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## FORMATION OF DESIGN AND CONSTRUCTION COMPETENCIES OF BACHELORS OF TECHNICAL PROFILES USING PROJECT-ORGANIZED TECHNOLOGIES

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**Annotation.** Modern division of labor in the field of engineering activity inevitably leads to the specialization of engineers, the basic component of any engineering activity is design and construction activity, the success of which depends on the formation of appropriate competencies in graduates.

**Keywords.** Engineer, designer, competence, activity, training, technology.

The notion of "educational (pedagogical) technology" is broader and includes learning technologies and is based on a certain scientific concept given earlier. The Association for Pedagogical Communications and Technology of the USA gives the following definition: "Pedagogical technology is a complex, integrated process that includes people, ideas, means and ways of organizing activities for analyzing problems and planning, providing, evaluating and managing problem solving, covering all aspects of knowledge acquisition". This multidimensional understanding of modern pedagogical technology determines the directions of theoretical and practical search for effective teaching technologies.

Consequently, learning technology is not only a scientifically-based recommended sequence of actions of the subjects of the process of education and training, but also provides in given conditions the effectiveness, efficiency of the educational process, as well as the assurance of its final result.

The essence of the search is reduced to the modernization of the didactic system of university pedagogical education on the basis of the study of its constituent elements and experimental testing.

First of all, it concerns the process of implementation of educational programs, namely the renewal of the content of professional education and the choice of effective approaches in the organization of training (activity-based, competence-based, integrative), focused primarily not on providing the student with a set of theoretical knowledge, but on the formation of graduates with a set of "key competencies" in the relevant types of activities that will allow the graduate to become competitive in the labor market and to be professionally realized in the labor market.

As noted earlier, the most important task of the modern education system in the training of bachelors of technical profile is the formation of a set of "universal learning actions", providing mainly the competence "to learn to learn", the ability of personality to self-development and self-improvement through conscious and active mastering of new social experience, and not only the mastering by students of specific subject knowledge and skills within individual disciplines. In this case, knowledge, skills and abilities are considered as derivatives of the corresponding types of purposeful actions, i.e. they are formed, applied and preserved in close connection with the active actions of students themselves. All this imposes serious requirements to the organization of the educational process

in higher education institution, including the selection and professional implementation by teachers of adequate pedagogical technologies based on active methods and forms of learning.

For this purpose, this section of the dissertation research analyzed approaches to the organization of the educational process in universities of different countries, which have accumulated and generalized the best practices of engineering personnel training, whose activities have largely contributed to the achievement of a high standard of living.

Problem-oriented learning allows focusing students' attention on analyzing and solving a particular problem situation, which becomes the starting point in the learning process. Sometimes it is important not so much to solve a problem as to set and formulate it correctly. A problem situation maximally motivates students to consciously acquire the knowledge necessary to solve it. The interdisciplinary approach to learning allows students to learn to independently "extract" knowledge from different fields, to group and concentrate it in the context of a specific problem to be solved. As a result, a new quality of engineering education is achieved, providing a set of competencies, including fundamental and technical knowledge, ability to analyze and solve problems using interdisciplinary approach, mastery of project management methods, readiness for communication and teamwork. This approach in training is the most important source of self-development, self-realization and stimulus for further professional and personal growth of students. It creates conditions that almost fully correspond to the real engineering activity. Students acquire experience in complex engineering design problem solving with distribution of functions and responsibilities among team members. An important aspect of project-based learning is the development of students' cooperation skills in the group that implements the project.

The project-organized approach is based on the technology of project-based learning, the initial theoretical positions of which were summarized by J. Dewey and W. H. Kilpatrick in the following provisions:

- the educational process is built not in the logic of the subject, but in the logic of activities that have personal meaning for the student, which increases his/her motivation in learning;
- the solution of a specific problem of the surrounding reality is put in the center of the process of creating a training project;



– the teacher is only a guiding link in the activity, the process of creating a learning project is oriented to the independent activity of students;

– the learner becomes the subject of the educational process, sets goals and selects information, determines its necessity based on the idea of his/her project;

– an integrated approach to the development of training projects contributes to the development of general professional, communicative and research skills;

– individual pace of work on the training project ensures that each student reaches his or her own level of development;

– deep, conscious assimilation of basic knowledge is ensured through its universal use in different situations.

The goal of project-based learning is to create an environment in which students:

– independently acquire new knowledge from different sources;

– learn to use the acquired knowledge to solve cognitive, creative and practical tasks;

– acquire communicative skills by working in a team;

– develop research skills (problem identification, information gathering, observation, experimentation, analysis, hypothesis building, generalization, etc.) and systematic thinking;

– the teacher's activity in implementing the project method is carried out in three main directions:

– forming a bank of tasks;

– creating conditions for students to develop and implement educational and research projects;

– providing them with the knowledge and skills necessary for this.

Taking into account the considered theoretical positions, project-based learning resolves the contradiction between the abstract nature of learning and the real subject of future professional activity, as well as between the forms of organization of educational and cognitive process and forms of professional activity of specialists that are not similar to them.

Project-based learning is the pedagogical technology that meets the requirements of professional training to a greater extent than many others, as it encourages students to show their abilities to comprehend their activities from the standpoint of a value-based approach:

social, personal, related to cognitive interest, life and professional plans;

to see the problem, to hypothesize, to demonstrate intellectual skills;

to goal-setting, oriented to significant results;

– to synthesize, integrate and generalize information from different sources;

– self-education and self-organization;

– make informed choices and take non-standard decisions.

As it was mentioned earlier, the technology of project-based learning is very closely related to the technology of problem-based learning, which as a model, concept and set of pedagogical practices proceeds from the following principles. Firstly, a problem situation (real-practical or fundamental-theoretical) sets the starting point and direction of learning, contributes to focusing the student's attention on solving a specific problem. Secondly, problem-oriented learning implies orientation to the learner, i.e. students are motivated to independently formulate problems and propose a project to solve it. Thirdly, students are stimulated to think interdisciplinary and search for a solution to the problem. Fourthly, the main part of training takes place in the form of group or team work of students. These principles are implemented through the appropriate organization of the learning process and competencies of teachers.

The effectiveness of the educational process built on the principles of competence-based approach is significantly increased through the use of modern educational technologies, such as problem-oriented and project-organized learning combined with individualization of educational trajectories, interdisciplinary nature of learning and advanced independent work, contributing to the formation of design and construction competencies of bachelors of technical profiles.

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## ФОРМИРОВАНИЕ ПРОЕКТНО-КОНСТРУКТОРСКИХ КОМПЕТЕНЦИЙ БАКАЛАВРОВ ТЕХНИЧЕСКИХ ПРОФИЛЕЙ С ИСПОЛЬЗОВАНИЕМ ПРОЕКТНО-ОРГАНИЗОВАННЫХ ТЕХНОЛОГИЙ

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**Аннотация.** Современное разделение труда в области инженерной деятельности неизбежно приводит к специализации инженеров, основной составляющей любой инженерной деятельности является проектно-конструкторская деятельность, успешность которой зависит от сформированности соответствующих компетенций у выпускников.

**Ключевые слова.** Инженер, конструктор, компетенция, деятельность, обучение, технология.