KEY FUNCTIONAL ASPECTS OF THE EDUCATIONAL PROCESS AND FUNDAMENTAL PRINCIPLES FOR INTEGRATING EDUCATION WITH INDUSTRIAL PRACTICE

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ABSTRACT

This article examines the key functional elements of the pedagogical process and reveals the principles of integrating education, science, and production. Particular attention is paid to analyzing mechanisms for increasing the effectiveness of educational activities through deeper interaction with scientific and industrial sectors.

The pedagogical process represents a form of purposeful interaction between a teacher and a learner, within which various interrelated components function. In modern conditions of improving education quality, the integration of the educational process with scientific and industrial activity acquires special significance. Such integration contributes not only to a more rational organization of learning but also ensures the connection between students' theoretical knowledge and practical skills, which, in turn, fosters the formation of professional competencies.

In the process of training future engineers, teachers regularly solve complex pedagogical tasks aimed at gradually moving students from one level of mastering knowledge, skills, and qualifications to a higher one. Various methodologies and approaches exist to ensure this transition.

At the same time, it becomes necessary to determine which technologies are most appropriate in specific educational situations. As key criteria for assessing the effectiveness of engineering training design, one can distinguish: first, the presentation of technology as a system of interconnected elements, and second, the degree of algorithmization of the educational process. The latter criterion presupposes clearly defined procedures, logical completeness, and the stability of educational technology. Both criteria are based on the functional elements of the pedagogical process, representing stable and profound interconnections between the key structural components formed through the interaction of teacher and learner. These connections determine the direction and dynamics of the

development of pedagogical systems, contributing to their improvement, stability, and viability.

Modern pedagogical systems are characterized precisely through the prism of such functional components. Each structural element emerging within various forms of individual and collective activity of participants in the educational process enters into new types of interaction with other components and forms a complex system of mutual influences.

To enhance the effectiveness of the pedagogical process, systematic development of its functional components is required. In this regard, the integration of the education system with science and industry should be built upon innovative methodological foundations. Such an approach enriches the educational process in practice, facilitates the training of qualified specialists who meet the demands of modern industry, and strengthens scientific research activities.

It should be emphasized that under contemporary social transformations, new forms of interaction between different spheres of social life must be established.

The modern unity of knowledge-intensive production and engineering education is characterized by the innovative nature of project and technological activities that encompass not only professional communities but also all participants in the educational process. In the context of an increasingly complex social engineering environment, special importance is attached to competent and motivated participants who can effectively realize their personal and professional qualities, demonstrate innovative thinking, a commitment to lifelong learning, self-organization, creative self-expression, and productive teamwork.

An analysis of the theoretical and methodological foundations of integrating education, science, and industry has made it possible to reveal the essential characteristics and regularities of integration processes in education, forming a unified educational space in close interaction with research institutions and industrial structures. The main regularities determining the effectiveness of integration include the following:

— integration processes become more productive as the potential for development between the education system, science, and industry is actively utilized;

— the effectiveness of integration directly depends on the number of structural components involved;

— a high level of professional training of specialists is ensured through the balance and coordination of the interests of all participants in the integration process educational institutions, research centers, and industrial enterprises;

The formation of competitiveness among future engineers and their orientation toward professional activity in the industry becomes possible through the inclusion of elements of integration with science and production in the educational process.

Enhancing the efficiency of the pedagogical process requires the coordinated development of its functional components and the deepening of integration between education, science, and industry. To achieve these goals, it is necessary to expand cooperation between educational institutions and industrial enterprises, actively introduce the results of scientific research into practice, and apply modern innovative pedagogical technologies. Such a comprehensive approach contributes not only to improving the quality of the educational process but also to

the formation of highly qualified specialists capable of effectively realizing their potential within the modern industrial environment.

References:

1.PEDAGOGICAL CONDITIONS OF SUCCESSFUL PROFESSIONALLY DESIGNED MATHEMATICAL EDUCATION IN THE TECHNICAL UNIVERSITIES - European Journal of Research and Reflection in …, 2015

2.Зеер Э.Ф., Павлова А.М., Сыманюк Э.Э. Модернизацияпрофессионального образования: компетентностный подход. М. – 2005. – с. 44-46.

3.Иванов Д.А. Компетентности и компетентностный подход всовременном образовании. М, 2007 г.

4.Park J., Teo T. W., Teo A. et al. Integrating artificial intelligence into science lessons: teachers' experiences and views // IJ STEM Ed. – 2023. – № 10 (61). – P. 1–22.

5. Yang, C., Zhang, J., Hu, Y. et al. The impact of virtual reality on practical skills for students in science and engineering education: a meta-analysis // IJ STEM Ed. – 2024. – № 11 (28). – P. 1–15.