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Vocational Education in Russia: Topicality, Challenges and Trends

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The paper considers challenges and trends in the development of secondary vocational education, which is regarded as an educational resource meeting the demand for skilled trades in the territory of the Russian Federation. The authors have investigated the reasons for the national secondary vocational education being uncompetitive on the global educational service market.

Key words: vocational education; networking; competencies; competitiveness of secondary vocational education; internship marketplaces; certification centers.

When analyzing the contemporary vocational education in the Russian Federation, one may speak of steady demand for this type of education in the society. According to the statistics for 2013–2014, the number of students involved in mid-level professional training increased in Tomsk Oblast from 15705 to16582, with rise in the number of fee-paying students – from 3954 to 4126 [1]. Similar situation is observed in other Russian regions.

The trend of stabilizing and even the increase in demand for vocational education is accompanied by the lack of blue-collar workers on the labour market. Therefore, the RF Ministry of Labour developed and is intensively promoting "The list of 50 most in-demand new and perspective jobs requiring secondary vocational education" [2].

However, one may say that being in demand in the domestic market of educational services, the Russian vocational education is low competitive on the international market. In other words, the graduates' professional level is low, which is proved by the results of 43 international competitions on professional skills Worldskills Competition-2015, where the Russian team took the 14th place in team rating, though its position improved as compared to the previous result at the competition of Worldskills – 2013 in Leipzig, where the Russian team took the 27th place [3].

This raises the predictable question – what current problems are there in the secondary vocational education and what prevents students from developing competencies relevant to the international demands?

According to the expert estimate (representatives of secondary vocational education institutions), in the course of project research "Potential of the Russian vocational education to increase the competitiveness of Russia on the world education market" performed by the research team of Tomsk Polytechnic University supported by the Russian Humanitarian Research Fund, the major problems are caused by low effectiveness of vocational guidance. The entire system of vocational guidance is to develop students' ability to choose a profession that best suits personal qualities and labour market demands. But the survey analysis of 800 respondents in one of Tomsk colleges has shown that 68% of students made their professional choice unconsciously, and only 32% chose the profession they would like to do. Hence, based on the statistical data of vocational education institutions and reports of academic departments, 50% of students

writing the resignation letters indicate the reason "Wrong professional choice".

The second significant factor is that secondary professional diploma does not guarantee further employment in the profession. Based on the analysis of collage graduates' employment in Tomsk Oblast, only 60% of graduates practice their profession. The employment problems of secondary vocational graduates are explained by many factors – both prestige of the profession and salary level. But there is one important parameter, i.e. the third factor specified by all experts – it is a level of competencies, which, in most cases, is unsatisfactory for the potential employers. Therefore, upgrade of discipline educational-methodic complex with focus on development of professional competencies has become rather urgent. The current educational standards allow doing it, as they permit 30% of variable part that can be changed in content.

But in spite of methodical potential, the current physical facilities of secondary vocational education institutions do not provide proper upgrade of professional competencies. There is out-of-date equipment in most of institutions that does not permit effective laboratory or practical classes. To some extent, the situation is improved by virtual platforms, but students do not acquire practical skills.

Moreover, professional competencies are virtually impossible to be developed not only on the basis of colleges, but also in the course of educational and work experience internships that students have at the companies. The logistical facilities of the companies are of different quality, but in most cases they are low (at the moment companies can afford to update machine-tools by 5-10% at best), which does not provide students with universal professional skills. In experts' opinion, it is the cause of failure in development of student professional competencies, since it is not possible to visit the company in large groups.

When arranging internships, teachers have to split student groups and assign them to small companies. In this case, every manager takes into consideration the company's technical capacity and focuses on those competencies that are necessary for him/her. It causes the problems in qualification exam in terms of students' different work experience internships, as it is impossible to unify the criteria for competency assessment.

In fact, the given problem can be solved by, firstly, unification of requirements for graduates' professional competencies of vocational education schools focused on international standards and those of FSES; secondly, arrangement of internship sites and centers equipped with modern facilities to develop specific professional competencies. What is more, students are to be assigned to such sites in full groups, not at random, for every student to work with the equipment as it will contribute, among others, to more effective mastering of theory. Such internship sites and certification centers might also be an intermediate in network cooperation between vocational education institutions and companies.

Polyfunctional Center of Applied Qualifications (PCAQ) for Oil and Gas Industry based on Tomsk Industrial-Humanitarian College may serve as an example of successful network cooperation [4]. Training in PCAQ is performed using the curricula developed and approved by JSC "Transneft". Today everyone who has taken training course in the Center knows that they have official certificate equal to multidisciplinary standards.

Summing up, one can conclude that topical trends in improving secondary vocational education are more effective career guidance for prospective students, guaranteed employment, international level of developed professional competencies or, at least, universal competencies meeting employers' requirements. The latter issue can be solved by means of arranging internship sites for students of secondary vocational

institutions and establishing certification centers. High-level professional competence-based training with the focus on international standards will make the Russian professional education more competitive on the international market of educational services.

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Modern Engineering Education in Conditions of "Information Explosion"

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Qualitative technological base is being upgraded and innovative technologies are being implemented in many countries of the world. The analysis of basic trends in education sphere proves that the strategy of e-learning is conditioned by the necessity of improving engineering education, educational process and inevitable globalization of education due to technological and communicational changes.

Key words: engineering education, pedagogics, training methods, "information explosion", generation Z, e-learning.

1. INTRODUCTION

One of the major challenges of modern life is to increase the quality of engineering education, mathematics, in particular, which tends to worsen in conditions of "information explosion". One of the solutions is to make easier the understanding of fundamentals of advanced mathematics, develop training methods, and use technologies of e-learning (TEL). The latter allows speeding up learning process by 10-15%, saving training time by 35-45%, increasing efficiency of academic activity of faculty staff by 30%, adjusting forms of educational materials to psychological features of Z generation, which would improve the quality of training.

2. NECESSITY TO IMPROVE ENGINEERING EDUCATION

In our digital epoch, mathematics has become a methodological base for almost all branches of science. Even biology and sociology are actively using mathematical methods. Thus, mathematics is necessary not only for physicists and engineers, as it used to be 40 years ago, but for all scientists and specialists. The "tip of the mathematical iceberg" is traditionally divided into three parts. The first part presents the essence of mathematics inherited from the ages from Antiquity to Medieval times. This part is studied at secondary school. The second part is advanced mathematics created during the last 400 years. It is studied at bachelor's, specialist's and master's degree engineering courses. The third part is divided into special disciplines the fundamentals of which are trained at departments of mathematics. These disciplines constitute a root system of a contemporary fast growing mathematical tree. There are no distinct boarders between the parts of the iceberg. In addition, the "University mathematics" course involves the basic ideas and facts of the elementary mathematics in more complicated forms. The "submerged part of the mathematical iceberg" involves separate facts, methods, and even theories that are already unnecessary, for whatever reason, or cannot be yet applied waiting for being developed in future. "Pure" and "applied" mathematics are even more relative classification [1]. In addition to inner demands and logics of mathematics development, there are external factors to increase mathematical knowledge and develop mathematical research; they are needs of natural science and technologies, and technical capacity to perform practical tasks. It is essential to increase the quality of education. The Russian education system

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