, 2015). The core of the innovative educational process is an interdisciplinary training, which provides the solution of production and engineering design tasks in groups composed of students studying in various areas. Classes are planned to be conducted on the basis of ASOI, whose educational facilities are analogous to the leading oil and gas companies. Students who study within the framework of the interdisciplinary approach will carry out and protect complex graduation course projects.

5. Conclusion

The main goal of the current study was to determine the advantages of studying in ASOI. It should be noted that the existing classrooms and laboratories of ASOI are outfitted with modern equipment that allows to create a dynamic and interactive learning environment in the preparation of highly qualified personnel. Educational programs in ASOI provide:

- individual approach to work with each bachelor / undergraduate / graduate student;
- a dynamic learning system using the virtual environment of professional activity;
- an interactive system for obtaining, analyzing and accumulating knowledge;
- a multidisciplinary approach to vocational training;
- a wide access to modern automated workstations (AWP) and round-the-clock access to the Internet;
- a synthesis of professional competences of academic and field study.

An implication of our study is a detailed plan to create the scientific and educational center, based on an interdisciplinary integration of the educational, research and innovation activities of the Institute. This center will solve urgent and long-range tasks in the field of oil and gas production.

The findings of the research provide the insights for the actual directions of problem-oriented studies, conducted by ASOI in cooperation with research institutes and oil and gas producing and processing enterprises of Tatarstan. The results of the investigation show that ASOI scientific and educational center and its structural subdivisions (sections / laboratories) offer to support the following research tasks:

- the definition of microbiological contamination of oil reservoirs;
- the corrosion monitoring of the main oil pipelines;
- the monitoring of surface and groundwater objects;

- the laboratory studies of oil, gas, water to assess their changes over time;

- the selection of chemical reagents and their compatibility in time and in dynamics which is important for processing of the bottomhole formation zone;

- the qualitative and quantitative determination of the content of organochlorine compounds in gas, oil, and oil products;

- the selection of the component composition, as well as further study of the rheological properties of the compositions for its use in a hydraulic fracturing system for the extraction of super viscous Tatarstan oils.

The results of the study indicate that in addition to the key events aimed at promoting the university in international rankings, we should also include the implementation of joint educational programs with foreign universities. No less important is the attraction of foreign professors for the training of our students, the development of international academic mobility for students and university professors.

The current data highlight that in modern conditions vocational education should provide training for experts with a high level of professional competence, able to perform a wide range of practical functions, independently make decisions about various issues arising in professional activities. The study has confirmed that only such higher educational institutions – as ASOI – are able to cope with the task in view. These institutions directly cooperate with industrial enterprises of oil and gas fields. The key strengths of such institutions are highly qualified human resources and a substantial material base.

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1. Almetyevsk State Oil Institute, Russia, 423450, Almetyevsk, Lenin ul. 2.

2. Almetyevsk State Oil Institute, Russia, 423450, Almetyevsk, Lenin ul. 2.

3. Kazan National Research Technical University named after A.N. Tupolev-KAI, Russia, 420111, Kazan, K.Marx str., 10. E-Mail: svetlana_ashirov@mail.ru

4. Kazan National Research Technical University named after A.N. Tupolev-KAI, Russia, 420111, Kazan, K.Marx str., 10.

5. Kazan National Research Technological University, Russia, 420015, Kazan, Karl Marx str., 68

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