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PRINCIPLES FOR IMPROVING THE METHODOLOGY FOR DEVELOPING THE PROFESSIONAL TRAINING OF FUTURE ENGINEERS USING DIGITAL TECHNOLOGIES

Tursunov Muzaffar Ilhamovich
PhD Student, Jizzakh Polytechnic Institute
tursunovmuzaffar52@gmail.com

Abstract
This article discusses the issues of developing the professional training of future engineers based on modern digital technologies. The possibilities of improving students' knowledge, skills and competencies through the effective use of digital tools in the educational process are analyzed. The main principles of improving the methodology of professional training are also developed.

Keywords: Digital technologies, engineering education, professional competence, innovative methods, interactive education.

Introduction

Currently, global digital transformation processes are causing fundamental changes in all sectors of the economy, in particular in engineering activities. The automation of production processes, the widespread introduction of artificial intelligence, big data (Big Data), and cyber-physical systems within the framework of the new stage of industry - Industry 4.0, are fundamentally renewing the requirements for engineering personnel.

From this point of view, it is clearly evident that organizing the professional training of future engineers based on traditional approaches is not enough. A modern engineer must have not only fundamental theoretical knowledge, but also the competencies to work with digital technologies, model, analyze and manage complex systems. The rapid introduction of digital technologies in the education system makes it possible to individualize the learning process, create a flexible learning environment, and activate students' independent learning activities. In

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particular, virtual laboratories, simulation models, distance learning platforms, and intelligent learning systems are seen as important tools for improving the efficiency of engineering education.

However, the analysis of existing scientific research shows that the systematic improvement of the methodology for developing the professional training of future engineers based on digital technologies, the clarification of its theoretical and methodological foundations, and the development of effective pedagogical principles remain an urgent scientific problem. The purpose of this article is to identify the theoretical foundations and priority principles for improving the methodology for developing the professional training of future engineers using digital technologies.

Main Part

1. The role of digital technologies in engineering education

Digital technologies allow for individualization of the educational process, increased interactivity, and the development of practical skills.

Including: virtual laboratories, simulation programs, online platforms, and artificial intelligence-based systems.

These tools develop students' ability to work independently and bring them closer to a real production environment.

2. Features of the methodology for developing professional training

The methodology for training future engineers includes the following aspects:

Integration of theory and practice, project-based learning (PBL), problem-solving, and working on digital platforms.

These approaches develop students' analytical thinking and innovative approach.

3. Principles of improving methodology

Improving professional training methodologies based on digital technologies is based on the following principles:

3.1. The principle of integrativity

Different sciences and technologies should be taught in an interconnected manner.

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3.2. The principle of interactivity

It is important to create an environment where students are actively involved.

3.3. The principle of adaptability

Educational content must be able to quickly adapt to modern technological changes.

3.4. The principle of practical orientation

The knowledge gained must be applied in real-life situations.

3.5. Principle of developing digital competence

Students will develop a culture of using information technologies.

Proposed model

The model for developing the professional training of future engineers consists of the following components: Target component, content component, technological component, and outcome component.

Organizing the educational process based on this model increases efficiency.

Conclusion

Developing the professional training of future engineers based on digital technologies is one of the relevant directions of modern education. The proposed principles and methodological approaches are important in improving the quality of education and preparing students for the labor market.

The above analysis shows that the development of professional training of future engineers based on digital technologies is one of the priority areas of the modern education system. The educational process organized in a digital environment serves not only to strengthen the theoretical knowledge of students, but also to develop their practical skills, independent thinking, and problem-solving competencies.

The study found that improving the methodology of professional training based on the principles of integrativeness, interactivity, flexibility, practical orientation, and the development of digital competencies yields effective results. An educational model organized on the basis of these principles significantly

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increases the level of professional readiness of future engineers and adapts them to the requirements of the modern labor market.

Also, the introduction of digital technologies into the educational process increases the openness, transparency, and efficiency of the educational process, and expands the possibilities for an individual approach. This, in turn, serves as an important factor in increasing students' motivation for learning and revealing their creative potential.

In future scientific research in this area, it is appropriate to deeply study the pedagogical possibilities of using artificial intelligence, digital twins, and adaptive learning systems in engineering education, as well as evaluate their practical effectiveness on an experimental basis.

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