



Concept of Implementing the Programs of Additional Professional Education Within the Cluster System

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CONCEPT OF IMPLEMENTING THE PROGRAMS OF ADDITIONAL PROFESSIONAL EDUCATION WITHIN THE CLUSTER SYSTEM

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Abstract

Paper presents the problems of cluster approach within the system of advanced professional training of industrial employees. The general interaction scheme between cluster participants was defined. The implementation model of additional professional education within cluster development was considered. The scheme of advanced professional training for industrial employees was proposed. It includes three levels of education process the efficiency of which is defined by the collaboration of university (as a basis of higher education), Russian and foreign educational research and engineering centers, and enterprises - participants of a specific cluster. It will also allow the integration of Russian and foreign educational, research and engineering centers to be significantly intensified, as well as a unique scientific and educational

environment needed for developing the innovative economics of the region and Russia in whole to be created.

Keywords: continuous professional education, cluster, cluster approach, engineering staff

Introduction

Nowadays one of the priorities of the state policy in Russia is to create an innovative economy characterized by enhancement of the role of scientific knowledge, innovative technologies, and availability of infrastructure, through which it will be possible to create and disseminate new knowledge. Thus, professional education becomes a factor of socio-economic development of the regions and the Russian Federation as a whole [1-5].

Educational innovation and clusters that are based on the interaction of main actors – educational institutions, enterprises, and social organizations - play a special role in the development of the regions. Cluster is understood as a group of adjacent interrelated companies and connected with them organizations that work in a definite sphere. This association is characterized by commonness of activity. They mutually reinforce each other. Therefore some researchers point out their positive role in the national economy [9]. During the recent years the term “cluster” was defined rather precisely: it is an industry-specific geographic concentration of enterprises, closely related branches, mutually promoting each other’s marketability. Many researchers emphasize strategic framework nature of cluster as its attributive feature. Peculiar features of clusters are as follows: integrated dynamic structures, stable nuclear of distribution of new knowledge, technologies, products, innovation campuses, interdisciplinary character, high degree of information system development, and absence of distinct limits.

Cluster approach is becoming advantageous due to the fact that cluster acts as an integrator of all the participants and is aimed at enhancing the efficiency and competitiveness of the region. The creation of such clusters is caused by the need to unite organizations according to specific criteria for achieving certain goals.

In the Republic of Tatarstan (one of the most industrially developed regions of Russia), dozens of oil and gas processing, petrochemicals and automotive companies are united in the “Kama innovative regional production cluster”. One of the trends of

development of such clusters is retraining, training and internships of employees, including training abroad.

Thus, according to the bylaw of the Cabinet of Ministers of the Republic of Tatarstan dated 03.09.2013 of №624 «On approval of the Program of Support Kama innovative regional industrial cluster for 2013 -2016 years," this cluster will be a mechanism for development of the area, where the education institutions and research centers play important role. As a result of the interaction of educational centers with enterprises, it is possible to form a long-term demand and interest of companies to innovate, and of course, to strengthen them both in the domestic and foreign market. As the main focus of this cluster is the petrochemicals and refining, Kazan National Research Technological University (KNRTU) being one of the leaders in this field, both in the region and in the country as a whole, plays an important role in this process.

KNRTU is a modern powerful educational and scientific complex. Among the universities of Chemical Technology Domain in Russia KNRTU is the leader in training highly qualified personnel. Today the potential of scientific and production activity presented by recognized scientific schools conducting research in priority areas of science and technology develops very fast [1].

Innovation Infrastructure of University includes 32 small innovative enterprises, and 33 scientific, educational centers and the leading scientific and educational institutions of the country. Also it is worth noting that the University has partnership programs with 111 organizations in 33 countries.

KNRTU is a leader of scientific and educational sub-cluster. It integrates primary, secondary, higher, additional and advanced professional education and innovation activity of the Republic of Tatarstan in the sphere of petrochemicals.

Thus, it may be stated that the University has all the real possibilities to develop in indispensable directions, because the priority of KNRTU and the Cluster in general is petrochemicals and refining. Therefore interaction and cooperation will be very useful, especially throughout innovative technologies.

Concept

Today, one of the challenges is the absence of workers with the necessary knowledge and skills, so the most important task of the cluster is to minimize the gap between employers' requirements and educational programs. As Kama cluster is routed to develop innovative technologies, creation of educational programs requires special efforts.

The employees are not ready to certain changes, in particular to the innovation process, so this is a national problem. So the Government of the Russian Federation seeks to increase employee productivity in all spheres, first of all it is about the competence of the staff. Still there is a tradition to get the education that does not meet the qualification requirements. So the direct interaction of enterprises with educational institutions may change this trend.

Retraining and training of employees are necessary as the key elements of effective development not only within one company, but also in the entire industry. This is especially urgent when it comes to innovation processes [6-8].

For effective realization of educational programs the university is used as a base of education, which primarily has substantial experience in training and research in various areas, in particular chemicals, oil refining, petrochemical, nanomaterials, etc.

Training will be conducted upon analog of the three-phase Presidential training programs for engineering staff, which in addition to training employees at the university provides industrial internship in Russia as the second phase and internship abroad as the third phase.

The realization of the proposed program includes the following steps.

1. The study of the innovative development plans of the enterprises included in the cluster. This would help to define the theme, the direction of development of innovative models of professional education not only of separate businesses, but of the cluster as a whole.
2. Next phase of model is choosing an educational, research and engineering center. The selection can be based on the contacts of the enterprise with foreign partners - suppliers or consumers of goods or services. The presence of partnerships with foreign companies and research and educational centers of the university that is implementing additional professional program play very important role.
3. Then the selection of supervisors among the faculty of engineering staff or foreign education, research and engineering centers should be organized. Selected practice leaders, in their turn, make a plan and start the internship preparation, including interactive and multimedia components.
4. During the study of curriculum of training the question about the absence of themes that are necessary for an internship may appear. In this case, the next step of model may be the tasks for individual work of students (IWS), an organization of additional block of lectures on the subject of the internship.

5. The final step in the implementation of the model, of course, is realization of the plan of internship. In this case, a group of students, accompanied by the head of the internship goes to the leading educational, research and engineering center.

The program algorithm is presented in fig. 1

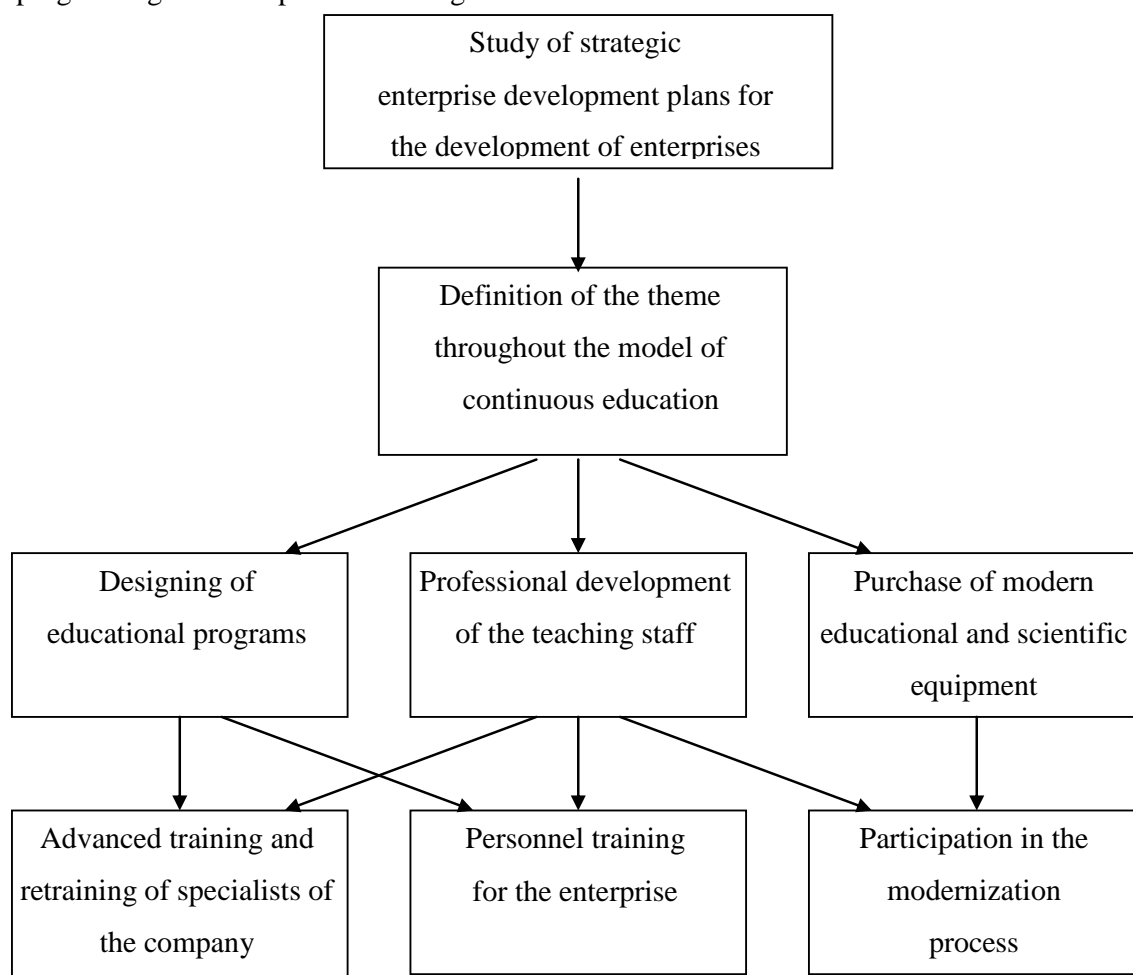


Fig. 1. Three-level training scheme of additional professional education.

It is worth noting that the Kazan National Research Technological University (KNRTU) has sufficient experience in such programs. KNRTU students had internships at large enterprises of Russia, such as All-Russian Research Institute of Aviation Materials (RRIAM), Federal Research and Production Center "Altai" etc. International internships were held at well-known educational research and engineering companies in the USA, Germany and Czech Republic, such as Perdue University (West Lafayette, Indiana, USA), Envidatec GmbH (Hamburg, Germany), International Trade Fair Plastics and Rubber K-2013 (Dusseldorf, Germany), Research Institute of Industrial Chemistry of Explosia as University of Pardubice (Pardubice, Czech Republic). The biggest advantage of the second and third

phases is working out joint strategies by educational institutions in cooperation with the centers of internship.

According to the above-mentioned algorithm 4 additional educational programs for the enterprises and organizations of the Kama innovative regional production cluster were elaborated and implemented in January – June 2014: “Manufacturing practice and processing of polymers and composites”, “Creativity as a basis for innovative development and competitive ability of petro-gas-chemical companies”, “Russian system of technical regulation in the context of developing the Common Economic Space, the Customs Union and the World Trade Organization” and “Innovational and production management of petro-gas-chemical companies in the context of the World Trade Organization and the Customs Union”. At the end of each program their efficiency and effectiveness were assessed.

For example, 25 representatives of 7 Kama innovative regional production cluster enterprises and companies participated in the program “Manufacturing practice and processing of polymers and composites”. The teaching staff consisted of 4 Professors, Doctors of Science, 10 Associate Professors, PhDs, with advanced qualification after upgrading their skills in the leading Russian and overseas universities, research centers and other institutions acknowledged as the world leaders in the corresponding fields. Among the trainees there were manufacturing technicians, shop superintendents and deputy shop superintendents, shift foremen, engineers, production quality inspectors, works foremen, assistants, enterprises and companies staff. Their employers have implemented, are implementing or are going to implement new manufacturing technologies oriented at production, utilization of recycling of polymer or composite materials. Therefore they need proficient handling operation, skilled engineering and operating personnel.

The final interdisciplinary examination gave the following results: 18 trainees got “excellent” grade, 6 students got “good” and 1 person got “satisfactory” mark. Altogether 2 trainees during the whole period of study have been getting only “excellent” for all exams, and 5 trainees got all “excellent” marks and only one “good”.

Upon completion of the professional retraining course efficiency was studied. Experts confirmed that the following competences have been formed:

- To be able to make the assessment of future developments and market launch of new polymers and composites;
- To be able to interrelate the structure and properties of polymers and polymer composites;
- To know approaches to create polymer composites, including tailored nanocomposite materials;

- To be capable of assessing properties and applicable scope of polymers and composites;
- To be able to predict the properties of polymeric materials reasoning from the knowledge of their chemical constitution, microscopic structure and topological characterization;
- To assess production and suggest a reasonable way of polymer wastes disposal and recycling.

Nowadays the following additional training programs are developed and prepared for implementation according to the suggested algorithm: “Applied chemistry of naturally-occurring energy resources and carbon-base materials”, “Contemporary polymeric nanocomposites”, “Technosphere and environmental safety of innovation technologies and processes” and “Management of international trade and maintenance of national market of goods, services and intellectual property objects by the petro-gas-chemical companies of the Kama innovative regional production cluster in the context of the World Trade Organization and the Customs Union”.

Conclusions

Thus, the development of research and innovation infrastructure in the cluster can contribute the improving of the quality and efficiency of research activities, creation of effective development and implementation of the enterprises of the Kama innovation cluster. Cooperation of research and educational centers and enterprises, may minimize the costs of cluster members in the field of research and development, innovation, and enhance the overall level of innovation activity.

Taking in consideration the above-mentioned, it may be stated that such events contribute to the competitiveness of enterprises in the cluster by gaining access to effective innovative technologies for the production of modern materials and products. This will give rise to creation of new unique to Russia industries, products, production. As a result the cluster members will have the opportunity to take a leading position in the Russian and global markets.

Successful elaboration and implementation of the three-level training scheme of additional professional education allowed the cluster employees to acquire and develop competences necessary for innovational growth of the cluster as a whole.

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