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The Management of Youth Employment in a Lifelong Engineering Education System

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ABSTRACT

The formation of lifelong engineering (technical) education based on the interaction and collaboration among education, industrial plants and business structures contributes to the creation of a youth employment management system which, in turn, makes a contribution to the development of human potential that will be able to satisfy the modern social and economic needs of a country. The system of lifelong engineering education allows: To create conditions for pupils' professional orientation toward technical and engineering specialization in their future vocational training; to provide conditions to engineering university students for the formation of their skills, habits and professional competence enabling to solve professional problems in real industrial production environment with the use of high-technology equipment; to manage and control the graduates' placement through the solution of the above mentioned tasks by increasing the number of young specialists being employed within 1 year after graduating from a university and getting an education. The system of lifelong engineering (technical) education enables to cover a large segment of the population by vocational training programs, retraining, post-secondary technical and advanced training on the basis of multi-functional centers of applied qualifications and educational-sectoral clusters. Practical outcomes of the above specified work will be the formation of an efficient youth employment management system and the provision of Russian economy with high-qualified personnel in the priority directions of modernization and technological development. Upon the obtained results of this research some scientific problems and priority directions requiring further consideration can be distinguished: The study and generalization of foreign and Russian engineering university experience concerning the development of youth employment management system through the implementation of innovative models of engineering education organization; seeking new areas of activity which will have a positive impact on the quality of lifelong technical education and youth employment. The material of the article can be useful and significant for specialists and managers of educational organizations, job centers and production-and-training centers by the determination of forms and methods of interaction, as well as selection and arrangement of the instructional content of technicians-and-engineers' collaborative training.

Keywords: Lifelong Education, Youth Employment, Interaction
JEL Classifications: A20, I21, I28

1. INTRODUCTION

The creation of innovative models intended for high-qualified engineering lifelong training, the collaboration of educational organizations and business structures, active participation of the members of educational process in international educational and technological space are the priority objectives of vocational training development in accordance with the needs of rapidly changing economic environment and the goals of community and state development. Thus, these priority objectives are one

of the most efficient tools of youth employment management (Russian Federation National Program Development of Education in 2013-2020, 2013).

One of the factors of the system effectiveness associated with vocational education is the number of higher vocational institution graduates and secondary vocational school leavers who were employed in accordance with their major (specialization) within 1 year after getting an education.

The population of young people at the age from 14 till 30 makes up 37 million people which constitutes 34 % of economically active population of the Russian Federation. It is to be emphasized that young citizens of the country possess economic and social mobility, imitativeness and have physical health, intellectual activity and open-mindedness to scientific and technological innovations which is a necessary condition of their adaptation to new socioeconomic environment. The number of officially-registered unemployed young people constitutes about 37% in Russia. The share of young people being employed in a real sector of economic activity is about 9-18% compared to 62% of young people being in the job market. Thus, there is a sustainable tendency of human capital loss among young people: These are the consequences of the inefficient use of the available potential and pose a threat to the state by decelerating its economic growth and declining the living standard.

The release of labor force due to the demographic processes of decrease in youth population at the age from 17 till 25 on 12-15% by 2016 compared to 2010 will cause a new tendency in this active labor market segment, e.g. the demand in high productive workplaces which will result in the improvement of human recourse personnel training quality enabling their high performance (Pokholkov and Pakhomova, 2015).

Current situation in the youth employment market generates a need for developing new approaches to the solution of the problem associated with unemployment through the youth employment management which is possible in lifelong education environment since it creates optimal organizational and pedagogical conditions for personal successful professional adaptation, socialization and self-realization (Irismetov et al., 2013; Ivanov et al., 2014a; 2014b; Zaitseva, 2013; Dmitrieva et al., 2015; Sabirov et al., 2015; Gallyamova, 2014).

The relevance of this research is determined by the contradiction between the engineering education quality and of potential employers' needs which results in low demand in engineering university graduates in the labor market. The analysis of the above mentioned contradiction shows that the employers are interested in hiring specialists who are able to be fully engaged in the professional sphere, to realize the key types of professional activity and capable of thinking and working independently and autonomously from the very first working day at the enterprise (Priymak et al., 2015; Khairullina et al., 2016).

The above listed requirements necessitate the need to overcome gaps in vocational training, to include some changes in graduates' theoretical knowledge, skills and practical experience, to develop the ability to predict future problems and consequences associated with these problems, to create advanced models aimed at coping with these problems (Kupriyanov et al., 2015; Kozhanova et al., 2015; Kalimullin and Masalimova, 2016).

It is unfair to state that scientific and pedagogical community has conservative views on the engineering education system (engineers and technicians' vocational training) and are against the implementation of new paradigms in vocational education. The State Standards of new generation and conceive-design-implement-operate initiatives intended to eliminate contradictions between theory and practice in engineering education adopted by the majority of engineering universities in Russia issue the challenge to develop innovative technologies of lifelong engineering personnel training (Crawley, 2011).

Lifelong engineering personnel training ensures competent and well-timed professional orientation to technical specializations, the formation of professional competence of future specialists capable of successful actions based on practical experience, skills and knowledge by the solution of professional problems in real production environment which will result in considerable reduction of time spent on engineering vocational training and retraining in accordance with the changing economic requirements, using formal and informal organization of education by engaging business in the educational process. All these measures, in aggregate, allow creating an efficient management system of engineering university graduates' employment (Magomedov and Kutepova, 2009).

2. METHODOLOGICAL FRAMEWORK

2.1. Empirical Research Method

Since the aim of the research is to find methods and forms to realize a lifelong engineering education system based on the collaboration and interaction between education and business as a factor of youth employment management, the analysis of observation data concerning the changes of secondary school leavers' professional intentions and inclinations, the results of surveys and interviews conducted among secondary vocational school leavers, graduates and employers on the issue of their satisfaction with vocational training quality are the most important initial stages of this research. The authors of this study applied a range of allied to pedagogics sciences by data gathering, its storage and processing concerning secondary engineering university graduates' placement. The place of data gathering was the Siberian Federal District. We studied the documents and outcomes of educational activity in engineering universities and secondary technical schools in the form of written, statistical, technical and other materials, where the percentage of engineering university graduates' employment in accordance with their specialty (major) within 1 year after getting an education and percentage of youth employed in the production and service spheres were taken as a target.

2.2. Methodological Principles

Lifelong education and employment comprise a very complicated system which effective study can be provided by the use of the

complex of general scientific and specific pedagogical research techniques and methods. The authors of this research have chosen the following methodological principles: Determinism which specifies the need to study the causes of youth unemployment from the point of view of their causality due to the impact of one or another factors; systemacy requiring the definition of youth employment management style, the type of management and control of lifelong technical education and collaboration and interaction among education, industrial plants and business as coherent components of a social and educational comprehensive whole; dialectical principle which recognizes the continuity of changes, transformation and development of a vocational training system, manufacturing and labor market.

2.3. Literature Review

Some studies conducted by Russian scientists were very significant for the subject of the given research.

Pokholkov and Pakhomova (2015) presented system analysis of the problem associated with the quality of vocational education, Ignatyev and Tretyakova (2014) analyzed the management of lifelong technical education, Piralova (2010) focused on the optimization of modern engineering education.

The study done by Bagautdinova (2004) is of great importance with relation to the management of engineering education system at regional, federal and municipal levels, Vinokurov et al., (2011) investigated the problem of engineering and technical personnel certification; Koulz et al. (2009) were concerned with the development of national engineering personnel certification scheme.

The works conducted by Simonyantz (2014), Bibik and Il'yaschenko (2014), Kozlov and Minayev (2004), Vlazneva (2014), Loshchilova et al. (2015), Vlasyuk (2007), Shvabauehr (2006), Minzer and Babayeva (2012), Buresh and Zhuk (2009) are of particular interest for studying the problem of youth employment management through the lifelong technical training system. Simonyantz (2006) presented various education technologies of engineering training through students' immersion in vocational environment of an industrial plant; Bibik and Il'yaschenko (2014) analyzed the teaching experience of practice-oriented approach by engineering and technical personnel training; the practice of using special purpose-oriented method of intercompany engineering training was investigated by Kozlov and Minayev (2004), Palyanov et al. (2013) performed the analysis of youth employment management system through vocational training modernization; Vlazneva (2014) focused on the technologies of the collaboration and interaction between the labor and educational service markets; Loshchilova et al. (2015) considered the models of networking interaction between universities and job centers; Vlasyuk (2007) described the motivation techniques of future engineers' career guidance and analyzed the problem of graduates' vocational adjustment and social adaptation; Shvabauehr (2006) devoted his research to theoretical and methodological grounds of lifelong education design; Minzer and Babayeva (2012) focused on the design technology of vocational education programs based on the integration of formal and informal education; the issues associated with the development and foundation of educational and research-and-production clusters as a strategy of competitive recovery of a region were discussed by Buresh and Zhuk (2009).

Upon the analysis of scientific literature devoted to the problem of this research we came to the conclusion that some socioeconomic aspects of lifelong technical education are still unstudied. There is a lack of research where the problem of engineering university graduates' employment is considered as a pedagogical problem and the system of lifelong technical training is studied as a management tool of youth employment.

3. RESULTS AND DISCUSSIONS

3.1. The Creation of Multifunctional Centers of Applied Qualifications (MCAQ) as a Factor of Conflict Resolution between the Quality of Engineering Training and Employers' Needs

The data analysis of empirical studies allowed the authors of this paper to determine the key problem which is in the contradiction between the quality of engineering and higher education specialists' training who are able to work at engineering posts (bachelors and masters) and employers' needs (their requirements to specialists). The quality of graduates' education in some Russian universities does not meet the current requirements due to the deterioration of material and technical resources, the lack of up-to-date laboratory equipment and crisis in the research and educational personnel training (Vinokurov et al., 2011). Employers are interested in the following qualities essential for modern engineers: The ability of critical thinking (systematic and independently) and the efficient solution of professional problems using their knowledge, skills and professional competences obtained in university; the ability to work in a team; the knowledge of technological processes and industrial and business environment; the ability to generate, endorse and implement a novel idea; the ability to present their own ideas (Ignatyev and Tretyakova, 2014).

The instructional content of engineering educational programs and currently used educational technologies hinder from the formation of professional competences. The current engineering personal training system is not oriented to changing industrial needs. There is no adequate prediction system which is able to analyze the industrial needs in certain specialists and there is also lack in the development of engineering special-purpose training courses (Bagautdinova, 2004).

The most important direction on improving quality of engineering personnel training should be the activity enabling the collaboration and interaction between education and business based on the principle of a social partnership, vested by the federal law of the Russian Federation about employers' participation in the development and implementation of state policy in the field of professional education, adopted in 2007 and the law adopted in 2009 which allows universities to establish small innovation enterprises. The results of regular monitoring conducted by the Soviet of the Federation of legislative and regulatory enforcement practice of the adopted laws, however, demonstrate lack of the expected effect (Matviyenko, 2013).

The unresolved contradiction between the quality of engineering training and the employers' needs (requirements to engineers) resulted in turning out specialists for job centers, because they still do not satisfy the industrial needs, which leads to aggravating the problem associated with youth unemployment (Palyanov et al., 2013).

A promising direction of the model development of youth employment management through the development of lifelong technical education system based on the collaboration and interaction between education and business is the creation of MCAQ on the basis of branch resource centers operating at industrial plants. MCAQ will be a connecting link of engineering personnel lifelong education as informal education lasting the whole life. The main principle of this education is training in accordance with the demands in close association with practice, flexibility of educational programs, timetable and places where the training is conducted (Minzer and Babayeva, 2012).

The main objectives of MCAQ include: The increase of youth employment rate through efficient job search by engineering university graduates in accordance with their major (specialization); individual support given to students and graduates concerning their career choice and job placement; the cooperation and interaction with potential employers on the issue of steady working practice and pre-graduation apprenticeship organization and personal graduates' appointments (distribution) to industrial plants; the implementation of probation period programs in high-tech companies and plants intended for students and young specialists; the formation of consultative committees arranging the cooperation of engineering universities, job centers and potential employers concerning vocational adjustment and youth employment management.

The efficiency of networking forms of interaction between education and business based on MCAQ is determined by some factors: The use of modern technological sites equipped with high-technology facilities being at industrial partners' disposal for educational institution needs; the use of high-qualified research and educational potential, e.g., pre-graduation apprenticeship heads (tutors) capable of working on high-technology equipment and lecturers using efficient innovative educational technologies; the implementation of a wide range of a short-term vocational training, retraining and advanced programs; rendering of an additional educational service on some certain specialties; the use of distance learning technologies.

3.2. The Creation of Educational-sectoral Clusters as a Factor of Youth Employment Management through a Lifelong Vocational Education System

Under the conditions when educational institutions of higher education aimed at training of technical and engineering specialists lost the support of base plants, the perspective to improve multilevel and multidisciplinary vocational education system with the use of partnership between engineering universities, implementing network forms and employers, including companies of all patterns of ownership, is of great importance. This partnership forms an educational-sectoral cluster, consisting of a group of plants and cooperating organizations, including educational institutions, supplementing each other through their interaction and collaboration by solving the problem of engineering personnel training possessing professional competences, satisfying the needs of innovative industry (Loshchilova et al., 2015).

The structure of the educational-sectoral cluster in the system of lifelong technical education includes: Engineering universities training specialists majoring in certain professional fields; educational institutions dealing with the secondary vocational education and senior stage of profession-oriented schools which train technicians and engineering university entrants; plants requiring qualified staff to solve professional problems in industrial environment.

Science is a constituent part in this type of cooperation. The employer is a consumer of the results of scientific, technical and technological advances who realizes his interests by the selection of entrants and influences the instructional content of entrants' education and retraining and also takes part in the assessment of graduates' training quality in the framework of Federal State Educational Standards (as members of State Attestation Commissions). Education as worthwhile welfare is carried out for the benefit of people, family, society and state and satisfies the needs of society through the satisfaction of the interests of industry and business aimed at providing high standards of living and competitiveness in the world market (Buresh and Zhuk, 2009).

The principle of the educational-sectoral cluster system operation is as follows: Industrial plants transmit information concerning the required specialists to their branch ministries and, thus, the claim for a certain specialist is carried out through the system of a government order. Industrial plants and business provide apprenticeship on modern high-technology equipment and guarantee to employ the graduates after their graduation from university.

The concentration of educational institutions of different types of educational level around the engineering university allows uniting scientific, educational, methodical, material and technical resources of industrial production and business in order to implement lifelong technical education system. At the same time, the collaboration and interaction between engineering universities and basic schools through the introduction of university grades in these schools help young people in their vocational engineering major choice (specialization choice). In the case, when the leavers of branch (profession-oriented) colleges have a chance to reduce the time spent on a course completion, the opportunity to enter the university-partner increases which helps to solve the problem of entrants' enrolment (Simonyantz, 2014).

Thus, the participants of educational-sectoral clusters get the opportunity to:

- Manage the training of high-qualified engineering personnel according to the real industry needs
- Increase the number of high-performance working places
- Participate in the system of social partnership on the principles of a project-based management.

Educational-sectoral clusters established on the basis of taking into account socioeconomic features of a certain region combine efforts of all educational organizations, industrial plants, business, job centers aimed at the formation of high-qualified engineering personnel; contribute to enhancing (expanding) of vocational information and education environment; allow to reduce the youth unemployment rate through the creation of employment management system; enable to supply industry with young specialists.

4. CONCLUSION

In the course of a detailed study of the problem associated with youth employment management through the development and creation of a lifelong technical education system by the interaction and collaboration among education, industrial plants and business, the key vectors of activities aimed at improving engineering personnel education system and increasing engineering university graduates' employment rate were determined.

The factors contributing to improving engineering personnel education system and increasing engineering university graduates' employment rate include: Re-orientation of vocational training to developing partnership with industrial plants and business; the introduction of a lifelong engineering personnel training which will ensure the required knowledge, skills and professional competences; the development of cooperation and interaction among the participants of youth labor market which will contribute to their qualitative modernization (standards of conduct, roles of market participants, value orientation of future specialists; the increase of information access); the development of employment system for young specialists taking into consideration the regional personnel needs through the conduction of measures for the advancement of employment.

The distinguish feature and the novelty of a lifelong technical education system is a stimuli to increase the motivation and improve the quality of vocational training of both, students and professional and teaching staff. A technical university gets the opportunity to increase its image due to mobilization of industrial and material recourses, the availability of high-technology places for apprenticeship and graduates' employment, strengthening of relations between university and professional associations, making of business agreements (commercial contracts) with industrial plants, the opportunity to get high-technology and high-paid working places, including executive positions.

The forms of interaction and collaboration among education, industrial plants and business which lead to improving professional competences of engineering university graduates and contributing to their successful employment include: The participation of industrial plants and business in the development and formation of educational programs intended for future engineers and assessment of education quality; the conduction of special-purpose and profession-oriented training, continued post-secondary technical training and education and retraining on the basis of MCAQ and educational-sectoral clustes; the conduction of scientific research on the themes proposed by industrial plants and business; the organization of apprenticeship in a real industrial production environment on high-technology equipment; graduates' placement and employment; making of commercial contracts with industrial plants and business concerning collaborate scientific research.

Upon the obtained results of this research we can distinguish a range of scientific problems and perspective directions requiring further consideration: The study and generalization of practical experience of leading Russian and foreign universities on the issue of the development of a youth employment management system through introduction and implementation of innovation models of technical education, the search of new scopes of activities which will have a positive impact on education quality of engineering universities and graduates' placement and youth employment.

The materials of this article can be useful for specialists, heads of educational institutions and production-and-training centers, special placement services and job centers by the definition of forms and methods of interaction and collaboration, as well as the choice and structuring of the instructional content of collaborate engineering staff training.

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