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Scientific Research Activity Of Future Engineers As A Pedagogical Problem

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Abstract: This article analyzes the process of preparing future engineers for scientific research as a pressing pedagogical issue in modern education. It highlights the methodological foundations for developing innovative thinking, problem-based approaches, experimental work, and research skills in engineering education. The article also examines current challenges in developing research competencies among students in technical higher education institutions and proposes solutions.

Keywords: Future engineer, research activity, pedagogical issue, innovative education, research competence.

Introduction: At the video selector meeting with the rectors of 36 universities on June 20, 2024, held under the chairmanship of the President of our country, on "Priority tasks in the system of training engineering personnel," it was noted with regret that the best practices and achievements in foreign universities were analyzed through "Cost engineering", "benchmarking" , and they were taught to take examples and implement them in production, " Reversible engineering " teaches to create similar products without violating copyright by breaking down the working mechanism of the finished product into parts, but in our country, no technical university has established training for these [1].

These criticisms of our President require in-depth scientific research in such areas of engineering activity as cost engineering, benchmarking, reverse engineering , and conducting research to understand and clarify the essence of engineering activity. In turn, the accumulation and formation of cost engineering, benchmarking, and reverse engineering skills in future engineers requires, first of all, the development of qualities of a striving for innovation, creative and non-

standard thinking, scientific and critical thinking on problems, a systematic and research approach, which, in turn, determines the relevance of forming skills for research activities in future engineers [3].

Higher education is one of the main stages in conducting research activities, and at this stage students have specific directions of research activities. There is a need to focus on increasing the effectiveness of personnel training based on equipping with educational models and technologies that have emerged on the basis of new pedagogical theories, to determine the goals, objectives, and content of the activities of youth organizations. At the present stage of the education system, new projects are being developed and widely implemented. Innovation, as one of the important tasks of modern higher education, is the level of education of the future specialist, sufficient for independent creative solution of worldview and research problems of a theoretical and practical nature [2].

Methodology. In this case, the mastery of research methods belongs to the essential characteristic of a high level of education of future engineers. In the studies of V.V.Davidov [5], L.V. Zankov [7], and others, it is noted that the originality of thought, the creativity of students, is most fully and successfully manifested in various types of educational activities with a research orientation.

Activity is a special form of specialized active attitude towards the surrounding world, the content of which is the purposeful transformation of the surrounding world and its replacement in accordance with people's interests.

The development and improvement of students' research activities as a mandatory component of the specialist training system is one of the important problems of pedagogy and psychology of higher educational institutions. In order to interpret research activity as an interdisciplinary category, we will consider its following components: activity and research.

According to V.V. Davidov, in the course of a multifaceted life, a person, first of all, carries out many specific manifestations of activity, differing in their objective content. In other words, each type of activity has a specific content according to its needs, motives, tasks, and actions [5].

Analyzing the semantics of the verb "research," V.K. Müller distinguished the following two parts: "Re" - "again, once again" and "search" - "scientific research, verification, testing, testing." Together, they mean thorough, systematic scientific study conducted in a specific field of knowledge.

I.A.Zimnaya considered research activity in the broad context of the information space, where the activity itself participates as a process, where the subjects of activity are active. Reflecting on research activity, he considered the following as a process of interaction: the activity of subjects working with objects of the real world or other subjects; the form of subject activity in research activity, manifested at all levels of its development (cognitive, conscious, intellectual, behavioral, social) [8].

Research activity is an activity related to the search for solutions to creative, research problems, the results of which are previously unknown, ensuring an active research point of view.

V.V. Davydov distinguished the following components of research activity: informational (obtaining information about existing knowledge, generalizing, recording this knowledge); analytical-critical (setting (forming) the research problem based on the analysis and critical study of existing knowledge, identifying a partially or fully unconscious part of the research topic); personal-research (conducting theoretical and experimental research to obtain new knowledge, recording intermediate research results); translational-formalizing (the emergence of messages and the appearance of scientific documents, recording the final research results and obtaining new knowledge) [5].

RESULT AND DISCUSSION

Theoretical analysis of the scientific literature allows us to identify the essential characteristics of the dissertation research. Research (in pedagogy) is the application of the method of scientific knowledge (in a broad sense) to solve problems in the field of education, training, upbringing. Research is understood as the process and result of scientific activity aimed at acquiring new knowledge about the laws of teaching and upbringing, the teaching of various disciplines, and the methodology of organizing educational work.

P. I. Pidkasisty writes that the following features of research activity arise [11]:

1) purpose is characteristic - cognition;

2) identification of a special area of research;

3) the use of special means of cognition;

4) homogeneity of terms.

A special feature of research activity is that new knowledge (discovery) obtained once forms the basis for the emergence of new knowledge for the next generation, which, in turn, leads to the achievement of new scientific results.

Research activity of students is a creative cognitive activity aimed at mastering independent theoretical and

experimental work using modern research methods and experimental techniques.

Currently, there is a need for special training of university students, in particular, future engineers, for research activities. Therefore, it is necessary to supplement the categorical apparatus of "research" with the concept of "preparation." Based on this, we will consider the etymology of the concept of "Readiness for research activities." When preparing future engineers for research activities in engineering fields of higher educational institutions, it is advisable to clarify the essence of the concepts of "readiness" and "preparation." In the process of analyzing psychological and pedagogical literature, we came to the conclusion that the concept of "preparation" is understood as the process of forming the knowledge, skills, and qualities of a person necessary for performing professional activity. Most researchers have defined "readiness" as the result of readiness.

In modern pedagogy and psychology, a very wide range of theoretical and practical works has accumulated on the problem of forming a person's readiness for activity in various fields, but there is no single approach to solving this problem. Psychologists have considered readiness for activity from the point of view of a personal and activity-based approach.

According to the personal approach, training is considered as a manifestation of individual qualities of the individual and their integrity, associated with the effective performance of activities that allow achieving high results.

According to the activity approach (E.P. Ilin [9] and others), readiness is considered as a specific mental state of the individual and is divided into short-term and long-term readiness, i.e., it is studied in a temporal state.

Within the framework of the component approach, readiness for research activity and research competence are the same (similar) concepts in meaning. In this case, research competence is formed throughout a person's life, therefore it was considered appropriate to talk about the formation of readiness in the process of training bachelors.

Research competence (readiness for research activity) is considered non-algorithmic, since students use both known and new algorithms in its implementation. The application of critical analysis, communicative and other skills, personal qualities in the process of forming research competence in students confirms its multidimensionality. From this it is evident that research competence (readiness for research activity) is characterized by features of basic competence. It is the basis for the formation of subject-oriented competence (general cultural and professional). Because it allows the student to study successfully, to become a competitive specialist, that is, to become a competent specialist. This, in turn, determines the significance of its formation.

Analysis of the essence of the concepts "readiness," "professional readiness," "research competence" allowed us to adjust this concept, taking into account its similarity to research competence in the context of a competency-based approach. As a result, we defined the readiness of future engineers for research activities as follows. Readiness of future engineers for research activity is an integrative personal characteristic that ensures, develops an active research point of view on innovative technologies and activity in production and application, and on oneself as its subject. Based on the analysis of the conducted pedagogical research, consideration of the important characteristics of research activity allowed us to conclude that it consists of three main components:

Activity determines the level of mastery of methods for performing research actions, the ability to apply formed skills, methods of actions, and accumulated knowledge in practice.

Issues of motivation of research activity have been widely considered. I.Yu.Danilova determined that motivation for research activity allows: creating an environment that allows the student to independently search for solutions to the tasks set before him, a favorable psychological situation encourages the pursuit of research. The following are distinguished as conditions for the development of the student's cognitive capabilities: interdisciplinary integration, project activity; students' stable orientation towards acquiring scientific knowledge; understanding it as a value for designing their life future; the emotional-value nature of the relationship between teachers and students [9].

A.L. Mazaletskaya expressed the motivation of research activity as a system of factors, including all its types: motives, needs, interests, inclinations, etc. They implement the goals of this activity [10].

For the effective preparation of future engineers for research activities, it is possible to develop the cognitive activity of students by introducing methods and forms of active learning, information technologies into the educational process, implementing the idea of modular learning in the educational system, and developing a technology for building a creative direction of learning. E.Yu. Girfanova's work focuses on the process of students' awareness of the necessity of research activity as a factor in their professional development [4].

Thus, the issues of student motivation for research

activities were considered by researchers in various aspects: However, insufficient attention was paid to the motivation of forming readiness for research activities, the development of a value-oriented system in research activities, taking into account the provision of an emotional-value component, the formation of stable student motivation, and at the same time, aesthetic and ethical norms for self-expression in the profession.

CONCLUSION

Interpretation of students' educational and research activities using teaching methods based on a creative approach implies the possibility of transitioning to a subjective point of view by providing students with the opportunity to choose an individual teaching strategy, stimulating the formation of students' reflection.

To activate the research activities of future university engineers, researchers have proposed the use of innovative technologies, which allows for self-learning and orientation of activity by activating experience, creating a successful situation, and entering a reflexive state.

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