

Problems and Prospects of Modern Inclusive Higher Technical Education in Russia: a View of Future Engineers, Economists and Managers

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Abstract

At present time, there are various problems of modern inclusive technical education, consisting the rapid development of modern technologies (their appearance is much faster than the existing timeline for training specialists), high competition (now high-tech and high-tech projects are preferred), and the complexity of training combined with many teachers from real practice, and at the same time unwillingness to go to work, given the relatively low wages.

The present article provides an analysis of the problems of modern inclusive technical education identified in Russia through a survey of students and also suggests ways to solve them.

Keywords: *higher technical education, problems of technical education, prospects of technical education, inclusive education, modern education in Russia, student survey.*

1. Introduction

At present, on the one hand, it is possible to note the interest of the state in training of specialists in technical fields of study, on the other hand, a decline in interest in technical professions among young people. In connection with this contradiction, it becomes necessary to study the problems and identify prospects of modern technical education in Russia.

Existing deficiencies in engineering education are a brake on development of the country as a whole and in solving urgent problems, such as import substitution in the domestic economic development.

The press often notes that higher education in the USSR was one of the best in the world. It is possible that education met the tasks of those years, but at present it does not satisfy either consumers represented by the personnel of industrial enterprises (employers) or applicants (students currently studying).

In the era of the fourth technical revolution, with an increase in the pace of change in the stages of world economic order, formation of the economy of innovation, and the post-industrial information society, there is a need to form a link between engineering education and the innovation market. It is necessary to prepare new generation of engineers who are able to design, produce new equipment, have knowledge in the field of modern economics, business organization, information and communication technologies, etc.

This task is relevant not only for our country, but also for economically developed countries that are considered leaders in the global technical space. Thus, in 2000–2017, the CDIO system [1] was developed. Among the organizers, were the Massachusetts Institute of Technology (MIT), the Technical University of Chalmers (Gothenburg), and others. The basic principles of the innovative educational environment for training of new generation

engineers are: Conceive - invent, Design - develop, Implement - implement, Operate - manage. The Worldwide CDIO Initiative is a community of practice-oriented universities using CDIO standards. International CDIO standards [2] focus on an integrated approach to the formation of such specialists. These standards provide for the system training of engineers who are able to generate ideas, design, produce, operate and dispose of engineering products.

The issues of modernization of engineering education and the quality of training technical specialists were discussed on June 23, 2014 at a meeting of the Council on Education and Science under the Presidency of the Russian Federation [3]. In his speech, the president noted: ... “in our country, the groundwork of the Soviet era is clearly over or ends in many directions. The whole world and our economy are being drawn into, if they have not already entered, a new technological level of a completely different quality.” The reports of leading experts - rectors, industry leaders presented a critical analysis of the current situation.

Among those who are now called stakeholders, school graduates, students, their opinion should be taken into account when developing a set of programs aimed at overcoming shortcomings. It is necessary to include in this list and pedagogical universities, which should prepare teachers who understand contemporary problems and who own methods of solving them.

Nowadays, almost three times more engineers are produced annually by Russian universities than required (a much smaller number begins to work). At the same time, there is a lack of qualified personnel in enterprises.

2. Research Method

Problems. In order to study the views of modern students on what they believe the existing problems of technical education are and

what they think the possibilities of solving these problems, a survey was conducted.

The survey was attended by students of 1–4 courses in areas of training on March 3, 02, management, March 3, 2005, business informatics, March 27, 2005, innovatika, and March 9, 2001, informatics and Computer Engineering.

The listed areas of study were not chosen randomly. Of interest are the opinions of both the students themselves in the technical field of study, and students in other areas of study.

And the other two areas are technical areas of study: 03/09/01 and 03/27/05: the field of education is engineering, technology and engineering, an enlarged group of areas for the preparation of higher education - bachelor degree: 09.00.00 computer science and computing technology and 27.00.00 management in technical systems.

In the course of the survey conducted in 2017 (the mass survey method was used), 162 questionnaires were collected.

The participants of the survey expressed their opinion on the existing problems of technical education and suggested ways to solve them.

The range of answers turned out to be quite wide. Therefore, we consider only the most popular answers, first separately for different areas of study.

Direction of preparation "Management". The main problem of technical education students in this field of study consider the presence of an obsolete material and technical base in educational institutions (43.9%). In second place is the complexity of future employment (31.8%) and further low wages (28.8%).

Based on the identified problems, survey participants logically point to the purchase of modern equipment for students (36.4%) and an increase in wages to employees (27.3%).

The direction of training "Business Informatics". When enumerating problems, the answers are again in the lead: "outdated material and technical base" - 48.6% and "difficulty of subsequent employment" - 33.3%. But the third place was taken by the students of the "Business Informatics" field of study, the answer was "lack of practice for students" - 31.9%.

And when pointing to the possibilities of solving the identified problems, the answer "more practice for students" became the most popular - 37.5%.

Areas of preparation: "Innovation", "Computer science and computing". Most students of technical areas of study also point to outdated equipment that is used in their learning (62.5%). And the answer appears in the second place "the presence of disciplines not related to the future specialty" - 58.3%. And also a little more than half of the survey participants noted such a problem as the lack of practical activity (54, 2%).

And according to these problems, the answers were distributed to solve them: 50% to add more core subjects, 45.8% to equip audiences with modern equipment and 33.3% to organize more practical classes and better at existing enterprises, and for this it is necessary collaborated with various enterprises (29.2%). And there is also a proposal to use new curricula and training programs (20.8%).

It should be noted that not all survey participants proposed solutions to the problems they indicated. The priority is still on the answer about the purchase of modern equipment (34%). Further they propose to organize more practical classes (29%) and there is a solution to the problem with the wages of workers (18.5%). They also pay attention to the provision of assistance in finding employment (17.3%), which can be partially solved by concluding university contracts with various enterprises (15.7%).

3. Results and analysis

In the modern conditions of the knowledge economy, engineers of a new generation are needed - innovation engineers in various fields of professional activity. In part, this can be facilitated by the implementation of the developed proposals.

OFFERS. Taking into account the results of the survey, the experience of the authors and suggestions expressed in the media, one can consider a number of ideas that may not be implemented in the near future, but can serve as points of the roadmap in obviously necessary measures to improve higher technical education.

3.1. Organization of scientific and technological clusters.

One of the main problems of technical universities is the development of integration of engineering and technical education with science and industry. Directly solve this problem is impossible (due to high costs) and is not reasonable, because the equipment is rapidly becoming obsolete, its loading at the university will not be high. The best solution is to organize technology parks and the inclusion of educational organizations in their composition.

- Clusters can include integrator universities, partner universities, business incubators, small innovative enterprises and others. Such an association will allow solving several tasks simultaneously:

- creation of conditions for training students on the most modern material and technical base. As noted in [3], "the research work of a student becomes an obligatory component of the main educational program, and success in it is the main tool for measuring the results of the educational process";

- creation of opportunities for university teachers to directly engage in relevant scientific work;

- creation of a resource for the work of teachers and students;

- equipping universities with modern equipment and software;

Provision of graduates with employment, because they fully meet the requirements of the employer;

achievement of students with high motivation in gaining knowledge;

implementation by employers of the quality assessment of training.

One of the socio-economic areas of modernity is lifelong education. This task, along with other structures, can be solved by such associations.

Currently, as a palliative solution is the creation of universities, engaged in the preparation of engineers, specialized departments of industrial enterprises. As an example, consider the experience of MIREA, MEPI, etc.

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3.2. Engineering choice.

The desire to become an engineer is laid in school. The system of school preparation and the unified state exam (USE in physics pass 15-30 percent of graduates) should be reoriented to new tasks. A high-quality vocational guidance and intellectual selection of students, training and selection of people who have an interest, talent is needed.

Another challenge is the preparation of school teachers. From them, the culture that is inculcated, and the level of knowledge, radically depend.

3.3. Forecasting.

The obvious fact is that higher education should be based on the study of technology and technology that will be used in practice for 5-10 years after the student has completed the education. Currently, in higher education institutions, the used educational programs are based on the study of existing material, and sometimes what the teacher studied in his student years. At the same time, a student, after graduating from a university, finds himself in a different environment, he has to retrain for a year or two, to acquire new knowledge. Under these conditions, it is naive to expect from him new, revolutionary ideas. Hence the task of

teaching forecasting, the method of looking beyond the horizons of existing realities. Forecasting involves the analysis of interphase shifts in reproduction in order to integrate the form of training being formed, determining the interests and motives in training specialists of a particular direction for the industry or region.

3.4. Interdisciplinary education.

Interdisciplinarity should be the basis of the curriculum. The explanation is the following: if earlier there was a chain in product development: a developer, a technologist, an economist, now there is a need for a specialist to share knowledge and use of information. This task can be described as the intersection of sets. The question of training engineers to work in market conditions is being considered, not only at an industrial enterprise, but for work in a company, at a firm. Knowledge of technology will not be sufficient without an understanding of the basis of an innovative economy. This means a clear understanding that successful innovations are born at the intersection of the most advanced technologies and social needs.

It is important that specialists understand the project management methods, know the principles of lean manufacturing, understand the management of production costs at all stages of the life cycle, in matters of service and after-sales service, because without the fact that these issues will be laid at the development stage You can not create a product that will ensure competitiveness.

3.5. Integrated curriculum engineering education.

The above tasks and methods for their solution should be united in the educational plan in order to obtain synergistic effects in the educational process. The solution to this question will be given to specialists.

As a result of such training, students receive engineering knowledge that studies and unifies the systemic, economic, social and technical properties of the object in unity.

3.6. System approach.

CALS technologies are the basis of engineering education. A modern society requires professional training of specialists who are able to solve various technical, organizational, economic and social problems of production. Therefore, the training of such specialists should be based on the integration of scientific, industrial and educational activities, including, taking into account the latest achievements and world experience, as the basis for the sustainable development of the economy.

In recent years, a large number of new methods and directions in engineering have emerged in the global technical space. The development of information technologies, ensuring the emergence of new opportunities for the development of production and competition of manufacturers, fundamentally changed the nature of engineering technologies, patterns of design and production processes, and the interaction of specialists of different profiles in solving design and other technical problems in an integrated information environment of an enterprise.

A modern enterprise faces the goal of developing on an innovative basis, solving a number of tasks, such as:

- modernization on the basis of the existing production by computerization of the main production processes;
- creation of new modern production with a high level of computerization of technological processes;
- the introduction of energy and resource-saving technologies, one of which is the electronic management of enterprise resources;
- increasing labor productivity, primarily in the engineering field, for a constant updating of the range of products and their accelerated launch into production;

Reduction of the production preparation cycle and improvement of its quality on the basis of modern information technologies for

design and engineering analysis of technological processes and tooling.

4. Conclusions

Training highly qualified specialists, which can be fully attributed to the new generation of the Russian scientific and technical intelligentsia, with its best traditions, love for the country and the desire to work and create for the sake of its prosperity, is one of the most important factors in strengthening the required level of security and accelerating the pace of modernization. in the country [4-6].

The implementation of the proposals listed in the article will allow in conditions of the new economic structure, and economy of innovations, to make the necessary changes in inclusive education, to ensure communication of engineering knowledge among university students (educational institutions of higher education) and the innovation market by creating a methodology for project-oriented training of students.

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