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DEVELOPING STUDENTS' DIGITAL COMPETENCES IN THE CONTEXT OF DIGITALIZATION: A MEDICAL PERSPECTIVE

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Abstract: Digital competences are increasingly recognized as one of the key factors in the contemporary digital transformation process. Today, not only human activity but also various technological systems play an ever-growing role in the creation and transmission of information. Although the development of artificial intelligence (AI) and information and communication technologies (ICT) significantly optimizes educational and occupational processes, it may also lead to insufficient development of certain essential digital skills. Consequently, this situation may negatively affect future professional growth and reduce competitiveness in the labor market. Moreover, some individuals interpret the concept of digital competence too narrowly, equating it merely with the ability to use social media, thus perceiving these platforms as their primary source of information.
Keywords: Digital competences, Digital transformation, Artificial Intelligence (AI), Information and Communication Technologies (ICT), Digital skills, Labor market competitiveness, Social media and information culture.

Introduction. In the context of rapidly accelerating digitalization, digital competences have become an integral component of modern professional preparation and the educational process. The evolution of artificial intelligence (AI) and digital technologies is transforming the structure of the labor market, generating new professional requirements and competence models, while simultaneously giving rise to challenges that were previously nonexistent. Contemporary conditions require employees to remain highly adaptable and to operate effectively within geographically distributed and dynamically changing work environments [1].

Such an environment necessitates not only proficiency in the use of digital tools but also preparedness for collaboration with automated systems, intelligent technologies, and AI-driven devices. This shift is accelerating the transition from traditional forms of human labor to innovative mechanisms based on cyber-physical systems. From this perspective, equipping future specialists with the digital competences demanded by the increasingly complex and multi-layered digital infrastructure of the modern labor market is becoming a strategic priority.

In particular, enhancing students' digital literacy—developing their ability to work with information, think analytically within technologically advanced contexts, apply algorithmic reasoning, process data, and collaborate effectively in virtual teams—is emerging as a fundamental direction of the educational process in the era of digital transformation. Mastery of digital skills is no longer an advantage but a necessity for maintaining competitiveness in the labor market. Therefore, the systematic development of digital competences serves as a critical factor in strengthening students' professional identity, increasing their adaptive capacity, and broadening future opportunities for professional development and lifelong learning.

The variation in how the concepts of "skill" and "competence" are defined and how they are interrelated across different academic disciplines [2] indicates that, before discussing digital

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competences as future-oriented competencies, it is necessary to clearly articulate the scientific definitions of these terms. In this article, the term competence is explained based on the definition proposed by Filipovich. According to the author, competence refers to "a set of dispositions—knowledge, skills, and attitudes—that enable an individual to perform professional tasks at an appropriate level" [3]. This definition incorporates the core structural components of competence. The literature commonly highlights knowledge, skills, behaviour, values, attitudes, personal qualities, abilities, and motivation as its principal elements. Therefore, skills are understood as a constituent part of competence, representing the ability to apply knowledge in practical situations, that is, through actions directed toward accomplishing specific tasks.

From the perspective of the education system and labour market requirements, the "Digital Education Action Plan 2015–2030" currently holds a central position as one of the key policy documents outlining the renewed strategic directions of the Republic of Uzbekistan. The second priority of this programme explicitly emphasises the growing need for the development of digital skills and competences in an era characterized by rapid digitalisation. The document outlines not only the fundamental digital literacy competences that should be cultivated from early childhood but also advanced digital skills aimed at increasing the number of highly qualified specialists in digital technologies. Furthermore, expanding women's participation in IT education and technology-related professions is highlighted as one of the essential strategic priorities [7].

The main purpose of the study conducted was to identify the digital-competence-related skills shaped within the framework of the "Information Technologies in Medicine'' course taught at the medical institute. The research was carried out among students of the institution.

The Importance of Digital Competences in the Educational Environment. Digital competences are gaining increasing significance within modern educational settings. In recent years, digital technologies have transformed not only the nature and execution of work but also exerted a profound influence on educational processes. The growing presence of digital skill requirements in job advertisements indicates a shift in employers' expectations regarding the profile of future professionals. This trend demonstrates that insufficient or inconsistently developed digital competences may restrict career opportunities in the labour market and influence the dynamics of the education sector as well. Consequently, the implementation of programmes aimed at developing and strengthening digital competences in higher education institutions and training centres is viewed as a necessary response to labour market demands as well as to the expectations of the new generation—often referred to as the "digital natives."

One of the most significant factors driving the development of digital competences is directly linked to the demands of the contemporary labour market. The findings of Mateescu et al. [8] reveal that motivation to enhance digital competences is closely associated with increased employability and improved competitiveness in the job market.

The increasing availability of information and diverse digital resources enabled by modern technologies continues to strengthen their role within the educational process. Alongside rapid technological development, innovative pedagogical approaches are being integrated into teaching and learning; such methods have been shown to enhance student engagement and significantly improve educational outcomes [9]. However, the use of digital teaching tools or the implementation of digital solutions must be accompanied by systematic efforts aimed at fostering students' digital competences, promoting a culture of responsible and ethical technology use, and raising awareness of potential risks associated with inappropriate digital practices.

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Scholarly literature emphasizes that an individual possessing digital competence must demonstrate a sufficient knowledge base, practical skills, and a responsible attitude toward technology [16, 17]. According to the framework proposed by Spante and colleagues [18], digital competence is understood as an integrated set of knowledge, skills, and attitudes that forms the foundation for effective participation in educational processes, professional activities, and, importantly, social engagement. Conscious, responsible, and ethically appropriate use of technology is considered an essential component of digital competence.

Digital competences hold particular significance within the academic environment. Advances in science and the widespread adoption of artificial intelligence technologies have led to the systematic development of digital competences in both school and higher education settings, thereby necessitating the continuous revision and modernization of curricula. The enhancement of digital competences contributes to students' ability to learn rapidly, supports autonomous learning, and fosters the development of critical habits such as self-regulation and responsible engagement in the learning process. Research evidence indicates that digital competences not only increase the likelihood of academic success but also have a positive impact on the effectiveness of distance education formats [19, 20].

Furthermore, students with higher levels of digital competence are more likely to perform effectively in digitally enriched learning environments, engage in collaborative problem-solving, and achieve stronger outcomes when working with complex tasks. Studies also reveal a positive relationship between digital competences and student engagement, the use of flexible learning strategies, concentration, and active participation in educational activities. According to findings by Cabero-Almenara and colleagues, digital competence is a key determinant of students' academic achievement. Their results show that students who were required to repeat an academic course demonstrated markedly lower levels of digital competence.

The scope of scientific research concerning students' digital competences is remarkably extensive, making it difficult to provide a comprehensive review of all relevant studies. Nevertheless, it is appropriate to reference those investigations that directly relate to the focus of this work—namely, digital competences associated with information processing, communication, and digital content creation. The study conducted by Javier-Aliaga et al. examined the relationship between students' self-efficacy and their level of digital competence. Meanwhile, Guevara-Otero and colleagues focused on identifying profiles among university students based on their use of digital competences in social communication, collaborative learning, and the processes of searching for and processing information. The research undertaken by Burgos et al. explored the development dynamics of digital competences among students before and during the COVID-19 pandemic, with the aim of determining how internet use influences the growth of competences related to social interaction, teamwork-based learning, and information retrieval and processing.

Types of Digital Competences and Measurement Tools. Systematically defining the various types of digital competences has become one of the prominent directions in contemporary research. Increasingly, scholars emphasize the need to design and validate measurement instruments capable of reliably assessing these competences. Accurate measurement plays a crucial role in determining developmental trajectories, evaluating the effectiveness of pedagogical strategies, and assessing the extent to which educational programmes achieve their intended learning outcomes.

The document titled **"A Framework for Developing and Understanding Digital Competence in Europe (DigComp)"** presents a comprehensive structure of digital

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competences designed for all citizens, underscoring the necessity of acquiring and continuously developing these competences. The framework identifies **21 digital competences**, categorized into **five key areas** [15]. The content of these competence areas is presented in **Table 1**.

Table 1.

No	Competence Area	Competences
1	**Information**	Browsing, searching and filtering data Evaluating information Storing and retrieving information
•	**Communication**	Interaction through digital technologies Sharing information and content Engaging in online communication Collaborating through digital platforms Managing digital identity
•	**Safety**	Protecting devices Protecting personal data and privacy Protecting health Protecting devices (again) Protecting the environment
2	**Problem solving**	Solving technical problems Identifying needs and technological solutions Innovating and creatively using technology Identifying gaps in digital competences

Tzafilkou and colleagues presented a comprehensive overview of the scales used in research aimed at assessing students' digital competences. The authors analyzed 20 different scales employed by various researchers between 2014 and 2020, focusing on identifying the core components of digital competence as well as examining the relationships among variables related to the digital competences of both students and teachers.

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Results of the Empirical Study. A total of 96 students participated in the study (70 of whom were female). All participants were first-year undergraduate students enrolled in the full-time "General Medicine" programme. The sample represented the entire population of students enrolled in this course, thereby covering 100% of the cohort.

The questionnaire consisted of two items, some of which were aimed at collecting demographic information, and was directly related to the course "Information Technologies in Medicine." First, students were asked whether the classes taught within the "Information Technologies in Medicine" course were useful and relevant to their field of study. The responses are presented in Table 2.

Table 2. **(Translated table content will be generated if you provide the data.)**

The responses to the question: "Were the classes, in the form in which they were conducted, useful and relevant to your field of study?"	yes (96)	no (0)

From this perspective, students were additionally asked to respond to the following question: "Did the classes taught within the course 'Information Technologies in Medicine' differ from previous educational experiences at the institute in terms of uniqueness, novelty, or special significance?" It should also be noted that this course is taught during the first year of the bachelor's programme, and students' prior academic experience is limited to one semester. The results obtained for this question are presented in Table 3.

Table 3.

The responses to the question: "Did the course differ from or demonstrate any unique or distinctive features compared to previous educational experiences at the university?"	yes (96)	No (0)

Table 4 presents the responses to the question regarding the extent to which students enjoyed the classes, based on a Likert scale.

Table 4. Degree of satisfaction with the classes
(where 1 — not enjoyable at all, 5 — very enjoyable).

The degree of students' satisfaction with the classes	Yes (96)	No (0)

Conclusion. As highlighted in the literature, higher education institutions and training centers must implement educational programmes aimed at developing and strengthening digital competences. Such initiatives not only respond to the evolving demands of the labour market but also function as one of the key motivational factors driving the expansion of digital skills. The integration of innovative pedagogical technologies, in turn, enhances student engagement and significantly improves the effectiveness of acquiring digital competences. Although the development of digital skills related to information management, communication, and content creation remains a complex task within the context of digital transformation, the results of the

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conducted survey confirm the relevance and necessity of addressing this issue within educational practice.

The findings of this research align with the competence areas identified at the theoretical level. According to students enrolled in the Management programme at the Bukhara State Institute, the digital skills included in the survey hold practical value in the higher education process. Moreover, these competences are likely to become even more significant during the preparation of undergraduate or graduate thesis projects, where the ability to search for information, evaluate digital content, and produce academically sound materials is essential.

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