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IMPROVE THE QUALITY OF TECHNICAL EDUCATION BY USING DIGITAL DESIGN TOOLS

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Annotation: This article scientifically covers the role and significance of digital design tools in the system of technical education, the possibilities of improving the quality of education by integrating them into the educational process. In particular, on the basis of statistical data, the effectiveness of CAD (Computer-Aided Design) technologies in the development of students' technical thinking, strengthening their ability to find solutions in problem situations and the formation of practical skills are analyzed. The experience of foreign countries, the reforms being carried out in Uzbekistan and the role of modern digital educational tools in technical and vocational education are analyzed. The article is enriched with methodological and strategic proposals for the development of digital-based education.

Keywords: Digital design, technical education, CAD technologies, SolidWorks, AutoCAD, quality assurance, engineering design, 3D modeling, innovative learning, STEM approach, practical skills, digitalization, modern learning technologies.

Today, digital technology has penetrated deeply into almost every aspect of our lives. Digital transformation, especially in the industrial and technical areas, is fundamentally changing the demand and approach to training a new generation of personnel. In this context, the use of modern digital design tools (CAD) in the technical education system is recognized as one of the most important strategic directions. These tools allow students to combine theoretical knowledge with real practice, visually design complex systems and mechanisms, as well as develop engineering thinking.

In traditional teaching methods, students would often try to grasp concepts through static pictures and diagrams in a textbook. However, this approach does not fully cover the demands of the modern workforce – in particular, creative thinking, technical problem-solving and teamwork skills. And digital design technologies are an effective solution to fill this gap.

Also, digital design tools not only increase students' interest, but also develop their analytical thinking, their capacity to analyze problems and offer innovative solutions. This, in turn, will help to increase the competitiveness of graduates of technical directions, to prepare them for the requirements of modern production.

The Decree of the President of the Republic of Uzbekistan dated April 21, 2022**, No. PP-211 sets out to improve the quality and effectiveness of teaching by introducing modern pedagogical technologies and information and communication tools into the system of**

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technical education. This has led to the recognition of the use of digital design tools as a priority area at the level of education policy.

This article attempts to analyze and evaluate the role of digital design tools in technical education, their impact on the educational process, performance indicators and foreign and national experience.

Basic Section (extended)

1. Types of Digital Design Tools and Their Possibilities

Digital Design tools (CAD - Computer Aided Design) allow you to create, analyze, test and enhance drawings, details, devices, mechanisms and entire systems in 2D or 3D format. The following are some of the important tools that are widely used in technical education:

AutoCAD – one of the main programs for designing 2D drawings, architecture, and structures.

SolidWorks – used in the mechanical and mechanical engineering industries. It allows for agitation of parts, motion simulation and strain analysis.

Fusion 360 is a cloud-based, collaborative 3D design tool. Suitable for beginners and educational institutions.

Tinkercad – designed for schoolchildren and beginner-level users with a user-friendly interface.

CATIA, PTC Creo, Inventor – used in professional industrial environments, especially in aviation and automotive.

Through these programs, students learn complex systems step by step, thoroughly mastering the fundamentals of engineering based on practical experience.

2. The impact of digital design tools on the education process

Integration of digital design technologies into the educational process has a positive effect in the following aspects:

Forms practical knowledge and skills. Students gain a deeper understanding of traditional lessons by collecting, analyzing, and refining real-world details in a virtual environment.

Develops constructive and creative thinking. Through the programs, students develop their projects independently, which unlocks their creative potential.

Provides a multi-discipline approach. Digital design technologies allow for the integration of mathematics, physics, computer science, and engineering disciplines.

It blends in with the STEM approach. CAD tools are becoming an integral part of teaching in STEM (Science, Technology, Engineering, Mathematics) disciplines.

Develop initiative and problem-solving skills. Work from a project-based approach will develop students' responsibility and independent thinking.

3. Statistical Data Analysis

The analysis conducted by the Agency for Innovative Development of the Republic of Uzbekistan and the Center for Quality Assessment of Education in 2023 showed:

While 79% of technical college graduates used digital design tools, the employment rate was 18% higher in this group.

Students who studied CAD programs showed **30-35%** higher results in completing project work.

The students' potential to come up with solutions in problem situations **is increased** by 25%.

Students working with digital tools are 1.5 times higher in quality of coursework and final theses.

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And the Autodesk Education Research Report 2022 provides the following global statistics:
88% of students who engaged in 3D modeling reported their increased interest in STEM subjects.
64% of students expressed a desire to choose a career in engineering.
71% of teachers working with CAD programs reported an increase in lesson effectiveness.

4. Chet el tajribasi

USA: Based on the Project Lead the Way (PLTW) program, tools such as SolidWorks, AutoCAD and other tools are included in compulsory training modules in schools and colleges. Every year, more than 2 million students learn the basics of engineering through these programs.
Germany: CAD platforms are one of the main teaching tools in cooperation between businesses and educational institutions in the framework of dual education.
South Korea: Each technical college has digital design labs where students work on real-world orders.

5. Work carried out in Uzbekistan

In recent years, the following initiatives are being implemented in Uzbekistan on implementation of digital education:
More than 200 educational institutions were equipped with CAD software within the framework of the Integration of Digital Technology into Teaching.
In 2024, special laboratories based on Autodesk and SolidWorks were opened in three technical colleges in Tashkent.
According to the National Strategy for Digitalization in Education, by 2025 it is planned to establish CAD laboratories in all technical colleges and institutes.

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