UDC 378

Interdisciplinary Project Management in Networking Cooperation: Training Students of Bachelor's Degree Programme (Machinery Engineering)

Urga Technological Institute, National Research Tomsk Polytechnic University
M.A. Loschilova, M.S. Vaichuk

M.A. Loschilova

M.S. Vaichuk

The paper reveals the necessity for new open system of professional education to eliminate the gap between labor market demand and education services. The authors suggest the ways for networking cooperation in training students of bachelor's degree in machinery engineering programme, which is based on the principles of openness and continuation.

Key words: training, network, networking, social partnership.

At present, contemporary state of engineering education is recognized as a crisis as it has a system gap between labour market demands for graduates and incompetence to these demands in the system of education.

Nowadays, the issue of transition to an open professional education, including not only educational institutions, but also other collective bodies interested in improvement of engineering education, is rather topical. Such an educational system implements the idea of social partnership as a special type of communication focused on increasing quality of education as a primary goal under the condition of mutual interest of all participants in this communication [2, p. 80].

It should be noted that bachelors' training in machinery engineering is influenced by a number of external factors: social-economic condition in the country, scientific and technical achievements, continuous professional training system, social partnership and internal ones – values and standards of machinery engineering bachelors' training, professional needs, personal qualities and status [4, p. 95].

Theoretical research of some scholars (S. Ya. Batyshev, A. N. Leibovich,

Ye.I. Ogarev, V.G. Onushkin) allows for conclusion on the fact that there is no single approach to definition of "machinery engineering bachelor's professional training" in pedagogy. This notion is considered as a stage of personal professional development including learning process in an educational institution; as a process of development of students' training for solving future problems; as a result of students' acquiring systematic scientific knowledge, skills, and competencies required for task performance.

Professional training of bachelors in machinery engineering means an integrated dynamic process of developing non-technical, professional, and supra-professional competencies ensuring machinery engineering bachelors' readiness for management, research, project activities under the condition of network cooperation between educational institutions and social partners [5, p. 49].

It should be pointed out that open system of professional education allows implementing dual education integrating theoretical classes and students' practical professional activity in working environment via "university – specialized enterprise" cooperation. The organizational structure of dual education includes a network. [7, p. 7].

According to Article 15 of the Federal Law of 29.12.2012 № 273-FZ "On Education in the Russian Federation" networking of learning process presents "an opportunity of students' completing educational programme using resources of several institutions".

The analysis of theoretical and practical investigations (A.I. Adamsky,

T.A. Zubareva, Ye.Ye. Sartakova, S.V. Tarasov, M.M. Chuchkevich, etc.) permits defining "network cooperation" as an arrangement of joint efforts of network participants to achieve common goals under the condition of collective activity including the relationship of social partners.

Networking defines a new organization form of open professional education and is characterized by flexible structure, functions within information-educational environment, in which different enterprises are incorporated.

The experience in "university – enterprise" network cooperation in Institute of Non-Ferrous Metals and Material Science (Siberian Federal University) and Urga Technological Institute (a branch of National Research Tomsk Polytechnic University) (hereafter UTI TPU) has allowed revealing the peculiarities of this activity [6, p. 544].

The key social partners of UTI TPU are groups of network cooperation participants: employers (industry); state administration bodies (employment service); educational institution including labour organizations, students' union at the co-management level.

Cooperation of UTI TPU with social partners and graduates' consumers requires the university to develop a new approach to request analysis of the region and industries in training machinery engineering bachelors to solve the priority problems of social-economic and engineering development, extension of basic trends in cooperation with strategic partners, implementation of which provides the synergy, replicable models, best practices for their expansion in the professional education system [6, p. 545].

Network cooperation of institutions and enterprises focused on improvement of quality of engineering education differs in the number of specialized enterprises integrated in the network of the universities mentioned above [6, p. 546].

The major strategic partner of UTI TPU is LLC "Urga Mashzavod" which consists of a number of full-cycle plants from open-hearth steelmaking to manufacture of machines.

The academic process in UTI TPU is characterized by a sequence of study and internship terms when the students study full-time and combine it with intra-extramural form at the specialized enterprise [1, p. 55].

Production activity is performed at workplaces, in the departments of specialized enterprise, but the appointment for the workplace is made according to the programme included in "Student's production-training passport" and "Schedule of rotation of workplaces and engineering positions" (Fig. 1).

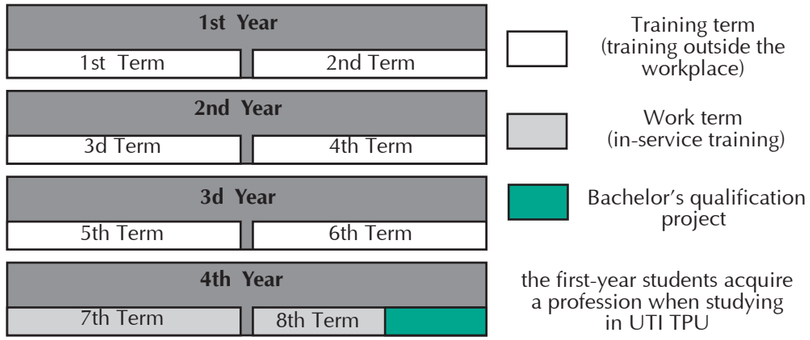
State administration bodies (employment service) participate in students' career guidance in educational institutions; hold practice-oriented courses; arrange special employment fairs of working and university places; contribute to academic process orientation towards graduates' professional career; participate in arrangement of students' short-term internship at regional small innovative companies, young specialists' employment, perform selection of appropriate work position from job vacancies database, assist in self-employment [3, p. 66].

In the course of our research the following *aspects of cooperation among the network participants* have been defined in bachelors' professional training in machinery engineering based on the principles of openness and continuation.

The first aspect – target training of bachelors in machinery engineering in terms of practical activity using integrated educational-industrial and educational-research programmes implemented by university together with leading enterprises-social partners, graduates' employment programmes, benefits for employers in young professionals' employment.

ENGINEERING EDUCATION
20'2016

Fig. 1. Pre-service and in-service training of bachelors in mechanical engineering under the condition of networking



The second aspect of cooperation among the network participants is continuation of additional professional programmes for professional development to train teachers and masters of in-service training in the system of additional professional education [3, p. 67].

The aspects of cooperation mentioned above as well as implementation of complex interdisciplinary projects in development of high-tech production result in necessity of continuous professional engineering education including training courses, internships for students of professional educational institutions, participation in Open-Door Days, employment fairs, agreements in specialists' training, professional development [5, p.112].

An important aspect of network cooperation is mutual involvement of teaching staff and students in performing urgent for the industry research engineering and design developments that enhances the practice-orientedness of learning process.

One of the interdisciplinary projects implemented in engineering majors at UTI TPU is a term project in the discipline "Mechanical Engineering Technology" that is performed by the fourth-year students under the employers' supervision.

The main stages of the project are design of technological process of product machining "Corpus" with the serial number K 500.04.04.031 produced by LLC "Urga Mashzavod", development of technological process of product machining FURA.390089.001 for medium-scale production.

The course "Technologies of mechanical engineering" includes such disciplines as "Bases of mechanical engineering technology", "Machine parts and bases of design", "Construction materials engineering", "Cutting and production tools" etc.

The given project contains specific description of current production, product designation, annual calculation of product programme and specification of production type, analysis of product design. The technological part of the project implies selection of feedstock and method of its production, selection of base, development of process route, selection of equipment as well as jigs, fixtures and tools, calculation of machining allowance, calculation of cutting conditions, process rate making. The design section contains description of design, calculations of parts and tools.

As a result, bachelors in mechanical engineering solve the set problem independently or by joint efforts, apply the necessary knowledge from different fields, obtain an actual and measurable result.

Another interdisciplinary project is a term project in the discipline "Cutting tool" that has prerequisites of the following engineering disciplines: "Cutting machine tools", "Bases of mechanical engineering", "Material science". The term project on the given discipline is to contain the design of special cutting and technique tools.

It should be noted that in the course of fulfillment and implementation of different projects the students acquire professionally important qualities: communicative skills, teamwork skills, critical thinking, capacity for self-development and some other.

Thus, as a result of machinery engineering bachelors' training in interdisciplinary project management under the condition of network cooperation the efficient innovative mechanism of participants' integration in education sphere has been developed which allows them to develop dynamically, providing the consistency of students' competence development with the requirements of knowledge economy.

REFERENCES

1. Bibik V.L., Klimenov V.A., Yefremenkov A.V., Morozova M.V. Novyi podkhod k podgotovke inzhenernykh kadrov na osnove integrirovannoi sistemy obucheniya [New approach to engineering staff training based on integrated education system]. Mashinostroenie i Inzhenernoe Obrazovanie [Mechanical Engineering and Engineering Education]. 2007. № 1. P. 53–62.
2. Glushanok T.M. Sotsial'noe partnerstvo kak sredstvo povysheniya kachestva professional'nogo obrazovaniya [Social partnership as a means of improvement of higher education quality]. Sovremennye problemy nauki i obrazovaniya [Modern problems of science and education]. 2008. № 6. P. 80–83.
3. Loschilova M.A. Vozmozhnosti setevogo vzaimodeistviya obrazovatel'nykh organizatsii i sotsial'nykh partnerov v obespechenii zanyatosti molodezhi [Opportunities of networking of educational institutions and social partners in the youth employment]. Professional'noe obrazovanie i zanyatost' molodezhi: XX vek. Preemstvennost' v deyatel'nosti professional'nykh obrazovatel'nykh organizatsii regiona v usloviyakh modernizatsii [Professional Education and Youth Employment: the XXI century. Continuity in Functioning of the Regional Professional Educational Institutions in the Conditions of Modernization]. Kemerovo: Kuzbass Regional Institute of Professional Education Development, 2015. P. 65–68.
4. Loschilova M.A. Professional'naya podgotovka budushchikh inzhenerov na osnove setevogo vzaimodeistviya obrazovatel'nykh organizatsii i sotsial'nykh partnerov [Professional training of future engineers based on network communication of educational institutions and social partners. Cand. Sci. (Pedagogy) diss]. Kemerovo, 2015. 269 p.
5. Loschilova M.A., Portnyagina E. V. Regional'nye aspekty optimizatsii upravleniya obrazovatel'nymi uchrezhdeniyami [Regional aspects of optimization in educational institution management]. V mire nauchnykh otkrytii [In the World of Scientific Discoveries]. 2012. № 5. P. 100–113.
6. Osipova S.I., Rudnitsky E.A., Loschilova M.A. Produktivnoe setevoe vzaimodeistvie v kontekste povysheniya kachestva inzhenernogo obrazovaniya [Efficient networking in the context of improving engineering education quality]. Sovremennye naukoemkie tekhnologii [Modern High Technologies]. 2016. № 2-3. P. 543–547.
7. Pokholkov Yu.P., Agranovich B.L. Podkhody k formirovaniyu natsional'noi doktriny inzhenernogo obrazovaniya Rossii v usloviyakh novoi industrializatsii: problemy, tseli, vyzovy [Approaches to development of national doctrine of engineering education in Russia under the condition of new industrialization: problems, goals, challenges]. Inzhenernoe obrazovanie [Engineering Education]. 2012. Issue 9. P. 5–11.