Contemporary Day Discussions on the Concept of Elite Engineering Education

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Article is devoted to modernization of domestic system of engineering education. According to the innovative development in higher technical education there exist contradictory problems which have been studied. The role of technical universities in preparation of professional elite – scientifically-engineering and state-administrative is considered. Analysis of transformation processes in a domestic education system is presented. Considerable attention is paid to the methods of shaping a modern engineering outlook.

Key words: engineer, modernisation, higher education, the industry, innovations, professional elite, methodology, formation, the concept, reform.

Introduction

In modern society the educational market is quite diversified, and Russia has to step in more actively, become more competitive and constantly work on raising its competitiveness that can be, first of all, supported by the modern education. Modern fundamental education is one of the powerful instruments for quality advancement of state management. It should be noted that elite education is always the innovative education. For the development of Russia, for its shout forward, the core strategic objective is to take a shift towards modernisation of domestic system of engineering education.

In a society that relies on a solid science base, higher education attains a top-priority role in development of countries and the global society overall. As a result, the key roles in such societies are played by people, those who obtain this knowledge, are capable of applying it on practice, and create new knowledge; people, who build up the society’s intellectual elite [1, c. 47-51]. Among these society’s educational institutions a distinctive place is assigned to the elite education, the main goal of which is the development of deep up-to-date knowledge.

Thus, for instance, Russia has always been known for its engineers; this profession has been a respectable one both in the pre-revolutionary Russia and in the Soviet times. Within the past few years there have been a number of actions implemented in order to support national engineering schools [2, c. 102-104]. National research universities that focus on training nuclear specialists have been created. Starting from 2006 over 54 billion rubles have been invested targetedly in the development of facilities and resources of engineering departments. The quality of specialists training has been successfully advanced, including training in such critically important specialties as aviation, atomic, automobile industries, metallurgy, power engineering [3, c. 88-91]. It is gratifying that social prestige of the profession is also rising; a career of an engineer is becoming more attractive from the point of its status and material wealth. Large industrial projects that are genuinely interesting for engineers to work in are launched in the country. And it is natural that more and more school students are keen on mathematics, physics, and chemistry. Leading universities report that a specific tendency for these professions’ prestige rising is getting stronger and the number of enrollees is growing. Nowadays, natural sciences are in favor and the selection competition for hard sciences is rising [4, c. 12-14].

Besides, there is a fair-minded demand for changes in the system of engineers’ training. It is not only the technological, but rather the overall lifestyle that is changing in the modern conditions; perception of engineering is altering, and the requirements for this profession are growing. Modern engineer is a high level professional worker, who does not only operate complex machinery or design up-to-date equipment and machines, but, as a matter of fact, forms the social realm [5, c. 106-108].

Fundamental basis for elite engineering HEIs

With an aim to train an intelligent and sophisticated engineer it is necessary to construct the curriculum in a way to have no less than 30% of the total number of hours for the fundamental sciences. Unfortunately, we have a completely opposite tendency. It originates from the fact that number of natural science subjects is, unfortunately, decreasing rapidly both in schools and in universities [6, c.10-12]. Thus, for instance, physics is not a mandatory subject for the Unified State Exam, and even mathematics may be excluded. Our goal is to enlarge the fundamental component of education. And we have good opportunities for this, including engagement of the great culture, that made invaluable contribution to the development of modern civilization.

Unfortunately, the world-wide tendency for fast growth of HEIs’ number and quality of higher education is contrary to the Russian policy for education that has resulted in rough reduction of budget allocations in the 90s. Consequently, a vast number of countries have drawn ahead of Russia in this sphere. Back in 60-70s Russia had a
leading position in number of students to overall population ratio. Today Russia has been outrivaled in this indicator not only by USA, Japan and many European countries, but also by such East Asian countries as South Korea and Taiwan. Reference to the economic difficulties (especially in the context of high prices for energy resources) cannot justify such a shortfall policy for education that lowers the chances of Russia for its economic upturn, for the recovery in the post-crisis period of the XXI century [9, p.12-34].

As of the moment, undoubtedly, it is not enough to have engineers, who obtain good professional skills in a specific field. It is essential here to actively attract enterprises, to understand methods of project management, to know principles of lean production, to comprehend cost management on all stages of the product’s lifecycle.

It should be noted that the balance between practical and theoretical knowledge should be 70 to 30 percent. So far worldwide there has been found a better way to solidify theoretical knowledge than the individual practical activities (for instance, course thesis and course design work) and the internships with mandatory participation of the work. All these activities contribute to the development of students’ personality, to the connection of theoretical knowledge with practical activity, to the development of the system of recruiting, that draws it closer to the modern society. These changes can be addressed as a part of the global transition towards the growing role of an individual as a part of social process that reflects the humanization and democratization of the global socio-political development.

However, the existing underrun of the Russian educational system, including the elite education, is intensifying. As has been stated above, the majority of experts (in the field of economics, sociology) does not agree about the possible changes, which should be made in the Russian system of education justifiable believe that for the sake of accelerated development of the country the most efficient actions are the investment in the “human capital assets”, in the fields of education and science (some economists believe that each dollar put into the development of science and education in short term period will turn out to bring in at least 10 dollars). Therefore, it is possible to speak of the poor judgement of those governmental for people, who get employed or (even decrease) the expenses on science and education when planning the budget.

Unfortunately, the drastic cutdown of the budget allocations for education and science as part of the “reforms”, such as those that took place during the 90s in Russia, led to the catastrophic decrease of the level of education. And in the XXI century, despite the announced priority of the educational system development, its financing is still being far behind from the leading educational systems (and especially the engineering ones), which can be understood), but in its proportion within country’s GDP. This becomes a precondition for future underrun of Russia in this field that may consequently lead to future degradation of our education and science (and this will further result in the degradation of economy and culture). While Russia still has HEIs and scientific school, that have high ratings in the global ranking, Russian HEIs don’t (and this will further result in the degradation of economy and culture).

It should be pointed out that the construction of the information society knowledge is, first of all, used for the production of the knowledge itself. The optimal management of such society should be based on the effective knowledge use for creation of new knowledge, including the most general knowledge that is focused not on any applied goal, but on the production of new knowledge. That means that it is not a direct answer to the subject’s demand, but potentialization to solve a specific class of problems, where the solution for an applied problem is just a special case of a general theory. At the same time a relative independence of science from the applied goals of the subject, its self-reproduction is noted. Knowledge is
the intellectual capital that is distinguished from natural, human, financial resources also by the fact that while transferring it for selling for a very high price the creator does not lose this information, he/she fosters and enhances this intellectual capital. Whereas by selling material assets, especially natural resources (they are always limited, usually non-renewable, and very often in deficit) the seller always makes his/her country poorer. The key good in the postindustrial world is the intellectual capital, thus, its creators play the key role as well.

At the present time, a concept of mathematics education is accepted [9, с. 25-36], it will allow the development of the basis for mathematics to become the force for other natural science disciplines. However, this may take some time, so, first of all, special attention should be paid to physics and informatics, not with the use of all, special attention should be paid to physics and informatics, not with the use of a top-down approach, as, for example, to announce a mandatory Unified State Exam on physics, but by creating a special environment, where the school and the students will be interested in teaching, learning and passing these subjects.

Year by year the number of school graduates, who take the final exam on physics and informatics is growing. Currently this indicator is estimated to be 30%. From the one side, this means that the prestige of engineering profession among school students is growing, from the other side, their self-confidence is rising, and, therefore, the quality of physics and informatics training at schools is advancing [10, с. 34-36]. Currently the laws and regulations allow the foundation of basic departments at partner enterprises (their network is already growing) are to be the basis for the internships and professional training, special attention is paid to the formation of soft skills, general and professional competences.

The statement about the connection between science, practice and engineering education is highly important, it is essential for any type of education. And here both types of mechanisms are acceptable: the ones that have been mentioned before and the ones that are provided by the current legislation. No one stands against putting these standards and these educational programs through filters of the employers. This is how it is done in many universities. As well as no one stands against attracting employers to be a part of educational and methodological expert teams, HEI’s scientific commissions and state examination boards. This is the right of an HEI, and it should be exercised.

Conclusion

When discussing the problem of the enhancement of engineering professional training level and the compliance of the acquired knowledge and skills with the requirements from potential employers and the demand from the real economy, it is essential to advance the whole structure of the educational process. It is necessary to head on towards continuous increase of investment into the field of education; this is the main track for the revival of Russia with its great cultural and scientific traditions. There needs to be a selective support of skilled and talented youth that includes the processes of searching and selecting gifted kids, talented girls and boys. These activities will mainly include the already tested competitions – regional and all-Russian olympiads, awarding grants to the winners and runner-ups for them to be able to enroll at country’s technical universities (it especially concerns the support given to the gifted kids, talented youth, who live in outland, in cities and countryside far from cultural centers). This is a vital element of the state policy on elite engineering education. The knowledge-based economy should be the prevailing one in Russia. A specific, if not the central role should be given to the education and science, first of all to the engineering education that has close ties with the knowledge development and training of specialists, who can manage high technologies, apply methodology of information analysis – specialists of very high level of qualification, innovators, who broaden the horizons of the mankind, whose lifestyle is a continuous and rapid development in the context of fast obsolescence of old knowledge, the need for its constant renewal and rethinking, and the need for new approaches, new ideas, new unifying theories. Russian system of education should have a flexible system of process management, where there is no strict centralization, where there should be a strive for balance between state educational programs and regional, local ones.

National programs for the development of education should include the control of the academic level of education, level of educational management, pedagogical control focused on the art of teaching, professional control – analysis of HEI’s graduates from the point of the “consumers” requirements, encouragement of different educational forms and methods.

The contents of this article can be useful for a wide range of faculty members and students, the system of vocational professional training, the system of HEI staff development programs, engineering and scientific workers.

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Model of Students’ Practical Training Processes in Institutions of Higher Professional Education

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The article deals with the model of students’ practical training processes, its unit-by-unit description of processes and relationship between them. It forms the basis for subsequent development of a monitoring model.

Key words: process management, resource technological base, the quality and efficiency of education, the rate of rationality, information-analytical system.

Problem statement. One of the most relevant trends in the improvement of contemporary education is the development of information and analytical resources (IAR) that reflect its actual status and can be used in management system design [1, p.7-9]. Adequate solutions, management objects and algorithms, for example, quality of student’s practical training, allow effective management in the educational process, the major constituent of which is academic-research-production base and, as a consequence, answer the question: “Whether expenditures for practical training justify high quality education of a highly-qualified and competitive engineer?”

IAR are developed on the basis of integrated monitoring. At the preparatory stage it is reasonable to design a model of students’ practical training processes to consider in detail the sequence and integrity of the processes in which the problem of IAR development is solved, to evaluate the quality and effectiveness of students’ practical training at all learning stages and set management functions [2, p.10-13; 3, p.22-25].

Results analysis. High quality of professional education is profound fundamental training based on the latest scientific achievements. These two principles have become academic-research-production base, which defines the resource potential of a university and conditions the opportunities of training sessions, research, and development, their results and quality of students’ practical training. At present, the development of academic-research-production base is performed through the implementation of high-tech, modern equipment and development of new technologies and forms of training. Both trends form a complex innovative education system grounded on academic-research-production base, which is appropriate to term a resource technological base (RTB) of education. It is clear that RTB, its state and development, is a crucial factor of HPE quality [4, p.31-35].

Competence approach is taken as a basis for HPE FSES. Defining the competence functions in training supports the main essence of competence approach – to enhance the practice-oriented training. Therefore, a distinctive feature of the modern HPE development stage is the significant increase of students’ practical training. This peculiarity promoted the formation of innovative training systems based on RTB, for instance, resource centers academic-research centers, research-academic clusters, etc. The design of such innovative systems provides a guarantee for high quality learners’ practical training [5, p.114-116].

At the moment, the quality management system (QMS) in universities has been established and certified, which is based

REFERENCES