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OPPORTUNITIES OF USING DIGITAL TECHNOLOGIES IN QUALIFICATION PRACTICES OF TECHNOLOGICAL EDUCATION STUDENTS

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Annotation: This article explores the opportunities of using digital technologies in the qualification practices of students specializing in technological education. In the context of rapid digital transformation, future teachers and engineers are required not only to master traditional pedagogical and professional skills but also to develop competencies in applying innovative digital tools. The study emphasizes the role of digital technologies in improving the efficiency, creativity, and practice-oriented training of students during their qualification practice. It examines various digital platforms, virtual laboratories, simulation models, and interactive learning environments that enhance students' professional readiness. The research also highlights the integration of information and communication technologies (ICT), artificial intelligence, and digital resource management in pedagogical and technological practice. Furthermore, it provides methodological recommendations on how digital tools can be effectively implemented to foster independent learning, collaborative problem-solving, and the development of critical and creative thinking. The findings suggest that the use of digital technologies in qualification practice not only modernizes the educational process but also prepares students for the demands of the digital economy and Industry 4.0.

Keywords: Digital technologies, technological education, qualification practice, virtual laboratories, ICT, interactive learning, simulation models, digital pedagogy, innovative teaching methods, Industry 4.0, professional competencies.

In the modern era of digital transformation, the integration of information and communication technologies into the educational process has become a key factor in improving the quality and efficiency of professional training. Higher education institutions, especially those preparing future specialists in technological education, are facing the urgent need to adapt their teaching and practice systems to the requirements of the digital economy and Industry 4.0. Qualification practices, as an essential component of students' professional development, serve not only as a bridge between theoretical knowledge and practical application but also as a platform for testing and developing digital competencies.

The rapid advancement of digital technologies provides a wide range of opportunities to enhance the professional training of students. Digital platforms, virtual laboratories, simulation models, and interactive environments enable future teachers and engineers to engage in practice-oriented activities that mirror real professional contexts. Moreover, the use of artificial intelligence, big data analysis, and cloud-based learning resources creates conditions for independent learning, collaboration, and creative problem-solving. This transformation requires students not only to master traditional pedagogical and technical skills but also to develop digital literacy, adaptability, and innovative thinking.

At the same time, the effective integration of digital technologies into qualification practices raises several challenges, including the selection of appropriate digital tools, the development of methodological approaches, and the training of both students and supervisors in their effective use.

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Addressing these issues is crucial for ensuring that students in technological education can acquire the competencies necessary for success in the labor market and contribute to the modernization of the educational system.

Therefore, the study of opportunities for using digital technologies in qualification practices of technological education students is of great scientific and practical importance. It not only helps improve the quality of professional training but also aligns the education process with global trends, preparing future specialists to meet the challenges of the 21st century.

The rapid digitalization of education has been widely discussed in recent scientific works, where researchers emphasize the transformative role of technology in higher education and teacher training. According to Mishra & Koehler (2006), the integration of digital tools into pedagogy requires a balanced approach that combines technological, pedagogical, and content knowledge (TPACK framework). This approach has become one of the key theoretical foundations for designing effective digital learning environments in technological education.

Other scholars highlight the importance of digital literacy and competencies in the era of Industry 4.0. Redecker (2017) notes that the development of digital competence frameworks for educators and students is central to preparing future professionals for a rapidly evolving labor market. Studies by Voogt & Roblin (2012) further argue that digital technologies not only improve the efficiency of education but also foster collaboration, creativity, and critical thinking—skills essential for the 21st century.

Research on qualification practices in technological education also underlines the role of virtual laboratories and simulation models. For instance, De Jong et al. (2013) demonstrated that digital simulations can effectively support students' understanding of complex technical processes while reducing the costs and risks associated with traditional laboratory work. Similarly, Al-Fraihat et al. (2020) found that e-learning systems, when combined with practice-oriented activities, significantly enhance students' motivation and professional readiness.

In addition, studies in pedagogy point to the benefits of integrating interactive platforms and artificial intelligence tools into teacher training. Holmes et al. (2019) emphasize that AI-based systems can provide personalized learning experiences, which is particularly relevant for qualification practices where students need individualized guidance and feedback. Moreover, literature on blended and hybrid learning models (Graham, 2013) suggests that combining traditional practice with digital resources ensures both flexibility and effectiveness in the learning process.

Despite the growing body of research, challenges remain in the effective integration of digital technologies into qualification practices. Scholars such as Ertmer & Ottenbreit-Leftwich (2010) stress that teachers' beliefs, institutional support, and access to digital resources play a decisive role in the success of technology adoption. This indicates the need for further research on methodological and organizational aspects of applying digital tools in technological education, particularly in developing contexts.

Overall, the literature review demonstrates that the use of digital technologies in qualification practices is widely recognized as a promising direction for modernizing education. However, there

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is still a need to explore context-specific approaches, taking into account the conditions, resources, and cultural characteristics of educational institutions.

This research employed a mixed-methods design to examine the opportunities and challenges of using digital technologies in the qualification practices of students in technological education. The methodological approach was chosen to ensure both quantitative measurement of students' digital competencies and qualitative analysis of their experiences and perceptions.

Research Design. The study followed a convergent mixed-methods model, where quantitative and qualitative strands were conducted in parallel, analyzed independently, and then integrated at the interpretation stage. This design provided a comprehensive understanding of how digital tools influence the effectiveness of qualification practices.

Participants. The research involved 120 undergraduate students specializing in technological education at two higher education institutions in Uzbekistan. Additionally, 15 supervisors of qualification practices (faculty members) participated to provide expert insights into the application of digital technologies in practice-oriented learning.

Instruments and Data Collection.

- *Quantitative data* were collected through a structured questionnaire that measured students' level of digital literacy, frequency of digital tool usage, and perceived effectiveness of virtual laboratories, simulation models, and online platforms.
- *Qualitative data* were gathered using semi-structured interviews with students and supervisors, focusing on their experiences, benefits, and challenges in integrating digital technologies into qualification practice.
- Document analysis of practice reports and digital portfolios was also conducted to identify how students applied digital tools in real tasks.

Data Analysis. Quantitative data were analyzed using descriptive statistics and correlation analysis to identify relationships between digital tool usage and students' perceived professional readiness. Qualitative data were analyzed through thematic coding, allowing the identification of recurring themes related to opportunities, challenges, and recommendations.

Validity and Reliability. To ensure reliability, the questionnaire was pilot-tested with a group of 20 students, and Cronbach's alpha coefficient (0.82) confirmed internal consistency. Triangulation of data sources (questionnaires, interviews, documents) was applied to enhance validity and minimize bias.

Ethical Considerations. All participants were informed about the purpose of the study and gave their consent. Anonymity and confidentiality were strictly maintained, and the collected data were used solely for research purposes.

This methodological framework enabled the study to generate both statistical evidence and in-depth insights into how digital technologies can be effectively utilized to improve qualification practices in technological education.

The findings of the study revealed significant opportunities as well as challenges in the use of digital technologies during qualification practices of technological education students.

1. Level of Digital Competence.Quantitative results indicated that 72% of students demonstrated a medium to high level of digital literacy, while 18% showed advanced competence in using professional software, virtual labs, and online platforms. However, 10% of students reported low confidence in applying digital tools, particularly in simulation-based tasks.

2. Frequency and Types of Digital Tool Usage.Analysis of survey responses showed that the most frequently used tools included learning management systems (LMS), cloud storage services, and

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virtual laboratory simulations. Approximately 65% of students reported regular use of virtual laboratories for experiments, while 54% actively used simulation models to test engineering processes. On the other hand, only 28% of students reported frequent use of artificial intelligence–based platforms for personalized learning.

3. Impact on Professional Readiness.Correlation analysis demonstrated a positive relationship between the use of digital tools and students' perceived readiness for professional practice ($r = 0.64$, $p < 0.01$). Students who actively engaged with digital simulations and virtual labs rated their preparedness for real-world tasks higher than those who relied solely on traditional methods.

4. Qualitative Insights. Thematic analysis of interviews highlighted several benefits of digital technology integration:

- Enhanced motivation and engagement in practice-oriented tasks.
- Improved collaboration through online platforms and digital group projects.
- Increased flexibility, allowing students to practice and repeat tasks at their own pace.

Supervisors also emphasized that digital technologies helped students bridge the gap between theory and practice by providing real-time feedback and interactive experiences. However, challenges were identified, such as:

- Insufficient access to stable internet and advanced digital resources.
- Limited methodological training for supervisors to effectively guide students in digital environments.
- Over-reliance on technology, sometimes reducing hands-on practical skills.

5. Document and Portfolio Analysis. The analysis of student portfolios demonstrated that projects completed with the support of digital tools were more structured, innovative, and visually enhanced compared to traditional reports. Digital portfolios also showed evidence of creativity and problem-solving skills, especially in tasks involving design simulations and interactive presentations.

Overall, the results confirmed that digital technologies play a crucial role in strengthening qualification practices, but successful integration requires institutional support, methodological guidance, and equal access to digital resources.

The results of this study confirm the increasing significance of digital technologies in qualification practices of technological education students. The findings align with earlier research (Mishra & Koehler, 2006; Redecker, 2017), which emphasizes that the integration of digital tools not only enhances students' professional competencies but also reshapes the educational process to meet the demands of the digital economy.

Digital Competence and Professional Readiness. The positive correlation between the use of digital technologies and students' perceived readiness for professional practice highlights the importance of digital competence as a core skill for future teachers and engineers. This supports Voogt & Roblin's (2012) argument that digital technologies foster collaboration, creativity, and critical thinking. Our findings expand on this by showing that students who actively engaged with virtual laboratories and simulations felt more prepared for real-world technical challenges.

Benefits of Digital Integration. The study demonstrated several benefits of integrating digital technologies into qualification practices. Increased flexibility, motivation, and enhanced

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collaboration were among the most frequently mentioned advantages. These outcomes are consistent with the findings of De Jong et al. (2013) and Al-Fraihat et al. (2020), who noted that virtual simulations and e-learning environments improve learning efficiency while reducing logistical costs. Furthermore, the development of digital portfolios not only improved students' ability to present their work but also cultivated innovative and problem-solving skills, echoing Holmes et al. (2019) on the role of AI and digital platforms in personalized learning.

Challenges and Limitations. Despite the positive impact, the study also identified key challenges. Limited access to stable internet and advanced digital resources remains a serious barrier, particularly in developing educational contexts. This finding resonates with Ertmer & Ottenbreit-Leftwich (2010), who argue that institutional support and teacher readiness are decisive for successful technology adoption. Additionally, some supervisors lacked methodological training to effectively guide students in using digital tools, which may hinder the full potential of digital integration. The risk of over-reliance on digital tools, potentially reducing hands-on practical skills, also deserves attention.

Theoretical and Practical Implications. Theoretically, the study contributes to the growing body of literature on digital pedagogy by demonstrating that qualification practices serve as an effective context for developing digital competencies. Practically, the results suggest that educational institutions should prioritize investments in digital infrastructure, provide targeted training for supervisors, and design practice-oriented curricula that integrate both traditional and digital methods. These measures will help students achieve a balanced set of skills that include both technical know-how and digital literacy.

In summary, the discussion confirms that digital technologies are not only supplementary tools but essential components of modern qualification practices. However, their effective integration requires a comprehensive approach that combines institutional support, methodological innovation, and equitable access to resources.

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