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METHODOLOGY OF SCIENTIFIC SUBSTANTIATION OF THE INTRODUCTION OF DESIGN AND CREATIVE METHODS IN THE EDUCATIONAL PROCESS WHEN TEACHING THE COURSE "POWER SUPPLY OF INFOCOMMUNICATION SYSTEMS"

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Annotation

Identification and testing of pedagogical conditions (content, educational project environment, technology, etc.) that contribute to the formation of the design and creative culture of the future engineer, justification of the educational design and creative environment that provides the formation of project knowledge, project skills and psychological characteristics as a key condition for the formation of the design and creative culture of the future engineer's personality.

Keywords

Project methodology, creative methodology, education, pedagogy, engineering education, power supply, competencies, process management.

Problem statement and relevance of the study

Speaking about worthy university graduates who position themselves as engineers of the highest category, it is impossible not to highlight the aspects of effective implementation of the planned reforms in the field of education and in the energy sector. The lack of a healthy competitive environment, the presence of a significant quasi-public sector, and the inconsistency of tariff policy measures with the principles of a market economy lead to excessive state regulation and conflict of state and commercial interests.

Let us add to the above aspects that none of the efforts made can work without a well-trained specialist who has an understanding of professional competence as an integrative property of the specialist's personality, which characterizes his deep awareness in the professional field of knowledge, professional skills and competencies, personal experience and education of a specialist who is focused on prospects, prognosticate in work, open to dynamic get rich, self-confident and

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capable of achieving significant results and quality in professional activities and solving professional problems in the production sector.

Combining the efforts of scientific and research areas, higher education increases the possibility of graduating from the walls of a higher educational institution, professionals who are able to compete in the international arena. The efforts made by the government can only be projects if the attitude towards the introduction of fundamental factors for the effective use of successful pedagogical technologies does not change. It is innovative pedagogical technologies that allow us to unlock the potential of the student, revealing the inner hidden unique features of the individual. One of the promising areas that identify and develop the necessary competencies is the introduction of design and creative methods in the field of education.

Indicators of modern higher education imply independent continuing education, the basic platform of which a specialist receives in school education. However, some difficulties ultimately affect the quality of the necessary competencies acquired by graduates of higher educational institutions, which indicates the relationship between primary education and vocational and higher education. In other words, the basic buildings laid down in secondary schools, taught in a certain way, are associated with some limitations (time frames, lack of practical layouts, lack of technical training tools, lack of practical simulators, outdated teaching methods), and indicate the need to reform the entire education system, starting from primary school to higher education.

Of great importance in the development of education is the fact that scientific and technological progress imposes not only new requirements on the person himself, but also on the system of higher professional education. The contradiction between the growing volume of information and the crisis of didactic methods of training specialists requires a transition to fundamentally new technologies of professional training. It is becoming increasingly clear that there is a need to change the priorities of professional training of specialists in the direction of developing heuristic and creative thinking, becoming an individual as a subject of self-development, mastering the tools of managing their own educational activities.

Problem statement

Necessary to think about full-scale changes in the structure and system of education, such as transformation of the concept of education, real and systematic solution of issues of integration of the country's education system into the world educational space (academic lyceums, colleges, bachelor's and master's degrees), application of new pedagogical technologies, development of modern pedagogical

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content for preschool, school (basic), post-secondary, vocational and higher education, providing all structures and forms of education with modern technologies, development of state education standards for all levels of the education system, development of new curricula, and much more.

Research objectives

Based on the above, it is possible to identify the main directions for further improvement of education, in particular higher education.

Within the framework of a scientific experiment on the basis of the Tashkent University of Information Technologies, Department of "Energy Supply Systems", technologies for teaching the course "Power Supply of infocommunication systems" were developed and tested integrative, personality-oriented, developing educational technology that covers all elements of the educational process, aimed at the formation of professionally important intellectual and personal creative qualities, necessary for the effective activity of an engineer in the conditions of energy production by means of design and creative methods of training.

Main part

Objectives of the scientific research were to substantiate the use of project-based teaching methods in higher educational institutions. The meaning and main purpose of applying the project-based creative training methodology was to provide theoretical and practical justification for improving training in engineering education with the following indicators:

- The basis for the introduction of project-based creative training methods is the formation of professional competence and mobility of future engineers, the development of their technical thinking, which is due to the corresponding objective trend of complicating engineering activities in the context of developing industries;

- The conceptual basis for designing educational technologies is the ideology of a systematic approach to the design of all their components: target, management, and procedural, content and control;

- Development of an integrative approach that allows you to coordinate the achievement of various goals within a single educational process at the level of the target and control components, and at the level of the content and control components - to form a system of transdisciplinary knowledge, skills and abilities that ensure a high level of professional competence in the field of high-tech production;

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- Implementation of a differentiated approach that takes into account the initial level of readiness, personal motivation and the formation of creative qualities at each individual stage of the educational process;

- Management of the process of formation of professional competence of engineers by pedagogical means based on the integrated use of a mutually agreed system of all types of educational activities: both general (lectures, practical exercises) and individual (term papers and projects, production practices, diploma design, research work);

- Justification of educational technology that is integrated into the educational process and correlates with other technologies that are used to achieve other educational goals.

In the course of a scientific pedagogical experiment based on system-structural, activity-based and personal approaches, a model of organizing project-based and creative learning was developed, focused on the formation of students independence, meeting the needs of the information society with a high level of creativity, independence and self-development, professional competence and mobility, considered as an integral, dynamic system that includes interacting content and procedural levels. The dynamics that significantly improve learning outcomes, increase pedagogical stimulation of students ' cognitive activity, collaborative interaction between project participants, and correctional and pedagogical support of educational work are revealed.

The use of project-based and creative teaching methods ensured readiness to transform the surrounding reality, which includes psychological foundations, principles and mechanisms for implementing the pedagogical process with justification of pedagogical conditions (educational project environment, technology, methods, forms, etc.) and levels (heuristic, productive and creative), in the rational application of the educational project environment and technology in the educational process. As mechanisms for forming the project-creative culture of a professional training teacher and a set of competencies among students.

When applying the project-based creative teaching methodology in the context of engineering education, students clearly have guidelines for working in the context of developing industries. This technology includes the following components: definition and specification of educational goals, the main of which is the formation of professional competence and mobility, and the development of the creative component of technical thinking; selection and structuring of the content of education and its transformation into the content of training (theoretical and practical), allowing students to form a system of transdisciplinary knowledge, skills

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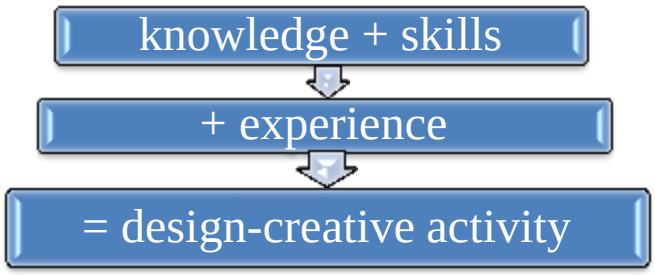
and abilities; selection of training technologies that are adequate to each stage of the educational process and allow solving specific tasks of these stages; a system for monitoring the level of students ' assimilation of technical knowledge and skills, including a system of technical tasks and tasks of various levels of complexity, as well as psychological tests that diagnose the basic properties of thinking.

In the course of the scientific experiment, various pedagogical technologies were used, based on the application of strategic, didactic, tactical and operational goals of the design and creative methodology. One of the basic technical steps taken as a basis, revealing the student's capabilities, is the B. Bloom training technique, in which it is easier to present educational goals in the form of activity samples. They describe learning activities and the objective results of these activities, which are easy to change and measure. Thus, the goal is the expected result that can be achieved through action, that is, the task-which is a prescription for action, in turn; tasks are solved by completing tasks, and allows you to orient the teaching teacher regarding qualitatively different educational results of students-students-competencies. The system contains approaches to activity and indications of the levels of students ' perfected competencies, understood as mastered methods of activity. Categories of educational goals in the project-based creative teaching methodology based on the B. Bloom method include:

Knowledge ↔ Understanding ↔ Application ↔ Analysis, Synthesis, and Evaluation.

As a result, we can talk about the formula:



Knowledge is the lowest entry level. All goals associated with this level are based on repetition: "list the laws of energy", "repeat Kirchhoff's law". Here it is enough to acquaint students with the relevant information so that they can repeat it.

Understanding - To demonstrate achievement at this level, students must present the material, as they understand it. The ability to summarize the

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information presented and present it in their own words confirms that the student has mastered it (with prints of the information received and its processing).

Application-at this level, goals are formulated in terms of applying the acquired knowledge to new (partially modified or new) situations learned.

Analysis-the goals of this level assume that students will be able to divide the material they are studying into its individual components and be able to describe its internal organization.

Complex link (synthesis) - having reached the goal of this level, students can effectively combine the acquired knowledge to form new structures. For example, the ability to integrate ideas from the program into a series of consecutive practical works.

Assessment is the highest sixth level, where students demonstrate relationships and make meaningful value judgments about the material studied and new data related to the field of study (Figure 2).

B. Bloom's taxonomy, taken as the main starting point, is an indicator of an increase in the degree of assimilated material. This is an attempt to organize different thought processes as a hierarchy. In this hierarchy, each level depends on the student's ability to work at that level or levels below it. For example, in order for a student to apply knowledge (stage 3), they must have the necessary information (stage 1) and have an understanding of it (stage 2).

In the final version, we can understand the prerequisites for implementing the structure of the design and creative methodology when mastering the course "Supply of infocommunication systems", based on the theory of B. Bloom derived in Table 1:

Levels training nters objectives the course ower pply of focommuni	**Definition, meaning**	**Actions student**	**Actions Teacher**	**Verbs for constructing task**

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Knowledge	Reproduction or location detection specific elements of e energy network formation base on nergy supply	Satisfy Perceives Remembers it Recognizes it Sets out Characterizes Describes	Directs Manages Directs Tells you Notifies you Shows Checks it out	Make a message, list, escribe, reproduce, tablish (what it is, here it is), formulate, arn, remember, tell, ate the facts, repeat, nd define.
Understand гние	Assimilating the eaning of a step-by-ep presentation material of the urse of ctures"Power pply of	Explains Interprets Interprets Proves it Discloses Identifies	Listening to He asks Compares Matches Polls Checks it out	Change, transform, formulate, describe, xplain, review, tell, mmarize, link gether, explain, make a nclusion, conclusion, nd state the main idea.
Application	Use of rules, ncepts, principles, eories, ideas in new tuations, practical daptation at power pply enterprises	Solves new ones problems Proves it Selects Organizes Initiates Generates	Facilitates Facilitates assistance Supports Observes Discusses Criticizes	Apply, try in practice, se, use, solve, prove, ow, illustrate, and do.
Analysis	Splitting formation into its mponent parts, identification of terrelations in the nthesis and analysis the construction of nergy systems	Discusses Discloses Lists Analyzes Divides into parts Parses it itically	Explores Encourages Observes Provides resources	Analyze, divide into arts, search, find, efine, distinguish, eck, compare, classify, fute.
Synthesis	Create a new or new roduct from various eas. a unique product, an, project, gorithm, or memo, report based on the eative work of nergy networks	Discusses Generalizes it Binds Matches Summarizes Summarizes	Organizes edback eflection) Expands Evaluates Develops it an idea Debating	Create, invent, predict, esign, design, imagine, nprove, suggest.

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Evaluation	Evaluating the lue of material or eas based on certain iteria or standards r the operation of e energy system	Judges Evaluates iscusses uestions Forms ompiles xpresses	Accepts Allows Agrees Recognizes Harmonizes Approves it	Make an opinion, come a conclusion, select, lect, evaluate, analyze, scuss, verify, argue, commend, define, stify, convince.

Training tasks in the project-creative teaching methodology in accordance with the levels of educational goals according to the Bloom taxonomy form various skills.

Thus, the first three levels of taxonomy – knowledge, understanding, and application-form repetitive (reproductive) skills – activities that consist in the ability to repeat or reproduce previously learned or just received information without distorting its meaning.

Tasks of the analysis and synthesis level are aimed at forming cognitive (developmental) skills - activities that require cognitive skills aimed at transforming explicit or hidden information. The basis of such skills is knowledge that is necessary for further in-depth knowledge of the discipline, or those that are further transformed into interdisciplinary knowledge.

Tasks of the assessment level are aimed at the formation of behavioral skills – these are those external and internal forms of behavior through which a person manifests his self-perception, perception of others, perception of various situations through his manner of reacting and acting.

Conclusions: analysis of the development of professional competencies showed that students form only basic knowledge, without analysis, synthesis and evaluation. For example, when studying the topic "Characteristics, functions and composition of electric energy sources of infocommunication systems based on the Smart system", students develop professional competencies at the level of definition, basic and generalized, while semantic, internal and required competencies are not developed.

The construction of a pair course using a project-based creative teaching methodology in higher educational institutions based on B. Bloom's technology makes it possible to clearly allocate time for all stages of the systematic development of the lesson. It is also possible to form vital competencies that are the basis for determining the purpose of the lesson. The student has the opportunity to compare the results obtained with real indicators and real factors during the analytical level. The teacher has the opportunity to track the development of

analytical thinking of the student during the lesson, and in the future during the entire course.

The ability to design classes based on a given goal is significantly different from designing a class based on a given content. The goal is aimed at developing a specific skill in the course of a couple of years.

B. Bloom's method marked the beginning of the formation of specific competencies and was the beginning of the development of a system of research procedures, which acts in the design of educational systems as a methodological regulator for building and transferring models to truly professional functions, but it was not sufficient to create a universal specialist who meets the requirements of the modern engineering market. The global development of engineering tells us about the need to create a unified teaching method that combines all the ideal opportunities and develops these opportunities to a creative level. When constructing the competence-based content of education, the idea of creating a method that meets the challenges of engineering development usingsmarttechnologies, namely, the project-based creative learning method arose.

But the systems of design and creative technologies that ensure the formation of competencies - key, basic, special, meeting the requirements of the educational standard-still need a deep modernization of the theoretical foundations for designing educational systems based on a new approach to creating its information and scientific and methodological base to provide an updated system of training personnel that form a new pedagogical thinking of researchers and didactic practitioners.

The main goal of design and creative technologists to create a base that will change the main function of the teacher: he will turn from a transmitter of information into a manager. The main thing for a teacher in the context of a modern couple is to manage the learning process. The role of the student also changes, he becomes an active person. The learning process takes the form of active research, which is aimed at the content of methods of action and their application in various conditions. The student's position is positioned by the willingness to engage in learning activities, because the teacher's tasks are a stimulator of active cognitive activity.

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