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Pedagogical potential of 3d technologies in preparing future engineers for industrial activities in a digital environment

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Abstract: This article analyzes the role and pedagogical potential of 3D technologies in preparing future engineers for industrial activities within a digital educational environment. It highlights the advantages of educational processes based on 3D modeling, virtual reality (VR), and augmented reality (AR) technologies, their importance in developing engineering thinking, and their role in forming practical skills. Additionally, the impact of educational models developed using 3D technologies on improving teaching effectiveness is scientifically substantiated. The article also examines innovative approaches and mechanisms for developing digital competencies.

Keywords: 3D technologies, digital environment, engineering education, industrial activities, digital competencies, virtual modeling, educational innovations.

Today, the digitalization of the industrial sector and the "Industry 4.0" concept are having a profound impact on the education system. In the field of engineering, the demand for specialists proficient in digital technologies is growing. Consequently, the use of 3D technologies in preparing future engineers for production activities at higher educational institutions is becoming a crucial pedagogical necessity. Through 3D modeling and digital prototyping technologies, students develop competencies in spatial thinking, design thinking, and systematic analysis of production processes.

3D technologies offer great potential in preparing future engineers for production activities in the digital environment, developing their practical skills, creative thinking, and problem-solving abilities. These technologies enable modeling, testing, and studying complex structures, machines, and processes in a virtual environment.

The main pedagogical possibilities of 3D technologies:

Development of practical skills:

Virtual Laboratory: Students learn to assemble, configure, and repair complex machines and systems without the risks and costs associated with real equipment.

Real-time exercises: Through virtual simulations of production processes using 3D models, students perform practical exercises on specific tasks.

Enhancement of design and creative abilities:

Design and modeling: Students learn to create their projects in 3D format, test their viability, and refine them.

Deepening understanding: 3D views help to visually comprehend the internal structure of objects and their operational processes, which leads to a more profound grasp of engineering concepts.

Developing problem-solving and analytical thinking skills:

Virtual prototyping: Students can quickly model their ideas in 3D format and test their effectiveness.

Error detection and correction: Teaches how to analyze and find solutions to problems that arise during virtual simulations.

Interactive and motivating learning environment:

Engaging learning process: 3D technologies present complex topics in a visual and interactive manner, making the learning process interesting and effective.

Self-monitoring: Students reinforce their knowledge by observing the results of their step-by-step work in 3D view.

Conclusion

3D technologies introduce new approaches to traditional teaching methods in engineering education. They enable students to transform theoretical knowledge into practical skills, find innovative solutions to engineering problems, and train highly qualified specialists who meet the requirements of modern production.

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