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Forming Innovative Abilities of Students in Engineering and Research

Key words: *creativity, process, thinking, innovation, professional engineer.*

Annotation: *The article discusses how the creativity of engineers now must be focused on entrepreneurial activity, because innovation in market economy conditions presuppose them. At the same time, all kinds of manifestations of creativity, and the form of its organization are inseparable and should be seen holistically.*

In recent years, more noticeable in higher education sustained trend towards innovative engineering education obtained outside the walls of the classrooms of the University. We are talking about efficient creative process, espousing the professional challenges through analysis, synthesis, design and creation of popular market competitive products, i.e. the development of the creative potential of the students as the basis of engineering activities.

There are many formulations of the concept, it is a "work, creating something qualitatively new and different uniqueness, originality, and socio-historical uniqueness. Creativity-specific to the person as the creator-always involves a subject of creative activity. We are impressed by the definition of G.V. Glotova (4) namely the phrase "creativity", meaning the ability to handle professional tasks, to which we will refer later.

We share the opinion of G.V. Glotova (4), which, while supporting the point of view of G.S. Altshuller, A.M. Matushkun, V.N. Nikolko and V.M. Jurakovskiy, considering it "as an integrated feature", reflecting the ability of the individual to carry out creative activity. It proposed the structure of creativity, including invariant (the makings, inclination, mobility, mental processes, etc.) and optimal part. The invariant parts she considers creative component (creative thinking its originality, lightness, associate, etc.) generating ideas, flexibility in thinking. The developed part-intellectual, emotional, motivational component and an evaluation component. Agreeing with its interpretation as a whole, yet it should be noted that in our view, the creative component of capacity applies to scientific component. We emphasize that the creativity of engineers should be focusing on entrepreneurial activity, because innovation in market economy conditions presuppose them. At the same time, all kinds of manifestations of creativity, and the form of his organization are inseparable and should be considered in an integrated manner.

In addition to the above methods, systems and complexes for analysis, solution development tasks and inventive creative abilities of students, there are other tools of psychological control. This is the course of development of the creative imagination, method for simulation of young men, the operator, "size-time-cost", the essence of which is thought resizing, time and cost of technical systems. Analysis of situations allows carefully examine the object and find an unexpected solution.

For the development of creative imagination, the most productive is fantasy. Fantasy is enriched by the ability to see laws of development systems, find and resolve contradictions, to enjoy the rich experience of the theory of inventive problem solving. Effective enough way is writing fairy tales. A method of modeling young men too is fantastic-is widely used in the theory of inventive problem solving and is (1) that conflicting requirements represent the diagrammed in the form of one or more drawings, which operates a large number of "little men". This method allows you to visualize how they should act to technical system gave the desired effect. Theory of inventive problem solving highly effective solutions for creative and inventive tasks, because students do not only solve creative problems in accordance with strong algorithms, but also develop their creativity, imagination.

Effective means of intensifying the development of creative thinking and imagination are heuristic methods and techniques. All of them can be divided into three groups: 1) problem; 2) expansion problems, 3) look at the problem from the outside. The first group includes methods of study-oriented parts, properties, and functions of the problem, the second focuses their problem, methods third allow to look at the problem from different perspectives and can be applied in teaching innovation of engineering activities. Heuristic methods, techniques and technology should be widely used in the educational process as students build non-standard creative thinking, willingness to address professional challenges. Drawing on the analysis of the teaching features of training scientific and technical creativity. N. M. Anisimov (2), underlines the relationship of intellectual and communicative aspects in the process of cognitive activity offers a system for collecting and processing of scientific and technical and methodological information on the basis of the principles of a systematic approach, which allows you to:

- meet the challenges of the development of methods of research and design to build generalized models of systems of different classes and specific properties;
- determine the properties of the object specific backbone links the object in question.

In recent years among researchers established the view that learning technology should be based on the pedagogy of cooperation implies joint formulation of problem, and the joint solution. Students choose work methods and establish deadlines that significantly increases the effectiveness of learning, stimulates the expression of creative abilities of students, relieves psychological tension in the work.

This technology fully complies with the requirements in training future teachers an innovative and inventive activity, higher technical education establishments and scientific and technical creativity to build not only based on science subjects (physics, chemistry, descriptive geometry; theoretical mechanics, etc.), i.e. fundamental, but also using the knowledge gained when examining the General professional disciplines (engineering graphics, electrical engineering, metrology, certification and standardization, hydraulics etc.) i.e. applied. All of these disciplines are included in the curricula and contents, methods and means of learning. The creative potential of students readiness for engineering innovation to successfully form the student Olympiads, contests and scientific schools of which was making the Olympic competitions in the creative application of knowledge and skills of the subjects studied in high school, as well as in the training of future specialists. They are conducted with a view to improving the quality of training of specialists, as well as to enhance the interest of students to the profession, to identify talented young people and human capacity for research, administrative, production and business activities.

This may be common Olympics, general professional or special disciplines, competitions and contests final qualifying works that take place in three stages: first, inside the high school, the second regional (City), the third Republican or interregional. Often International acquires the status of the Olympics. Olympics as a form of education brings together almost all the advantages of modern teaching methods: active, context, problem, cognitive, developmental, personality-active and student-centered, differentiated and individual, multilevel and continuous, and others.

The olympics have always been an integral part of research students, and for the disciplines taught the first course of study in high school it is important to be included in this activity, as students are interested in constant contact with teachers of the department (5).

We consider the olympics movement as one of the mechanisms to improve the quality of engineering education specialist competitiveness on the labour market, the process and the result of the adaptation of the young specialist in the labour market, in terms of production, the degree of personal satisfaction of students the process of cognition and creativity (6, 7). That is, pertinent to the Olympics provides free creative space search unique professional creative permissions problems.

While defining the components of this environment he believes social environment, based on mutual support and respect for the work of all its members; internal-personality environment, in which creative intellectual activity level corresponds to the social order of society; information, which professionally oriented knowledge-become a tool-permissions professionally creative situations. Its main elements are olympics micro olympics group assignments and, in fact, the Olympics themselves. The determining factor is micro group representing the informal organization. Its members are becoming willing to acquire new knowledge, to better prepare for future professional activities. Training, which allows to solve the issues of vocational training in a stressful situation. Basic ideas of training in cooperation are: the common goals and tasks of individual responsibility with equal opportunities for success.

In the context of the educational process, modern high school to avoid stressful situations in training activities leads to insufficient training specialist to follow-up in terms of production olympics environment makes it possible to simulate these conditions shape the students' readiness for creativity under tight restrictions and responsibility for the final result, remove internal barriers hampering the creative process that also meets the requirements of innovative education.

It is important to note that one of the major factors of formation of olympics Environment is the presence of a true leader, a teacher, who is able to influence people to unite to achieve any purpose, express the cognitive and creative interests olimpiadnoj micro group as well as to create social relations conducive to unleash the leadership potential, other members of the micro group. Note further that the teacher was not limited to just the selection of gifted students, because after the unsuccessful party may Olympics performances on all his subsequent education and professional work get heavy psychological trauma. Means need methodological system to ensure such a work. Here it is possible to allocate such principles as solidity of knowledge between substantive communication, continuity and knowledge development, maximum autonomy, activity efficiency of knowledge, outstripping the difficulty level of tasks, analysis of the results of the jobs.

The determining factor for the successful holding of the Olympics is qualitatively made up the task that meets certain requirements and the complexity of the status of the Olympics. The basic methodological principles of Olympiad tasks: heuristics, availability of problem situations, the importance of these theoretical jobs, professional focus, continuity and continuity of jobs that match the level of complexity of the stage of the Olympics, the variability of solutions complexity competitive job performance.

In addition to theoretical tasks many researchers strongly suggest the need for inclusion in experimental tasks, so B.P Virachev (3) justifies this tendency by some students to abstract theoretical reasoning, and other, more specific, and interest to the disciplines develop through the solution of different tasks.

In the case of contests, practical tasks are essential because they allow you to implement one of the major engineering education principles, namely fundamental unities and professional orientation. These jobs also must meet specific guidelines: professional feasibility. The job must meet modern level and intended use of the equipment used in conditions, simplicity and unambiguity of the job (it should not be difficult) with the explicit condition that combine affordability and non-standard (to include elements of research). One of the most active forms of technical creativity of students in extracurricular time are scientific schools. Their conduct is attributable, firstly, to internally summer break in the cycle of year-round work in scientific circles, and secondly, the need to examine the individual scientific directions of modern advanced technologies (such as nanotechnology) and other reasons. These schools can be both within the University and international status.

The goal of schools also can be very diverse. By the time of the easiest school holiday-summer and winter, for their implementation do not affect other factors arising from the educational process, and all the attention can be drawn only on the decision of tasks in view. Semester school is similar to group work is organized within the framework of the educational process, as after school supplementary education. Calendar-with basic lessons on the modular principle and most often exit. Periodic-combined with weekends and holidays and is short-lived.

Form of teaching in schools is governed by the aims and objectives of the activities.

Activity chosen teachers individually for each track, but must conform to modern methodical approaches including teaching innovation of engineering activities.

And so the above contents, methods and forms of education, together with the practical training while taking into account psychological-methodical particularities form the technical universities students abilities to innovative engineering activities.

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