



УДК 378.14.18

QUALITY IMPROVEMENT OF PROFESSIONAL TRAINING OF FUTURE ENGINEERS IN THE CONTEXT OF DESIGN AND STRUCTURAL COMPETENCE

ПІДВИЩЕННЯ ЯКОСТІ ПРОФЕСІЙНОЇ ПІДГОТОВКИ МАЙБУТНІХ ІНЖЕНЕРІВ У КОНТЕКСТІ ПРОЕКТНО-КОНСТРУКТОРСЬКОЇ КОМПЕТЕНТНОСТІ

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Abstract. *The basic components of design competence of future engineers are considered in the work. The structure and components of design competence of engineers are presented. Criteria of estimation of formation of design and design competence, which serve as a starting point for determining the levels of development of this quality in future engineers, are defined.*

Key words: *engineer, specialist, technology, design competence, components, criteria.*

Introduction.

The new paradigm of Ukrainian education involves improving the training of a specialist, becoming him as a professional, deeply educated in his field of knowledge and competent [3, 4]. The modern industry needs a specialist erudite, ready for research work, implementation of a personal approach in designing a strategy of his own professional formation, able to self-actualize, gain personal authority and status. Today, there is a need for a highly qualified specialist who, from the first steps, is well-versed in production technologies and systems, independently finds and analyzes information, rationally uses the experience gained to successfully solve professional problems and problems [7]. The quality level of engineering education is an indicator of the professional competence of the graduate [4, 10]. Modeling the content, types, forms of professional work of an engineer and creating a production environment, it is important to take into account the nature and features of a specific area of activity of the engineering.

Analysis of problems of modern higher education has allowed to distinguish features and specifics of engineering education and to identify its problems in the conditions of implementation of competence approach.

Competence synthesizes knowledge, relevant skills and new-type skills that integrates a person through training and professional activity, accumulating experience [11]. There are several points of view on the professional competence of a specialist: 1) an integrative concept that includes a set of components (mobility of knowledge, alternatives to the method of activity, critical thinking); 2) system of components (social, special, individual); 3) a set of components (vocational training and key competences); 4) the composition of integrated knowledge, skills, abilities, etc. ; 5) possession of knowledge in action, social and own experience of activity in a



certain field; 6) qualitative and quantitative characteristics of personality traits. At the same time, at present, there is not enough scientific development of the model of professional competence of the engineer for adequate formation of professionals in the process of professional training.

The main text.

Upgrading the content and technology of higher education should be in line with employers' and societal requirements to create effective mechanisms for implementing a competency approach. The search for the implementation of a competence approach in engineering education should take place in the field of scientific and pedagogical theory and practice, taking into account structural and technological problems of production and needs of society [12].

Competent (lat. competes, from competo – proper) – a qualified specialist who has a profession, intelligent, full-time, full-time, capable of acting, deciding, demonstrating the required volume and level, experience according to standards. “Competence” is interpreted by scientists as excellent awareness, a range of powers of a certain body or official, an informative problem of a professional level [2, 4, 5, 6]. Some scholars use the terms “competence” and “competence” as words synonymous with an emphasis on the effectiveness; most scholars regard competence as a component of competence. There is a division of the concept of "competence" with an emphasis on the effectiveness of professional opportunities implemented by mechanisms of self-organization and self-regulation. Competence determines the overall intellectual potential of the individual and is characterized by the integrative property and integrity of the results. Scientists consider competence in understanding the basic unit, the basics of forming the competence of its development and becoming [2, 4, 5, 10, 11].

The professional competence of an engineer is an indicator of readiness, a system of competences, integrated knowledge, skills, abilities and experience necessary for the performance of duties and functions, the solution of production tasks and problems according to the defined powers, abilities and demanded capabilities. Psychologically, all professions are divided into classes: man – technique; man – wildlife; man – man; a person is a sign system; man is an artistic image. In the profession of engineer stands out interaction with the dominance of systems: man – sign system – technology – technology - man.

A student engaged in design activities, is able to apply their abilities in different situations and different areas of activity, which confirms the multifunctionality, versatility and supremacy of design competency.

Design and design competency is understood by us as a personal, integration, formed characteristic of the ability and readiness of the property engineer, manifested in the design, on the basis of possession of special design knowledge and skills, the use of modern technologies and means of design, rational choice and optimization of choice and optimization. , accounting for rapid technology change.

The multidimensionality of design competence is confirmed by the use of higher education in the design activities of cross-curricular different thought processes and intellectual skills. This competence is mobile, mobile, variational, can be applied in any situation and in any material. Thus, design competence is key to engineering



activities, which determines the importance of its formation.

The active structure of design competence is defined as the unity of components: motivational-value, cognitive, activity and reflexive-evaluation.

The formation of each component of design activities is associated with the formation of its characteristics and properties as part of a holistic system.

Motivational value component. The initial level of development of design competence is expressed in a positive attitude to design and construction in professional activity and in the future there is a steady interest in design and construction in the professional field, as well as the formation of general professional competences.

The presence of interest in professional and design activities is expressed in the need for personality in knowledge, in mastering effective ways of organizing design activities and interaction.

Cognitive component based on the knowledge of theoretical bases for the construction of images of spatial shapes on the plane, acquisition of skills and skills necessary for professional performance of design activities. The cognitive component is demonstrated through knowledge of the laws of drawing, in the algorithms for solving positional and metric problems, in the methods of drawing conversion, in theoretical positions for the construction of geometric shapes, in the construction of axonometric projections, in the basic provisions and requirements of ESKD, in the basics of computer graphics in the provisions and requirements of design documentation, in the rules of construction of threaded products, working drawings of parts, execution of sketches of parts of machines and mechanisms, in built and assembly drawings, general view drawings and more.

An activity component based on a set of skills in the organization of design activities, including methods of project activity, special design skills, reflecting the ability of a future engineer to create new systems and technologies. This requires a higher education student of a certain level of basic knowledge and skills, the ability to solve positional and metric problems, build surface sweeps, build axonometric projections, draw up all design documentation in accordance with GOST, calculate and cross out drawings of machine-building, machine-building, use computer graphics tools to perform graphic works for various purposes.

In the structure of design competence, it is important for us to identify such a component that would determine the level of development of self-esteem, understanding of their own significance in the team, responsibility for the results of their activities, knowledge of themselves and self-realization in professional communication. In our view, such a component is a reflexive evaluation.

Justified appeal to this component allows us to study Gorshkov V., Zinchenko V., Ilyina G., Solomatina A., in which reflexivity is considered as one of the main characteristics of professional activity.

The reflexive-evaluation component includes the self-analysis and self-assessment of the future engineer of his design activity and its results, allows to comprehend and evaluate the degree of realization of the desired goals of design activity aimed at revealing professionally significant knowledge, skills and skills.

The realization of design competence through the listed components of activity



is not through the transfer of information, but through the development of the ability of the higher education applicant to competently solve problems and tasks, to master, in other words, holistic professional activity. To create conditions for the achievement of activities from the past, from the present to the future, from teaching to work. The student is aware of what has been (“become” samples of theory and practice), what is (feasible activity) and what will be (simulated professional activity situations). All this motivates cognitive activity, educational information and the learning process itself, acquiring personal meaning, information is transformed into personal knowledge of the student.

The formation of design competency is a process that can be characterized by criteria and levels of formation.

Determining the criteria for the development of design competence, we were guided by its essential characteristics and provisions of the criterion approach (the criteria should capture the activity status of the subject, bear information about the nature of the activity, the motives and attitude to its implementation).

Considering the structure of design competency as the unity of its components, we evaluate the degree of its formation by the following criteria:

- awareness of the meaning of design activity (motivational and value component);
- application of engineering knowledge in solving professional situations, reasoned expression of their own opinions in solving communication and production situations (cognitive component);
- implementation of design and design activities (activity component);
- analyzing and controlling the results of its activities (reflective-evaluation component).

These criteria for assessing the development of design competency serve as a starting point for determining the levels of development of this quality in future engineers.

Summary and Conclusions.

In view of the above, we can assume that design competence plays an increasingly important role in the life of an educated engineer, inherent in the development of many components, whose main task is the comprehensive development of the student as a person who seeks further enrichment and growth their professional potential. The definitions and concepts of “design competence of the future engineer” in the educational process have become a guide for creating your own definition of the concept under study.

Thus, the design competency of a future engineer is defined as a characteristic of the student's readiness for future professional activity, which is manifested in the gradual accumulation of normatively determined graphic knowledge, skills in the process of studying general technical disciplines, implies the free possession of information and technology to further enrichment and increase its educational potential. Now the future engineer must have the developed design competence, self-develop and improve as a creative personality in the process of professional activity in order to further develop his professional competence.

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Анотація. В роботі розглянуто основні складові проектно-конструкторської компетентності майбутніх інженерів. Представлено структуру та компоненти проектно-конструкторської компетентності інженерів. Визначені критерії оцінки сформованості проектно-конструкторської компетентності, які служать вихідним моментом для визначення рівнів розвитку даної якості у майбутніх інженерів.

Ключові слова: інженер, фахівець, технологія, проектно-конструкторська компетентність, компоненти, критерії.

Article sent: 05/10/2019 of

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