UDC 378

Possible Alternative of Interdisciplinary Learning in Russian Engineering Training System

Municipal state funded institution of additional education "Parus", Ufa city
I.N. Konyukhov

I.N. Konyukhov

At present the Russian system of supplementary education for schoolchildren does not imply interdisciplinary learning. One of the alternatives of such learning is to develop supplementary education programs for school age children that would involve diverse scientific and activity areas. Another challenge is to train instructors who would be able to implement such programs.

Key words: system of engineering staff training, additional education for schoolchildren.

While participating in the meeting of the President's Council in science and education on the 23rd June, 2014, the President of the RF, Mr. Vladimir Putin, paid special attention to the necessity for the professional education system to meet modern-day challenges, social and economic demands, and to facilitate the increase in competitiveness, technological upgrade, and labor productivity. Mr. Putin also noted that according to the survey conducted in 2013 among employers, the quality of graduates' training was graded 3.7 score on a five-point scale, and approximately 40% of employees, recent graduates, need additional professional training. In this regard, it is necessary to identify what jobs and specialties will be demanded by the regional production industries in 5-10, or even 20 years. It is a difficult challenge with the modern technologies progressing so rapidly. However, we should make an accurate prediction, paying special attention to the areas and activities that will determine or already determine the new technological stage [1].

To identify the tasks faced by the Russian education system, the Agency for Strategic Initiatives and Moscow School of Management SKOLKOVO conducted a survey to determine reality and prospects of staff training system for high-tech industries, which resulted in the Atlas of new jobs [2]. It includes 11 "trans-professional" skills, defined by employers as the most important ones for employees of the future. Two of them are as follows:

1. Interdisciplinary communication skills (to be aware of technology, processes and market in related and non-related industries).
2. Systems thinking (to identify and work with complex systems including systems engineering).

Taking into account all mentioned above, one of the tasks for the education system is to organize effective training within the framework of supplementary education of schoolchildren aimed at fostering multifaceted and comprehensive education that would ensure development of the "trans-professional" skills. However, the traditional way of individual training paths, which is used nowadays, have several disadvantages in terms of resolving the task:

1. There can be a problem of academic overload, since there is an increase in academic hours due to supplementary courses a pupil (student) should attend in addition to the basic secondary education.
2. A complex approach to creative problem-solving can hardly be achieved through traditional training carried out by instructors who make a specialty in a very specific area and, thus, viewing a problem in terms of this area.

ENGINEERING EDUCATION
20'2016

Moreover, there is no training system for instructors of supplementary education in Russia to supply schoolchildren with multifaceted learning process.

To avoid the disadvantages mentioned above, it is necessary to use a scientifically-based background that is resulted from the research conducted under the supervision of Alexey Yu. Savin, an academician of European Academy of Natural Sciences (EANS), the head of the EANS department studying intellectual human resources, Doctor of technical science, and Doctor of philosophy. The research involves developing and testing programs aimed at fostering intellectual human resources [3].

One of such programs developed by Alexey Yu. Savin is called "Genius Russia" [4]. It is focused on multifaceted and comprehensive training to develop the abilities and skills that are required from engineers in high-tech industries.

The modern-day Russian education system does not imply a systemic training of teachers and instructors to ensure multifaceted education in multiple areas. It refers both to secondary and professional education systems of different levels. The whole education system is subject-based and specialty-based.

Thus, there is an urgent need for reconstruction of the Russian education system to meet the needs of the age, which can be achieved by introducing a training course of a new specialty: an instructor of multifaceted education programs. Such professionals should be trained for all education levels: from the secondary school to higher education institutions, PhD's and Doctor's degree programs.

To put into practice the program "Genius Russia", Konyukhov I.N. developed and implements a program of supplementary education "Samozvety Rossii" (Russian hard stones) in the framework of EANS research [5]. The program is carried out in a municipal state funded institution of additional education "Parus", Ufa city. It aims at training schoolchildren aged 7-15 (three age groups) and developing their skills that may be required for further professional activity in high-tech and engineering industries. This program of supplementary education involves three-year training, and is approved by the Institute of Education Development in the republic of Bashkortostan. The program introduces the following modular-based activities: overcoming obstacles on a hiking route, decorative and applied arts, technical creativity, literary creative work, journalism, theater, (public performance, and project defenses), use of computer programs (drawing programs, presentations, video editors, etc.), taking photo and video, mnemonics, activities to harmonize mental processes. All these activities are aimed at forwarding 9 out of 11 trans-professional prospective skills noted in the Atlas of new jobs.

The practical implementation of the program can be as follows: children attend supplementary classes of one instructor who would offer them diverse activities integrated in one course. For example, hiking and regional study can be combined with drawing, literature, theatre, technical creativity, computer science and chess. The idea might look absurd. However, if we take a closer look, it is quite reasonable.

Thus, the idea of environmental protection becomes obvious every time we go out of town, on a hiking tour near city. The problem of rubbish dumps in forests and river banks cannot be solved only by writing slogans like "No litter". It can hardly teach children environmental awareness. A more efficient alternative is to show and teach them some ways of recycling. For example, plastic bottles can be used for different purposes. When making a plastic flower, a child will not only follow environmental behavior pattern, but also understand how to apply used things and materials in a different, non-standard way. Besides, it will also develop competencies in decorative and applied arts, and give practical life skills. Thus, there is a consistent link between several types of activities: hiking, environmental behavior, and decorative and applied arts.

While hiking or travelling out of city,

children can observe a lot of unique natural phenomena, wonderful landscapes and views, which makes it quite reasonable to take a camera and take pictures and videos. On coming back, children make posters, edit the pictures and videos, and present them on some events or festivals accompanying them with a report or story. These activities need integrating a variety of skills both technical and creative. They foster development of literary, journalistic, presentation and computer skills that will be necessary for their future. This approach can also be applied in the activities related to theatre art. Children should be involved in every stage of the performance design and implementation: from a scenario and costume design to final performance.

The program was tested during 2 years both in the city and in villages. The positive effect is proved by high performance of the children in various competitions of different levels (city, nationwide, and international).

Currently, such educational process is planned to be studied in the framework of an education system testing site founded by the Minor Academy of Science " Mental power of the future" and Education Academy of Russia. The research will start in 2016-2017 academic year in municipal state funded institution of additional education "Parus", Ufa city, with Savin A.Yu. consulting the study.

REFERENCES

1. Vladimir Putin, Kachestvo inzhenernyh kadrov stanovitsja odnim iz kljuchevyh faktorov konkurentosposobnosti gosudarstva [Jelektronnyj resurs] [The quality of engineering staff becomes a key factor of the state's competitiveness] [Electronic resource], Russkaja narodnaja linija: inform.-analit. sluzhba : sajt. [Russian national line: inform-analyt. Service, site], St.Petersbourg, 2010–2016], URL: http://ruskline.ru/news_rl/2014/06/23/kachestvo_inzhenernyh_kadrov_stanovitsya_odnim_iz_klyuchevyh_faktorov_konkurentosposobnosti_gosudarstva, free, Title from the screen (Accessed: 11.05.2016). (in Russ.)
2. Atlas novyh professij [Jelektronnyj resurs] [Atlas of new jobs, Electronic resource], Moscow, 2014–2016, URL: http://atlas100.ru/about, free, Title from the screen (Accessed: 11.05.2016). (In Russ.)
3. Proekty Akademii [Jelektronnyj resurs] [Academy's Projects, Electronic resource], European Academy of Natural Sciences, Hannover, 2009–2016, URL: http://www.eanw.org/index.php?option=com_content&view=article&id=389&Itemid=157, free, Title from the screen (Accessed: 11.05.2016).
4. Genial'naja Rossija [Jelektronnyj resurs] [Genious Russia, Electronic resource], Intellektual'nyj klub «Komanda 10003» [Intellectual club "Team 10003", site, Moscow, 2011–2016], URL: http://www.10003.ru/#!/z8bid, free, Title from the screen (Accessed: 11.05.2016). (In Russ.)
5. Samocvety Rossii [Jelektronnyj resurs]: dopolnit. obshheobrazovat. programma / razarab. Konjuhov Igor' Nikolaevich [Hard stones of Russia, Electronic resource, supplementary education program developed by Koniuhov I.N., Pedagogical site, Moscow, 2013–2016]. – Published 07.04.2015. – URL: http://pedsite.ru/publications/86/6729, free, Title from the screen (Accessed: 11.05.2016). (In Russ.)

UDC 378.141.4, 378.14.015.62

The Engagement of Educational Process Into the Practical Activities as a Main Route for Development of Modern Engineering Education

Omsk State Technical University
V.V. Shalay, A.V. Kosykh, A.V. Myshlyavtsev, L.O. Shtripling

The best practices and perspectives of practice-oriented education development are disclosed in the article.

Key words: educational standards, practice-oriented education, new model for organization of educational process.

The cornerstone in the assessment of learning outcomes, including their assessment in higher engineering education, is the issue of the quality of education.

Older generations, who received education in Soviet times, are overall satisfied with its quality and typically showcase it as a good example when speaking with the new generation. It most likely has some reasonable basis behind it. The system of higher education that existed at those times did not have such words as "competence-based approach", the descriptors "to know", "to be able to", "to possess", however the level of education of the majority of graduates was sufficient for the purpose of performing the required functions after a certain adaptation period. Moreover, their level of preparedness allowed them to step up the career ladder or change the sphere of activities more or less seamlessly.

How was it assured? There was an adequate approach to the development of typical curriculum, which joined the humanitarial (soft skills) component, the excessive fundamental basis and, in most cases, the insufficient professional training. The latter one could be considered insufficient due to the fact that, for instance, a mechanical engineering graduate usually was supposed to get the practical knowledge of all: the mechanical engineer, the technologist, the design engineer and the production manager. This insufficient professional training was smoothed by the 3-year "young engineer" status, which gave graduates an opportunity of receiving practical skills at their workplace; and the excess of fundamental education gave them solid basis for future professional growth.

Back then, there were no standards, but a set of disciplines, their content and volume for each major was formed by leading universities that had close ties with field-specific enterprises through developing typical curriculums. This system assured the required level of education for all specialists in the country. The government used to prepare specialists for its own industrial enterprises. The quality criterion was the assessment of graduate's capabilities at his/her workplace.

The drawbacks of such system could be underlined as follows: students did not always understand why they learned one or another course; typically, professors praised their own courses thinking that they are the core basis of specialists' education. However it all fell into right place – the knowledge received by learning the identified set of disciplines assured the evolvement of a graduate (specialist) and lied in the root of his/her further professional development.

Later on, the standards have been introduced and constantly changed: RF 1994, State Educational Standard (SES)-1, SES-2, Federal State Educational Standard (FSES) of Higher Professional Education, FSES of Higher Education. The appearance of the FSES-4 has been declared.

V.V. Shalay

A.V. Kosykh

A.V. Myshlyavtsev

L.O. Shtripling