

Training of Engineering Personnel for the Innovative Coal Industry: Problems and Ways of Solution

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Abstract. The article is written based on some results of the long-term scientific research of the problem related to the urgent need to find the ways of training personnel for the innovative coal industry in the higher education system. This is due to the fundamental changes in the Russian social and economic conditions: the change in the social system and the owner of the coal industry, the emergence of new technologies in the field of coal mining and processing, and in the management of these processes. At the same time, the system of training specialists for the coal industry in the higher education institutions has largely remained unchanged: technologies and principles of training, scientific approaches and concepts take little account of the changed situation, traditional views of specialists working in the university continue to dominate innovative ideas. Many innovations, especially related to technology and the principles of education, struggle to make their way into the higher education system. The article substantiates the urgency of the problem of training personnel for the innovative coal industry in the higher education system, as well as the importance of scientific analysis of the problem in order to find the ways to solve it.

1 Introduction

The turn of the third millennium was marked for the mankind by the entry into an era of great changes that radically changed all spheres of human life. The new conditions for socio-economic development and the nature of changes in society caused by the two revolutions (scientific and information) contributed to the formation in the leading countries of the post-industrial "new economy", for which knowledge and human capital became the main resource. According to a number of sources, the new knowledge that is used in modern technologies, personnel, in the organization of production of developed countries accounts for 80 to 95% of the growth of the gross domestic product. The researchers found that the knowledge and the level of development of human capital present the main source of economic development and the wealth of the nation in the new era rather than the wealth of natural resources.

The competitiveness of states, their leading positions in the development of national industry and their place in international markets present an important factor in the economic development of the world's leading countries today. The modern global nature in the supply of a large number of goods and services gives way to tools that help to conquer the markets through active technological competition in the field of innovation.

In the Strategy for Innovative Development of the Russian Federation for the period up to 2020, it is noted that the most important problem in ensuring a high level of competitiveness of the country's economy is the problem of being competitive in everything: a person must be competitive, as well as a city and an industry, in other words, the whole country and all its components need to be competitive [1, 3-5].

In this document, it is noted that in addition to quality education, the person's attitudes to life and models of his/her innovative behavior play an important role in the innovative development of society. It should be recognized that the desire for lifelong learning, innovative thinking and creativity, as well as other personality properties important for innovative development, in general, are not sufficiently developed among graduates of the Russian higher education system. The development of a higher level of innovative activity of the university graduate is an actual problem that requires attention of both scientists and practitioners.

2 Materials and methods

A major role in this is given to the system of education, its integration into the world educational space while preserving its own value. This causes profound transformations in all its spheres and generates a change in the educational paradigm: the "knowledge" model of education is replaced by the "competence" one filled with activity basis. The system of mutual relations of participants in the educational process in the university is being restructured. Formation of the key competencies of engineers, including in the field of innovations that contribute to the mobility of the individual in a changing world and professional success in the innovative economy becomes the basis for the training of professional specialists, including in the coal industry.

In this regard, it is extremely important to actively form an understanding of the special mission of the university in the public consciousness and the state authorities and develop an education system in it that would be oriented towards training specialists possessing innovative thinking necessary for the development of the innovative Russian economy. Training of an innovative type engineer requires the implementation of innovative educational technologies in the higher education system: a university teacher using new technologies is able to train an engineer with innovative thinking.

The urgency of the search for the grounds for the training of engineering personnel in the university for an innovative economy is determined by the following circumstances:

- significant changes in domestic and foreign education systems associated with the Bologna Process;
- a change in the social system in Russia, its transition to a market path of development;
- the needs of the post-industrial economy in the preparation of innovative engineers with innovative thinking.

Such concepts as "innovative economy", "innovative educational technology", "innovative thinking", "innovative type of specialist" are important for our research, so it is important to define the concept of "innovation". In the Russian and foreign literature, this concept is interpreted in various ways, the preferences are based on methodological approaches: if it's the activity approach, then innovation is the result of creative activity; if

it's the process approach - that is the process of introducing innovations; if it is functional, it is a system of functioning of innovations.

There is a reference point in the understanding of "innovation". This is a kind of international standard, it is taken as the basis for the development of concepts, programmes and other strategic documents of innovation. In accordance with it, innovation is considered as a novelty introduction, i.e. the final result of creative activity, which is realized in the form of new or improved products sold on the market, or a new or improved technological process used in practical activities [1]

The attempt to find ways of training engineering personnel for the innovative economy, in particular for the coal industry, allowed us to determine, as a direction of the movement, the need to develop the theoretical and methodological grounds for this. The analysis carried out confirmed the importance and necessity of a scientific search in this direction.

For example, the need to train engineering personnel for the innovative industry was identified as the basis for the comprehensive development of the coal industry in Kuzbass. This is reflected in the developed and adopted Strategy of the region until 2025, "... the creation of a multidisciplinary economy, the transition to a more qualitative, innovative stage of its development" [2]. It proposes to master the newest technologies for coal processing, to develop mining machinery building, strengthen the innovative component in each branch of the economy in order to bring products of high limits to the world and domestic markets.

With this purpose in view, the Concept and the integrative - competence model were developed in the course of the study for training the engineering personnel for an innovative economy using the example of the coal industry in the region. Technologies for their implementation were proposed, which were presented to the scientific and practicing community for wide awareness [3-5].

During the study of the problem, some inconsistencies in the training of engineering personnel for the innovative coal industry were identified, including:

- a high level of theoretical studies of the problems of professional education and an insufficient degree of study of the development of modern approaches and theories of training engineering personnel for the innovative economy;
- the need for training of engineering personnel for the innovative economy and an insufficient level of development of its theoretical and methodological justification;
- a high innovative potential of modernization of the education system and a lack of theoretical developments that allow on a scientific basis to carry out training of engineering personnel for the country's innovative economy;
- a significant potential of ideas for innovative development of professional education for engineers and inadequate elaboration of the conceptual and technological foundations for the training of engineering personnel for the innovative economy.

The inconsistencies also testify to the urgency of the attempt to develop the concept of training specialists in the system of higher education for the innovative economy, using the example of the coal industry. The concept is based on the integrative interaction of the components of the scientific, educational, production and innovation spaces, as well as regional, federal and international levels of economic development with the goal of training a specialist, a mining engineer with the competence in innovation.

The development of the concept of integrative-competence training of specialists for the innovative economy, including the mission, goals, objectives, principles, resources, indicators and indicators for assessing the effectiveness of the professional education system development, will contribute, in our view, to the task of forming and developing mining engineers required for development of the innovative sector of the coal industry.

The main idea of the Concept is the need to create a system of training specialists for the innovative economy, as an integral characteristic of the process, result, the system of professional education, which envisages regulation of the process based on the integration of its main components, as well as factors influencing the final result considered to be the innovative competence of a specialist.

The integrative-competence concept is focused on training specialists for the innovative economy, in particular the coal industry, and is based on the idea of integrating a number of grounds (attributes):

-organizational - integration of the systems of training specialists for the innovative economy with the aim of forming their innovative competence at the following levels of professional education: general, primary, special, higher, postgraduate and additional;
-functional - integration of basic and additional processes of formation of innovative competence of specialists in the system of professional education implemented in the educational system.

The essence of the integrative-competence concept is the integration of the management functions of the process of forming the innovative competence of specialists in various educational processes (education, upbringing and development), etc.

The implementation of the functions of managing the process of forming innovative competence of specialists in certain educational processes based on integration is reflected in the following procedures: introduction of state educational standards, accreditation and licensing of educational institutions, final certification of graduates, certification of pedagogical staff, examination of projects and programs, etc.

The process of formation of the innovative competency of specialists in certain educational processes based on the principle of integration includes, for example, such components as:

-content - is the integration of the content of education at various levels of professional education included in the integrated system of training specialists for the innovative economy; the requirements of the education standard, employers, the labor market and the economy, the achievements of modern science and practice (domestic and world);

-parameter - is an evaluation - criteria model of training a specialist for the innovative economy, which includes such elements as:

- Criterial system for assessing the quality of training specialists for the innovative economy, in the context of the integrative system of professional education, focused on the formation of an innovative and competent specialist;
- Evaluation of the effectiveness of the implementation of educational programs and the quality of training of future specialists in the coal industry, in the context of the integrated innovation-oriented system of professional education.

The concept includes the following components: scientifically substantiated goals and objectives of the integrative - competence approach to training specialists for the emerging innovative coal industry; principles, features, conditions and directions of its implementation; technology of designing and implementation of the integrative-competence approach to the training of mining engineers in the context of the integrative system of professional education.

It also includes methodological requirements for designing a multi-level regional system of training specialists for the innovative economy.

The features of the competence approach to training of specialists for the innovation economy, its components, criterial apparatus, organizational and pedagogical conditions (personnel, regulatory, legal, information) and resources that contribute to ensuring the effectiveness of training specialists for the innovation economy were based on the integration

of the system, integrated, interdisciplinary, technological, competence, and situational approaches and models of training specialists for the innovation activity.

The essence of integrative - competence approach to the training of specialists for the innovative economy consists in the integration of organizational, methodical, scientific, personnel, managerial and other efforts in order to achieve a new quality of training specialists for the innovative economy with competence in innovation. Based on the principle of a multi-level and integrated construction of a specialist training system in the field of higher education for the innovative economy introduced into the concept, we propose an approach to designing a regional specialist training system based on integrating interrelated processes and highlighting the stages in the life cycle of the training process. The theoretical and methodological grounds of designing a regional educational system for training specialists for the innovative economy were determined, taking into account the experience and achievements of the modern domestic and world science of professional education. They are presented as a set of scientific approaches (systemic, integrated, interdisciplinary, technological, competence and situational) with the dominance of the competence one. The peculiarities of the process of designing the integrative - competence approach of training a specialist for the innovative economy were identified. The idea of an integrative - competence approach to training specialists with an emphasis on innovative parameters of the development of the coal industry and, the whole economy was implemented. The idea of the integrative - competence concept of training a specialist for the innovative economy presents a systemic integration interaction of its components. A sign of such interaction is the unification of the organizational, functional, content and parametric grounds – this is firstly. And, secondly, the impact of this unification on the process of training specialists, on the group of other sub-processes.

3 Conclusions

The methodological basis of the integrative competence approach to training a specialist for the innovative economy is the integration of a systemic, integrated, interdisciplinary, technological, competence and situational approaches, the implementation of which ensures a real increase in the educational, personal and professional achievements of graduates who meet the requirements of the innovative economy.

As we determined, the basic principles of the integrative and competence approach to the training of specialists for the innovation economy are as follows: compliance with the requirements of the current external environment, potential flexibility, integration of activities and resources, the innovative orientation of scientific and educational activities, the conjugation of educational programs, the optimality and adaptability of management, etc.

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