

# ENGINEERS WITH PROFESSIONAL AND CREATIVE SKILLS TRAINING IN THE UNIVERSITY

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**Summary.** The paper focuses on the perspectives of concept of future engineers' professional-creative skills formation during the process of professional becoming taking into account the objective social and professional needs of future specialists. The purpose of the paper is to analyze the benefits and perspectives of the concept in development students' professional-creative skills. The concept describes the process of formation of professional and creative skills of future engineers, tools and techniques of its implementation. General characteristics of major groups of professional and creative skills are presented in the article.

The author comes to the conclusion that during the of problems decision of professional and creative skills formation of future engineers the main point of reference on the methodological level is acmeological approach as a new understanding of the meaning of modern engineering education.

**Key words:** concept, professional-creative skills, professional needs, professional training, acmeological approach, methodological support, verification.

In the strategy of innovative development of the Russian Federation for the period up to 2020 it is noted that "the key problem is a low demand for innovations and inefficient new development. Especially from the point of view of creating an effective innovation system, the continuing high level of higher education in engineering is important. All of this requires changes in engineering activities, the formation of creative engineering personnel which are able to solve production problems effectively. In this regard, the problem of training engineers with professional and creative skills in higher education is actualized [5].

Higher technical education should ensure the formation of professional and creative skills that move the progress forward. "Of special interest are those huge, really occurring changes of a person living in this new situation, ones that at hearing and at the same time which are the least understood. We are talking about changes of perception, its structure, content, rhythm and speed of acquiring information, enhancing the right hemisphere brain load, the requirement of motivational and emotional-volitional spheres of space activities, structure of relations, including the destruction of many of the norms and principles of behaviour"[6, p. 10].

The central link is a contradiction between the quality of engineers training and requirements of employers. Employers are interested in such qualities of professionals as: the ability systematically both independently and effectively to solve production problems using the competencies gained at the University; the ability to work in a team; knowledge of business

processes and the overall business environment; the ability to generate and perceive innovative ideas; the ability to convincingly present his idea. Without a focus on creativity there is no tradition or modernization can not guarantee innovative result [4].

In order to structure the approaches, methods, concepts of formation of professional-creative skills of future engineers appropriate to their research design in the form of appropriate concept, which is considered as a set of attitudes and concepts in the field of professional training of students, built on the basis of the theory of acmeological approach and design principles of the process of formation of professional-creative skills of future engineers, generalization of advanced pedagogical experience in this field, taking into account the needs of modern society and production. The concept of formation of professional-creative skills of future engineers in the context of acmeological approach determines the formation of professional and creative skills as the basis of building an innovative didactics of engineering, within the framework of developing the national qualifications system, allows to realize the requirements of the Federal state standard in the formation of a complex of professional, special, general cultural competences.

The aim of our article is to describe the main points of the conception of the formation of professional and creative skills of future engineers in the context of acmeological approach.

The concept describes the process of formation of professional and creative skills of future engineers, tools and techniques of its implementation. For a basis we took the scientific basis of the concept proposed by E. V. Yakovlev and N. O. Yakovleva. [7]. It includes:

1. general provisions (purpose, objectives, prerequisites development, methodological support, regulatory framework, terminology);
2. methodological support (acmeological approach, methodological principles);
3. content – pedagogical model of formation of professional and creative skills of future engineers on the basis acmeological approach;
4. verification (figure 1).

The purpose of the concept is a justification of process of future engineers' professional and creative skills formation on the basis acmeological approach, which are capable of developing new ideas, solving production problems and adopt innovative solutions.

The concept must accomplish the following tasks:

- to define methodological bases of formation of professionally-creative abilities of future engineers;
- to define the conceptual and categorical framework (definitions, reference to which is assumed in the framework of the concept);

- to organize educational acmeological environment, is a prerequisite for the solution of problems of innovative didactics of engineering of the University focused on the formation of professional and creative skills of the students of engineering universities;
- to define the necessity of consideration of requirements of employers, provisions of professional standards on the basis of formation of system of partnership enterprises with basic;
- to formulate the principles underpinning the effective selection of content and technology of formation of professional and creative skills;
- to create special forms and means of the process of formation of professional-creative skills;
- to structure components and indicators that are integrated into a coherent pedagogical model, changes in the process of professional training;
- to determine criteria and assessment unit, including criteria and indicators of determination of the levels of future engineers’ professional and creative abilities formation.

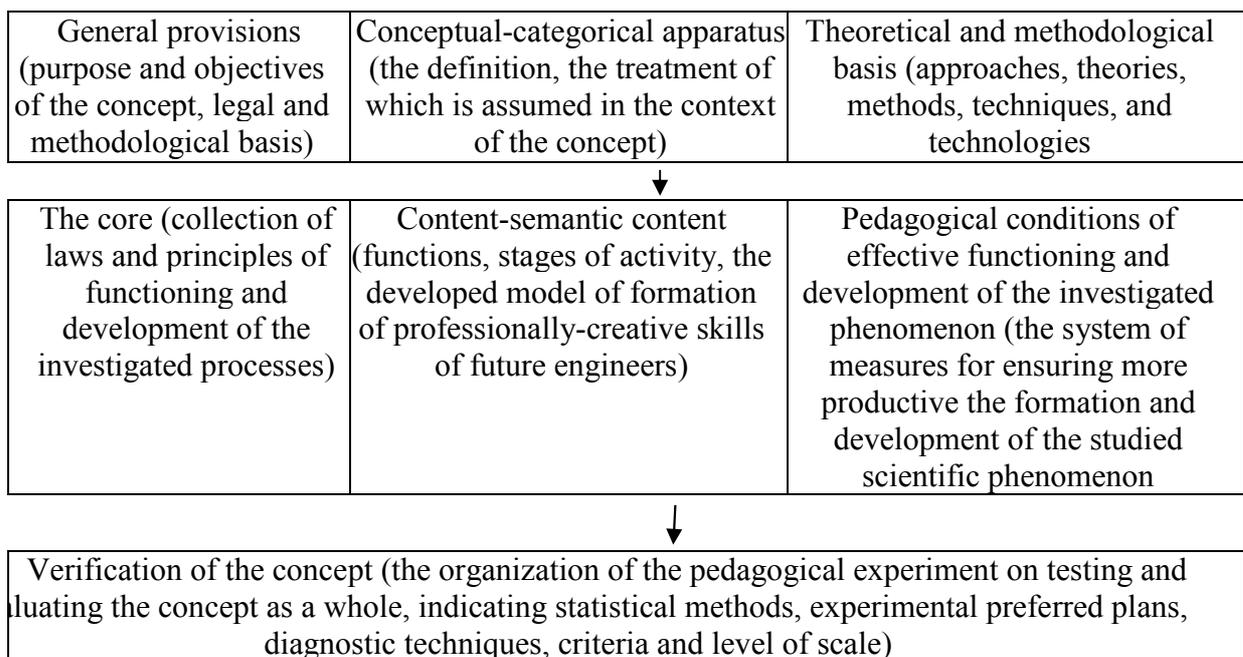


Figure 1. The structure of concept of professional and creative skills formation of future engineers on the basis acmeological approach in educational process of the University

Terminological apparatus of the concept presents definitions that reflect the specificity of the training process: "professionally-creative abilities", "acmeological approach", "developing acmeological environment engineering of the University", "training of engineer with professional and creative skills", "acme-technologies". The problem of formation of professional and creative skills of future engineer is solved from the position of acmeological approach as the study and implementation of practical improvement engineer through the transformation of existing professional development level to a higher optimal level (the actualization of hidden abilities).

We consider a professionally-creative abilities of future engineer as a new definition that is in the desire of the individual to achieve a positive-transformation in training, successful implementation of personal and professional potential in various activities aimed at creating something new, contributing to the speed and ease of learning methods and techniques.

In our research taking into consideration the previously defined principal creative tasks in professional activities of the engineer allocated to the following groups of professional and creative skills (see table. 2): research, reflective, organizational and informative. The allocation of professional activity of engineer of organizational, operational and monitoring and evaluation of actions and the specified range of vocational and creative skills gives you a reason to pay particular attention to the didactics of solving engineering problems, namely: problem formulation, conditions assessment; definition of requirements for the results of decisions; planning the study, identifying the structure of action, the choice of methods in solving engineering problems, testing of solutions, evaluation of the results. In this case, as the methods used in solving engineering tasks allocated to the following: observation, comparison, experiment, abstraction, analysis and synthesis, deduction and induction, analogy, modeling, methods of mathematical statistics.

Table 2. – General characteristics of major groups of professional and creative skills

Groups	Contain
Research: – diagnostic – prognostic – constructive	a) diagnostic: the ability to carry out a critical analysis and assessment of the situation, detect problems and contradictions, to determine the nature of key relationships; b) prognostic: the ability to formulate the problem; to make up the hypothesis of the solution of unusual tasks, to determine the model of professional activity to address problems and contradictions of the objectives of the activities; ability to solve problems in non-standard conditions; c) constructive: the ability to make up a plan of solving the problem given the diagnostic and prognostic operations, to distribute the events into steps in sequence; the ability of spatial and technical thinking, ability to see figuratively
Reflective	The ability to assess professional activity adequately; to estimate the level of professionalism; the ability to control himself, to keep self-control, to exercise self-control; the ability to keep persistent in a professional position; flexible thinking (the ability to reconsider its conclusions in the solution depending on conditions); depth (the ability to penetrate into the essence of the most complex issues of theory and practice, to foresee the further course of events); latitude (the ability to cover the issue); criticality (the ability not to take away his and others ' decision to subject it to critical reflection); speed (ability to quickly navigate in the job); ease of generating ideas, spatial imagination; independence, the search for innovative approach to solving problems
Organizational	Self-determination, the ability to allocate attention, select objects of attention change from one object class to another, to plan, to identify the main points
Meaningful	Emotional-valuable, intellectual relationship: to share knowledge, to cooperate, political culture [1]

The theoretical analysis of essence of concept "professionally-creative skills", consideration of the essential characteristics of professional activities of the engineer under the requirements of federal professional standards, an analysis job description "person-technics" allows to define the main components of the training of an engineer with professional and creative skills: additive, creative, moral, spiritual and socio-cultural components, and each component has a projection on the moral and spiritual component [2].

In the formulation of the methodological foundations of the work we take into account, "that any study is based on previously achieved results of the predecessors in a particular scientific field and is conducted within a particular scientific approach with clear principles and methodological position determining the direction and progress of research"[3].

During the of problems decision of professional and creative skills formation of future engineers the main point of reference on the methodological level is acmeological approach as a new understanding of the meaning of modern engineering education.

The result of the purposeful, systematic influence on the creative skills as a component of professional and personal competencies of the students will be their readiness for professional and creative activity, creative self-development in professional and social spheres.

The current higher education can and should provide a high quality of education, provided that it will be function as a multi-dimensional model, acting in the spirit of social order.

So, we can draw the following conclusions:

- the basic contradiction of engineering education in Russia - the gap between professional competencies of graduates of universities acquired in the educational process, the increased requirements of high-tech industries. Today, a national system of innovation economy, which needs an immediate influx of competent and competitive professionals, ready to be creative and proactive activities in the framework of national and international social-engineering projects of any scale. In practical engineering there are significant changes, forming major "challenges" to the system of higher technical education. The problem of quality of education in the globalized world community can be solved only when education will begin to touch the underlying processes of human development, its mentality, intelligence and thinking;

- formed professional and creative skills are determinants of improvement of professional training quality of future engineers. It is relevant to the implementation of acmeological approach with the aim of providing pedagogical conditions for the effective formation of professional and creative skills and adaptation of the educational system for the formation of the continuous education system. Implementation of acmeological theory in practice means the approach to the solution of problems of continuity in training, stability of development of professional-creative skills of the future graduate and the formation of personality of future specialist

– the concept of formation of professional-creative skills of future engineers in the context of acmeological approach determines the formation of professional and creative skills as the basis of building an innovative didactics of engineering of the University, within the framework of developing the national qualifications system, allows to realize the requirements of the Federal state standard in the formation of a complex of professional, special, general cultural competences.

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