Multilevel Innovative Scientific and Educational Complex: Integration of Science, Education and Business

Penza State Technological Academy
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The authors examine the performance of multilevel innovative scientific and educational center as a good example of professional education modernization that is based on effective interaction between educational establishments, scientific and business organizations.

Key words: *multi-level educational complex, integration of education, improvement of vocational education system.*

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The strategic objective of Russia within the Concept of Long-Term Socio-Economic Development of the Russian Federation for the period up to the year 2020 is defined as follows: «to achieve economic and social sustainable development ensuring the status of Russia as a leading country in the world in XXI century, which is competitive on the global economic level, defends national interests and safeguards the exercise of constitutional rights» [1]. More precisely, the given strategy employs professional education as a key point where, however, it is necessary to solve a number of problems:

- to provide innovations in undergraduate higher education;
- to modernize educational institutions as a tool for social development;
- to develop up-to-date continuing education system including professional learning and advanced training;
- to assess quality and demand for the education in compliance with customer's requirements.

The solution of the above-mentioned problems will provide a key resource for innovative economy – human capital characterized by a unique combination of creative thinking skills and highly professional and social competencies. To achieve this goal, it is necessary to reform professional education through the integration of science, education and business.

Such integration must be beneficial to all concerned. It ensures that, for example, workers, technicians and engineers are trained in the same methodology and learning environment; enables an employer to develop quality standards for professional education; contributes to the development of research resources and knowledge base which can be applied in scientific work and experiments to increase the competitive ability of enterprises.

Besides, the cooperation with educational complex will enable enterprises to increase their operational, economic, social and research efficiency. Specifically, operational efficiency can be achieved through a target training of specialists for definite working positions ranging from a factory worker to a top manager in different professional spheres. Social outcomes can be achieved through the increase of specialist training programs to meet the high-demand of economy for essential education services. The economic impact will result from the reduction of HR costs of regional enterprises. Cooperation in scientific research will allow implementing various industrial projects, including development and promotion of new technologies, competitive science-based manufacturing, implementation of information systems in goods design and business management.

It must be noted that the necessity of integration is caused by a number of external factors [2]. First of all, keeping track of in-demand specialists at different levels is impossible without the assistance of potential employers. Secondly, technology research facilities of educational establishments must be enhanced to meet the level of present-day enterprises' equipment and machinery. Thirdly, the training of modern specialist requires a continuous adjustment and improvement of educational programs, as well as broadening the spectrum of educational activities.

Having considered all the above-mentioned factors, a multilevel educational institution combining international experience and the best national traditions in training engineers was established in Penza region.

Penza State Technological Academy (PSTA) was established as the result of merging Technological Institute, Chemical Engineering College, Industrial Technology College and Vocational school. It provides training of highly qualified, competitive and career-focused specialists who are capable of performing their work effectively and adjusting to rapidly changing professional and social environment.

Despite the change of status, PSTA, however, has preserved partnership relationship with the enterprises which have a long history of cooperation with all institutions of educational complex. Due to perfect work coordination between different educational establishments and personnel departments of these partner enterprises, it is possible to provide target training of specialists. A complex offers a broad range of educational programs designed in accordance with the local development strategy and demand for specialists in various spheres.

Above all, PSTA has launched a multi-level education enabling it to provide continuous professional training of in-demand specialists in such spheres as mechanical and instrument-making engineering, information technologies, food industry, and chemical engineering (Table 1).

The educational programs of Research and Production Association, Vocational Education Institutions and Higher Professional Establishments do not duplicate, but complement each other. Thus, the continuity of education is achieved, which in its turn contributes, on the one hand, to the reduction of specialist training period and, on the other hand, to the enhancement of young specialist qualification. The peculiarity of education the Academy provides is that PSTA has preserved the best national traditions in engineering training: combination of professional education and work practice allows PSTA to train specialists who have profound theoretical knowledge and extensive work experience. Starting with the fourth year of education (full-time tuition) and the second year of education (part-time tuition), students work in the enterprises in accordance with their specialty. It allows them to solidify their theoretical knowledge and gain required work experience [3].

Such educational pattern forms the basis for the innovative project named «Specialist-Enterprise» which makes possible to provide both succes-

Table 1. PSTA Education Levels for Mechanical and Instrument-Making Engineering, Information Technologies, Food Industry, and Chemical Engineering

Levels	Higher Professional Education	Intermediate Vocational Education	Elementary Vocational Education
150000 Metallurgy, Mechanical and Instrument-Making Engineering	151900 Design-Engineering Support of Mechanical Manufactures 151000 Production Machines and Equipment	151901 Machine-Building Technology	151902.03 Machine Operator (metalworking production) 151022.01 Commercial Refrigerating Machinery Electrician
230000 Information Science and Computing Engineering	230100 Information Science and Computing Engineering 230400 Information Systems and Technologies 230700 Applied Information Science 230111 Computer Network	230113 Computer Systems and Complexes	230103.01 Computer Operator
240000 Chemical Engineering and Biotechnology	240700 Biotechnology	240134 Oil and Gas Processing 240705 Biochemical Manufacture	240100.02 Ecologist-technician 240101.02 Pump and Compressor Operator 240705.01 Equipment Operator in Biotechnology
260000 Food and Consumer Product Technology	260800 Product Technology and Catering Arrangement 260100 Vegetable-Based Foods	260103 Baking and Alimentary Product Technology 260107 Zymurgy and wine industry 260201 Dairy Engineering 260202 Meat Product Technology	260103.01 Baker 260103.02 Bulk Storage Unit Operator 260103.03 Automatic Line Operator (macaroni production) 260103.04 Baker-master 260107.01 Brewer 260201.01 Dairy product Operator

sive and parallel professional training of specialists due to the integration of institutions of elementary and intermediate vocational education, as well as the establishments of higher professional education and post-graduate study. It also allows educational establishments to offer Bachelor's and Master's Degree Programs, as well as programs of further professional education.

Besides, as learning activities applied in educational process are based on the definite technological issues, a student of PSTA has a possibility to get familiar with manufacturing process during the study period. An employer in its turn can hire the applicants with the higher qualification and better professional skills. Such cooperation contributes significantly to the quality enhancement of specialist training due to the thorough consideration of enterprise technological process, i.e. applied technologies, various research and manufacturing problems.

Another important point is that it is essential to organize career orientation activities for secondary school students. The «SCHOOL-UNIVERSITY-ENTERPRISE» project of PSTA involves the organization of profession-oriented classes in state secondary schools in accordance with the in-demand professions and it aims at arousing pupils' interest in engineering and technological sciences. The project is also realized with the assistance of partner enterprises which provide schools with all the facilities necessary in preliminary career oriented training and elementary vocational education. At the present time, PSTA is successfully involved in joint programs with Penza Education Authority and such leading enterprises as OJSC «Biosintez», JSC «Tyazhpromarmtura», OJSC «Elektropribor», «Dizelmash» and etc.

To provide programs of further professional education, Advanced Training and Professional Development Faculty, Center for Pre-University Education and Center for Extended Learning «Tekhnika» have been established in PSTA.

Thus, PSTA is a unique multilevel educational platform offering affordable, flexible, continuing, and quality academic opportunities (Fig. 1).

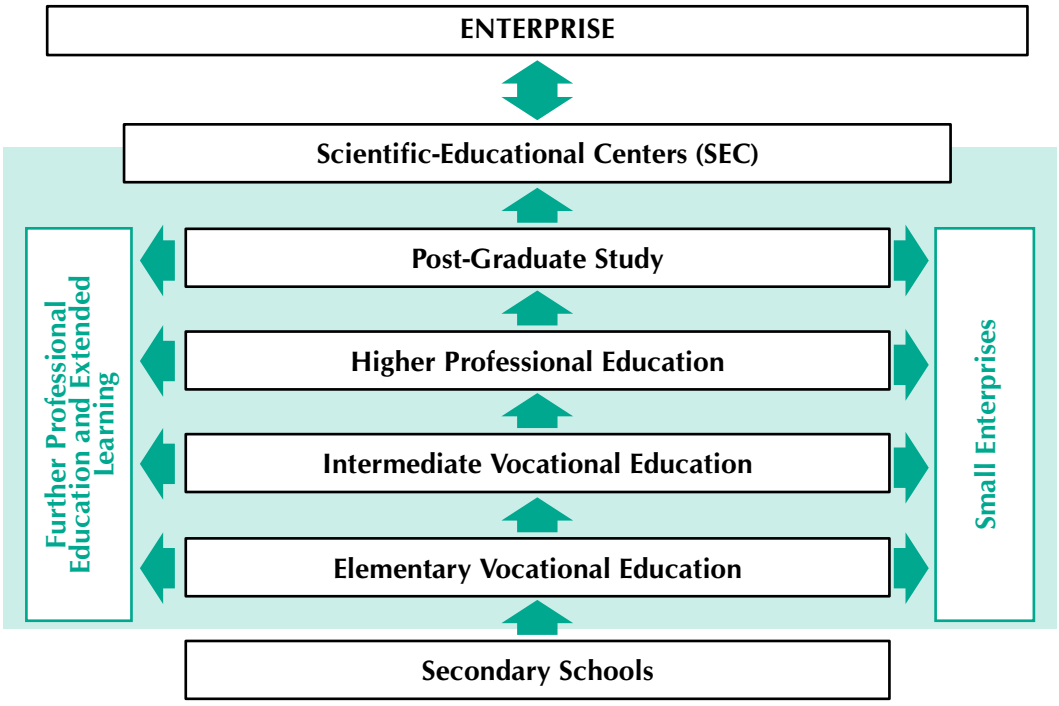
It has been proven that this three-way partnership is an effective strategy for training scientific, technological and managerial community [5]. Special educational agreement between higher educational establishment and enterprise allows students to get easily started without any adaptation period. In this case, their professional skills and knowledge are evaluated by chief engineers and supervisors of the company concerned. It is no coincidence that PSTA is a winner of All-Russian Competition «Quality Assurance Systems for Specialist Training», while its students annually become prize winners of the competition «National Asset of Russia».

Such results have been achieved because of PSTA educational system itself which combines learning process, internship with working activity. As PSTA professors who are at the same time managers of research contracts are familiar with the technological peculiarities of partner-enterprises, it makes possible to train specialists for the real economy. Thus, it can be stated that in a case of educational complex, scientific work is no less important than the learning process itself. The main objectives of the Academy are to ensure qualitative improvements and advancement in research and learning activities, to develop scientific database, to provide the Academy units with all the facilities required for scientific work, and to establish the platform for innovation and research.

Therefore, new forms of scientific management were developed. In accordance with Federal Law №217-FZ of the Russian Federation dated August 2, 2009, five new business companies and fourteen scientific-educational centers have been established for implementation of intellectual activity results.

The enterprise technological problems database which could stir knowledge-intensive manufacturing in Penza region has been developed within the framework of 10-year cooperation between the Academy and Manufacturer Business Association. Based on the

Fig.1. Multilevel Scientific and Educational Complex



data of the Assistance and Innovation Advancement Center, PSTA coordinates innovative activity in the spheres of information technologies, computer-aided design, image identification, and etc.

It is vital to note that PSTA activity is aimed at meeting the needs of such parties concerned as the Ministry of Education and Science of the Russian Federation and citizens of Penza including local authorities, Rector's Council, employment service, mass media, as well as school-leavers and their parents, directors of enterprises and authorities of secondary educational and intermediate vocational educational establishments. Quality Management System of the Academy has been developed with due regard for the results of science, education and labor market research [4]. The study of consumer's needs and satisfaction, as well as monitoring graduate employment rate, is performed by PSTA Job Placement and Target Learning Center in accordance with the following Academy standards: «Interaction with Employers. Analysis and Monitoring of Employer's Needs», «Employer Satisfaction Analysis» and etc. The Academy places a lot of emphasis on helping its graduates to find job within the framework of cooperation with enterprises and companies. According to the data concerning top ranked university centers, which were provided by the Coordination and Analysis Center of Employment Assistance for the Graduates of Professional Educational Establishments (Moscow, 2010), PSTA is ranked 8th among higher professional establishments of Russia.

The experience of Penza State Technological Academy has proven that the integration of enterprise, business and modern education establishments can contribute significantly to the assurance of quality education of specialists and assist graduates in job finding and starting their professional career. Therein lies the reason for the intensive development of the Academy which goal is to train highly-competitive specialists who will be in demand in leading service and science-based companies.

Thus, the multilevel system of professional education which has been developed in Penza State Technological Academy on the basis of science, education and business integration contributes to the successful solution of urgent problems of all the participants of continuing educational process.

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