Creativity training in engineering education

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There are analyzed proposals suggested in V. I. Livshits's paper on the problem of creativity formation in the course of training the engineer. It is specified that it is necessary rather to optimally combine fundamental and professional training than to substitute fundamentalization of engineering education for professionalization.

Key words: *fundamentalization, interdisciplinary activity, creativity, innovativeness.*

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The article by V. I. Livshitz "Developing creativity training in engineering education" is published in this issue. It considers the actual problem of training creative personality, capable to provide significant positive changes in the field of engineering and technology within post-industrial economy, which is characterized by the intellectualization of the industrial environment.

The author draws attention that today engineering education (EE) system is significantly distanced from the task of teaching creativity. This situation, according to him, leads to the fact that many graduates avoid working at techno sphere enterprises because of their low level of professional competence.

These are author's key proposals how to update the concept of engineering education:

1) replace fundamentalization of engineering education by professionalization;

2) increase capacity of educational engineering - education and technological systems, to avoid the use of adapted training systems;

3) initiate tests of professional knowledge for teaching staff;

4) review the current impersonal approach to the formation of student groups, when people with different profiles of training have to study together;

5) make a chain of subjects following the basis of machine assembly: details – components - car.

It is difficult to accept the first proposal, because fundamentalization of scientific basis of engineering knowledge and engineering is the background for training future professionals. It makes sense to speak of optimal combination of basic (fundamental) and professional training. Obviously when studying fundamental subjects students need to clearly understand how these knowledge can be applied in their future careers. Therefore, even the teachers of mathematics and natural science must be aware of the specifics of professional activity (specialty) in different training directions of students. It is important to introduce innovative educational programs that are integrated into the global educational environment that will contribute to the continuous basic and specialized training and are oriented to the solution of inventive problems.

Concerning the ban on using adapted training systems, it is unlikely that this can be done at an early training stage because of the high cost of industrial systems. However, it could be implemented for upper division courses with effective interaction of university and industrial companies.

One of the important requirements for teachers of engineering disciplines to have work experience at modern enterprises, research institutes or engineering design offices. If it fails, then such teachers must necessarily undertake the internship. Necessary condition – efficiency of completed research projects and management students' research activities. Then there will be no need to make special tests for teachers. In addition, there are standard procedures for determining the qualifications of teachers before approving them on position.

The author examines in detail the ways of solving the problems of the formation of creativity in relation engineering qualification with specialization: designer, technologist, production line manager, commissioning engineer, analytical expert, systems engineer, professional disciplines teacher.

Unfortunately, it is not indicated that innovative thinking and high creativity it is a combination of creative, strategic, systemic and transformational thinking activity, which should take place on the basis of interdisciplinary knowledge [1]. From this point of view it is necessary to perform interdisciplinary course projects within each educational program.It is crucial to use such form of cognitive activity as interactive learning, and one of its options as interaction with the student's learning environment based on the actual production process. The following elements of interactive learning can be implemented: virtual systems, automated training systems, simulators, full-scale working models of equipment [2]. It is important to create a learning environment which is adequate to the prospective technological system in real industrial sector. Modern production - is often dispersed ("network") production, which requires the ability to form a network to work in an interdisciplinary team, including the use of information and communication technologies. Therefore universities should create virtual ("electronic") ventures together with industrial enterprises.

It is reasonable to ensure that a flexible automated system became a part of electronic network of the company, equipped with modern machinery equipment, which allows the output to have a specific product. Using electronic network enterprise in education process will generate extremely relevant skills: creating an interactive environment for a group to design and develop real product and implement interdisciplinary approach, creating structural pattern of innovative products, electronic definitions of all stages of the life cycle of innovative products.

The author points out that an important role in preparing the next generation of engineers should be devoted to the Theory of Inventive Problem Solving, a proven and effective tool for creativity initialization. This is a really urgent task for the universities.

In general, training of engineers capable for creative activity, requires close collaboration of universities and innovative companies at all stages of the life cycle of professional engineer development.

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