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# THEORETICAL BASES OF FORMATION OF DESIGN-DESIGN COMPETENCE OF FUTURE ENGINEERS IN THE PROCESS OF HIGHER EDUCATION

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**Annotation**
This article discusses the essence and content of the concept of design competence of a future engineer, the theoretical foundations of the formation of design competence of future engineers.

**Keywords:** project-design, competence, engineering.

## Introduction

The object of research is the learning process of shaping a future engineer, so we will define what the term “engineer” means.
In the general sense, the definition of "engineer" is interpreted as a person with a higher technical education, who carries out the design and construction of material objects, regardless of what is specified in the diploma: including "bachelor", "master", "specialist", "engineer", "engineering" activities ”and others.
It should be noted that the organization of engineering activities in the process of development of production led to its separation from other types of mental labor. Engineering activity itself consists of the creation of technical objects, environments and technologies based on scientific knowledge and practical experience, and has a dynamic, innovative and creative, social character. Scientists distinguish the main types of activities in the process of engineering activities: planning, design, construction, preparation of project documentation, organization of the production process, implementation, etc.

## Methods and Research

In our work, it is necessary to emphasize the process of forming the competence of future engineers in the transformation of the construction industry.
One of the problems in the implementation of information modeling of buildings is the lack of qualified engineers, and one of the solutions is identified as "creating a modern and secure digital learning environment." Thus, professional challenges are an element that encourages educational change.

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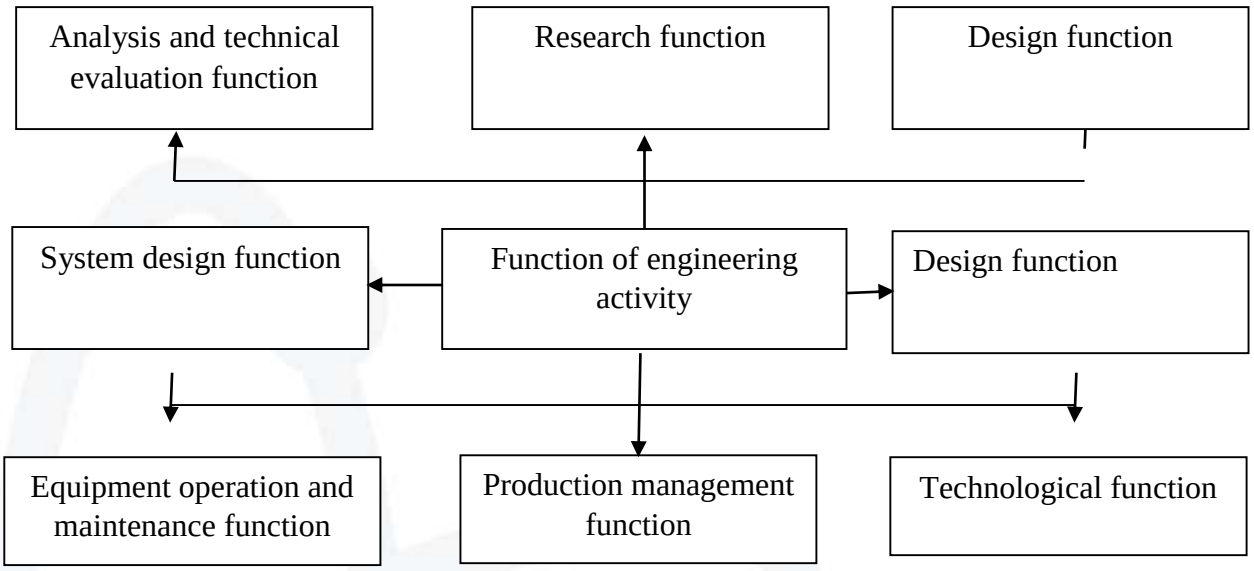
Summarizing many classifications of engineering functions, we distinguish two blocks of functions - social and technical, which can be divided into more precise functions. Social functions include humanistic, socio-economic, governance, education and development. As part of the topic, you can look at the technical functions shown in Figure 1.

The design function is to implement a technical idea in the form of a technical project by building it using technical means.

The design function is to develop a technical system for the implementation of the project, in which the technical idea is implemented in the form of drawings of the working project.

Technical functions of engineering activities. Figure 1




The analysis and technical evaluation function allows to identify trends and prospects of technical development and to determine the main parameters of the engineering task.

The research function is manifested in the study of a technical problem in order to comply with scientific laws.

Технологик функция техник объектни яратиш учун техник тизимни ишлаб чиқишда намоён бўлади [1].

The function of production management is to organize production and coordinate the joint activities of employees to solve a particular technical problem.

The operation and maintenance function is to keep the operating object in operational condition.

The system design function evolved in engineering, and a new system led to the emergence of the engineering profession. Its meaning is to give a single direction,

complex characterization to the whole cycle of engineering movements and is the methodological basis for the formation and use of information systems in construction organizations [2].

The study of the above engineering functions allows us to say that a significant part of the technical functions of engineering activities are design activities.

In connection with the development of engineering activities, the approach to the characteristics of the engineer has also changed, its main characteristic is engineering competence, and since the main type of engineering activity is design activity, the most important component of engineering competence is design competence.

Based on the competency-based approach as the methodological basis of the research, we will consider the competency process in detail.

The idea of a competency-based approach is to establish a system that includes learning objectives, the choice of learning content, the logic of organizing the learning process, and the validity of the assessment of learning outcomes expressed in competence. At the same time, competence is manifested in the acquisition of certain abilities by a person, including the personal attitude of the subject of activity. At the same time, the value of a competency-based approach is determined by the importance of non-professional learning outcomes, without diminishing the importance of subject knowledge, which plays an indicative role in it [3].

An etymological analysis of the definition of “competence” allows us to consider it (Latin compotens - appropriate, correct, capable, knowledgeable).

In most studies, the content of competence is presented as follows:

- a set of features of professional activity;
- a certain level of professional and employment requirements;
- The level of knowledge, skills, abilities, methods of activity required to carry out professional activities.

Conclusion

Based on the above research, competence is generally defined by the quality of activity expressed in the sustainable nature of the activity.

Summarizing the consideration of the design and design competence of the future engineer, based on an understanding of its components - design and engineering, we form the following definition, which is necessary for our research [4].

The design competence of future engineers means the acquisition of specialized knowledge and skills using constantly evolving technologies and engineering design tools, including the implementation of design and development activities as an individual approach of future engineers.

Design competence is a characteristic feature of the abilities and capabilities of future engineers, so it is necessary to determine the structural structure of this competence. The structure of competence has been discussed in detail by the following scholars.

Summarizing the different views on the division of competence into components allowed to determine the system of components of the design competence of future engineers, taking into account the professional characteristics of motivational, cognitive, operational and reflexive.

The motivational component is as follows: a positive attitude of the future engineer to the design and construction activities and the realization of their professional shortcomings; positive interest in design opportunities from the use of modern digital technologies and their application in design activities; the desire to engage in the professional community and personal development opportunities that arise in the course of design activities.

The cognitive component depends on the knowledge component of geometric and information engineering modeling and is focused on the implementation of design activities. The cognitive component is demonstrated through the laws of geometric and engineering modeling, the regulatory framework of design and engineering activities, and the development of architectural and construction drawings of buildings and structures.

The operational-activity component is related to the need to develop design activity skills using graphical packages and operational skills of practical design and engineering programs.

The reflexive component is manifested by the prospective engineer through introspection and self-assessment: professional shortcomings and opportunities to fill them; results of design and construction activities; to know the place and role of engineers in the professional community.

Thus, the study of the essence and content of the concept of "design competence of the future engineer" in the educational process of higher education allows to draw certain conclusions.

Engineering activity is a specific type of engineering activity of an engineer, with engineering content and functions, requiring a systematic focus on the topic of activity. The structural nature of engineering activities is determined by the understanding of the engineering design process.

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