DEVELOPMENT OF DIGITAL COMPETENCES IN UNIVERSITY STUDENTS AS A NECESSARY CONDITION FOR THEIR PROFESSIONAL TRAINING

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Abstract: The digitalisation of social processes determines the requirements for the competence of a modern specialist, the rapid development of information and communication technologies, and the active dynamics of the labour market. The formation of professional competence is currently focused on three main areas: hard skills, soft skills, and digital skills. This article aims to analyse the potential for developing digital competences among students of higher education institutions as a component of professional training. The primary digital skills necessary for the successful and prospective professional realisation of higher education students in today's labour market conditions have been investigated. The theoretical and methodological foundations for forming digital skills among higher education students have been systematised. The dynamics of digital skills by type among the adult population during 2019–2023 and the level of utilisation of information systems in the national higher education space during this period have been analysed. The potential of modern professional training methods in developing digital competences among university students has been examined. The vital pedagogical technologies for developing digital skills for professional competence in the modern specialist have been identified, including social media, data analysis, immersive technologies, and others. It has been substantiated that integrating innovative pedagogical solutions into the higher education environment increases student motivation, stimulates the development of critical thinking, adaptability, and the ability for self-education, and intensifies responsibility and self-organisation. It has been proven that the active use of information and communication technologies in the educational process influences the formation of students' digital skills – mobility, the ability to find necessary information quickly, and competences in the use of digital tools and services for professional and personal development. The effectiveness of this process is determined by the success of the adopted pedagogical methodologies, the readiness of the teaching and administrative staff in higher education for the dynamics and significant changes in the educational process, and the presence of state-level support.

Keywords: digitalisation, digital competences, higher education, integration, educational process, digital skills, professional training.

1 Introduction

Innovative approaches to transforming the higher education system in the modern integrated society involve the active digitalisation of the educational process. This includes shifting from traditional classroom-based teaching to blended, distance, or informal learning and implementing innovative pedagogical technologies within the learning process. Virtual environments, interactive lectures, and educational platforms are becoming integral parts of higher education and require students and educators to be prepared for the rapid development of digital learning opportunities. Overall, the process is aimed at the practical, comprehensive professional training of students in the direction of hard and soft skills and essential digital skills.

Despite the challenges to educational progress during the war, society is rapidly acquiring the characteristics of a digital one, and the labour market is forming its vision of the sought-after specialist of a pan-European standard. All this highlights the priority of integrating pedagogical approaches and tools for developing digital skills in higher education. It is advisable for Ukraine to maximally leverage the successful experiences of the international community and the opportunities for partnerships and collaboration to create a developed digital educational environment.

2 Literature review

The issues of innovative development in higher education, in its various aspects, are being explored by several foreign and domestic scholars. In particular, contemporary researchers outline the relationship between the digitalisation of education and social innovations (Melnychuk, 2023; Viunenko et al., 2023; Henseruk & Boiko, 2020), analyse the pedagogical tools for forming digital competences in the process of higher education (Bakhmat et al., 2023; Yuldashev et al., 2022; Popov et al., 2022), study immersive technologies and educational platforms (Lubko & Sharov, 2021), and examine the possibilities of artificial intelligence in the context of education (Chychkan & Kostovskyi, 2021).

The issue of developing digital competences is also the subject of active discussions among scholars (Koval et al., 2024; Viunenko et al., 2023), who focus on exploring the interplay between digitalisation and the innovative development of higher education during periods of unstable socio-political situations and in the post-crisis period. Among the publications representing global trends in the application of information systems to improve the quality of higher education, it is necessary to highlight the works of (Koval, 2021; Larionov et al., 2021), where modern trends in virtual and mixed reality, data analysis, social, educational platforms, and interactive forms of presenting educational material are analysed. The authors pay special attention to personalised learning, individual educational systems, and pedagogical technologies of blended, flipped, and informal learning to maximise the personal potential of students, developing their unconventional thinking, and equipping them with skills for independent search, selection, and optimal presentation of information on the internet.

The development of this issue in academic circles convincingly demonstrates the relevance of the problem of forming digital competences among students of higher education institutions. At the same time, the conceptual aspects concerning the principles, guidelines, and barriers to the innovative development of the professional training system require more profound study.

The study aims to analyse the potential for developing digital competences in students of higher education institutions as a component of professional training.

3 Materials and methods

In the course of the research, several general scientific methods were used, including the structural-logical method (to develop proposals for improving the professional training of students in higher education institutions within the digital environment), analysis and synthesis (to study relevant theoretical concepts and scientific developments on the issues of forming digital competences among higher education students, clarifying the terminological framework, and assessing the impact of digitalisation on the development of higher education); comparison (for systematising conceptual approaches to defining basic concepts and criteria within innovative pedagogical approaches, identifying related risks and barriers); abstraction (to form priority requirements for the digital skills of graduates from higher education institutions).

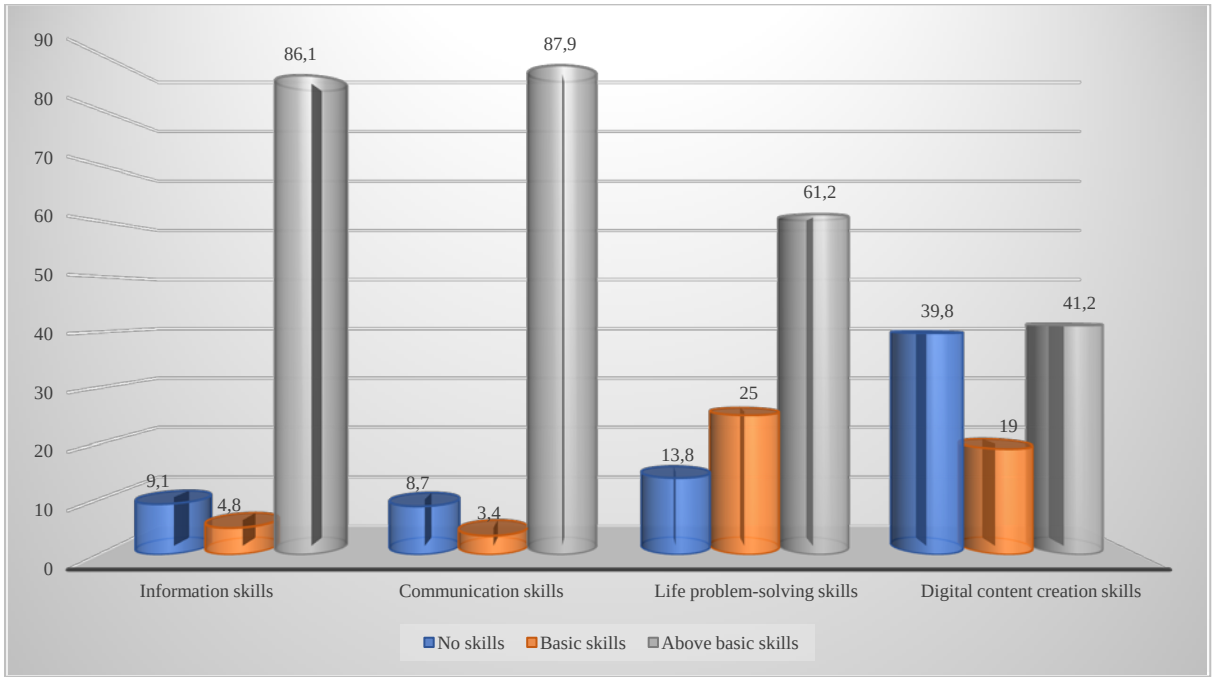
4 Results

A modern specialist's fundamental professional and personal skills include critical thinking and adaptability, communication skills and creativity, quick orientation in dynamic conditions, mobility, and skills for continuous self-education and self-improvement. The current challenges related to the development of the higher education system are focused on forming three main categories of professional skills: soft skills, hard skills, and digital skills. The formation of basic skills is determined by the theoretical and pedagogical foundations of the educational process, while digital skills are primarily determined by methodological principles (Melnychuk, 2023; Viunenko et al., 2023; Henseruk & Boiko, 2020). While the formation of hard skills (core professional competences, theoretical knowledge, basic abilities) and soft skills (communication competence, creativity, critical thinking) is currently complementary to the pedagogical process, digital competences are a relatively new

concept in the context of Ukrainian higher education, multifaceted and dynamic (Chychkan & Kostovskyi, 2021).

Overall, digital skills embody innovative higher education, characterised by the mobility and adaptability of learners, the ability to quickly find necessary information, and competences in integrating electronic tools and services into work, education, and everyday life (Bakhmat et al., 2023). The current development period is marked by a rapid increase in digital skills among the adult population (see Figure 1), driven by the global digitalisation of most social processes. Between 2019 and 2023, all digital skills increased by 4-7 %. The largest share of the population – 87.9 % – has mastered communication skills, while the smallest share – 41.2 % – has mastered digital content creation skills (Diia. Education, 2023).

Figure 1: Dynamics of Digital Skills by Type among the Adult Population in 2019–2023



Source: Compiled and systematised by the author based on (Diia. Education, 2023)

It is evident that the positive trends recorded in the official statistics, as shown in Figure 1, are due to the active development of higher education against the backdrop of European integration processes, where future professionals acquire the necessary competences. In particular, the use of virtual and mixed reality technologies provides a unique experience that is successfully synthesised with other effective learning strategies such as simulation, visualisation, and practice-oriented learning (Kryvoshein et al., 2022; Viunenko et al., 2023; Koval et al., 2024).

By incorporating vibrant multimedia and informational content, immersive technologies create a system of unique interactivity where the context can be successfully adapted to individual learning styles (Bakhmat et al., 2023). Immersive tools are relatively new in education. While they cannot entirely replace traditional teaching methods, they can significantly enhance the learning experience by making it more practice-oriented, simpler, and engaging (Lubko & Sharov, 2021).

Pedagogical technologies based on artificial intelligence and machine learning hold significant potential today. The main task, however, is not to master them as "replacements" for thinking but as "stimulators" of critical perception, rapid analysis of large volumes of information, and creative approaches to problem-solving (Henseruk & Boiko, 2020; Honchar et al., 2021; Melnychuk, 2023; Viunenko et al., 2023). The general directions for implementing advanced educational practices to develop digital competences in students of higher education institutions within the context of professional training are presented in Table 1.

Table 1: Teaching Methods in Higher Education Institutions for Developing Students' Digital Skills

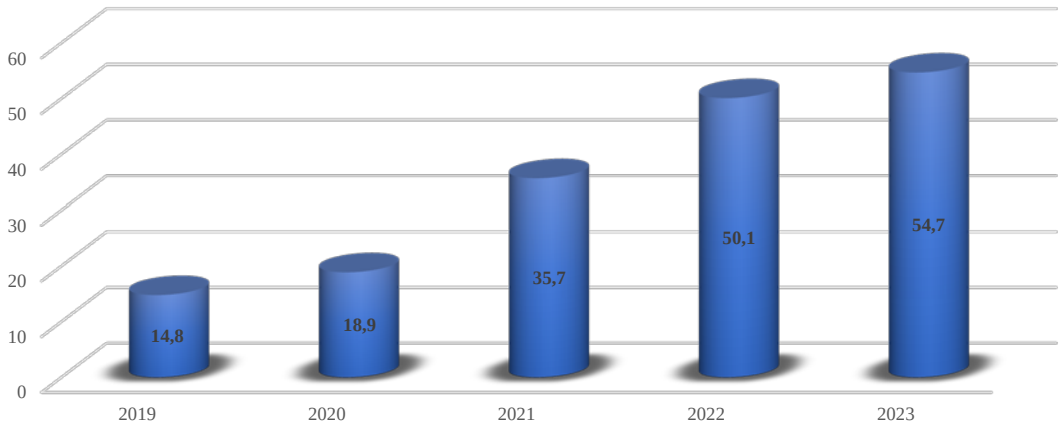
Pedagogical methodology	**Functionality**
Distance or blended learning	The synergy of traditional classroom and virtual classes, elements of self-education, and online modules intensifies learning's adaptability and flexibility, develops self-control and self-improvement, and increases motivation to master online communications.
Flipped practice-based learning and self-study	Students learn new material at home, while classroom lessons are practical. The method stimulates the skills of searching, selecting, and mastering a significant amount of information, the ability to surf the web, and the ability to critically evaluate online resources.
Online platforms	Targeted resources that provide maximum opportunities for practical self-study. They motivate self-improvement and develop skills in online data analysis, time management, and self-criticism.
Immersive technologies	Integration of virtual or mixed reality to maximise the visibility of the material.
Project methodology	Use of digital tools for planning, developing, adjusting and presenting projects.
Social methodology	Integrating social media into online educational projects requires efforts in communication, social media, and content development.
Adaptive (personalised) learning	Technologies involving artificial intelligence adapt educational material to professional training needs, personalising the complexity and requirements.

Source: Author's conception.

The digital skills acquired during higher education often play a crucial role in developing students as professionals. Companies in various industries strive to enhance brand recognition, improve service processes, attract potential clients, and intensify revenue (Koval et al., 2024; Viunenko et al., 2023). Despite the obstacles posed by the full-scale war, Ukrainian higher education institutions recognise the necessity of digital development and are successfully implementing innovative solutions (Figure 2).

The digital competences of higher education students encompass a range of abilities related to using digital devices, communication programmes, and the global network to access and manage information competently. These skills enable communication and collaboration, creating and sharing digital content, and problem-solving for practical self-realisation (Hawkridge, 2022).

Figure 2: Level of Information Systems Use in the National Higher Education Space, %



Source: Compiled by the author based on (Ministry of Education and Science of Ukraine, 2024).

Students who successfully acquire digital competences optimise their career prospects by understanding useful artificial intelligence tools and primary digital channels. Among the critical digital skills, the following should be highlighted:

- Communication competences, which are manifested in social interaction skills, the ability to use various communication channels, efficiently utilise online connectivity, and conduct meetings in real-time.
- Information and content processing, which forms the foundation of professional competence in terms of adaptability, creative approach, and critical thinking.
- Problem-solving skills using digital tools.
- Transaction management and digital financial literacy.
- Skills in ensuring security and compliance with legal actions online.

Analysing the global practice of developing students' digital competences, it is noteworthy that most higher education institutions currently prioritise mastering targeted digital skills, which are essential for future professionals in any field. These include social media. According to research by WeAreSocial, there are more than 4.76 billion active social media users worldwide, requiring modern graduates to understand and use them effectively, given the potential of social media for maximum community engagement (Szymkowiak et al., 2021).

Other relevant digital skills in the global educational community include search engine marketing (SEM), which allows students with the experience to increase a company's website visibility in search engines; data analysis; content creation (blog posts, videos, podcasts, infographics), which equips students with valuable skills preparing them for careers in any industry; augmented and virtual reality, and mobile technologies; digital strategy and planning based on analytics and quantitatively measured SEO data; video, which is positioned not as entertainment but as an influential professional tool, supported by the rapid growth of YouTube, TikTok, and Instagram (Haleem et al., 2022).

Thus, based on the analysis of the state of digital competence development in higher education in Ukraine and the global integrated environment, the theoretical and methodological foundations for the formation of digital skills within professional training can be systematised as follows:

- Active integration of digital tools into the educational process.
- Continuous self-education based on acquired experience and the experience of mentors.
- Implementation of targeted tasks aimed at developing competences.
- Application of case methods and electronic tools in the learning process.
- The realities of full-scale war do not allow fully realising modern educational practices' potential to form students' digital competence in higher education. At the same time, the post-war recovery period holds the prospect of establishing modern universities as hubs of all the necessary professional competences for future specialists, which will complement the demands of social dynamics.

5 Discussion

Several modern scholars are actively exploring the impact of digitalisation on the dynamics of professional competence requirements for university graduates. In particular, Castro and Tumibay (2021) deem it necessary to develop a pedagogical methodology towards integrating machine learning and artificial intelligence. These researchers, among other things, analyse the effectiveness of online courses for higher education institutions using meta-analysis.

Conversely, N. Burbules et al. study the potential of the virtual environment for creating a practice-oriented educational environment, identifying five trends in education and technology for a sustainable future (Burbules et al., 2020). Alam (2021) argues for the importance of fostering processes of self-education and self-improvement, which form the foundation for implementing the concept of lifelong informal education, relevant against the backdrop of the mobilisation of artificial intelligence tools and learning analytics in education.

Researchers Zhao et al. (2021) and Adıgüzel et al. (2023) analyse digital skills from the synergy perspective with soft skills, believing that digital skills cannot be mastered without critical thinking, creativity, and communication skills. The

authors investigate aspects of revolutionising education through artificial intelligence, particularly its transformative potential in tools like ChatGPT while emphasising the prioritisation of cybersecurity requirements.

Continuing on this theme, scholars Reis et al. (2021) focus on transforming the traditional methodology of assessing students' knowledge, skills, and competences in the modern digitised higher education environment. According to these scholars, the main focus should be on the practical aspects of professional training, emphasising the assessment of soft skills, despite their immeasurable nature.

Several modern scholars (Baird & Parayitam, 2019; Sinambela, 2020; Hernandez-de-Menendez et al., 2020) explore the dynamics of communication models against the backdrop of the digital transformation of higher education. The authors note the need to abandon outdated action algorithms, instead advocating for the integration of online communication during the learning process to consolidate and practically apply skills related to functional chatbots, educational mobile applications, social learning projects, and media products. Meanwhile, Baird and Parayitam (2019) evaluate employer rankings in the US and Europe regarding the importance of skills and competences necessary for university graduates.

At the same time, scholars Lubko and Sharov (2021) argue for the effectiveness of educational digital platforms, which enable maximum individualisation of the professional training process by focusing on challenging aspects. The researchers pay special attention to the characteristics of expert learning systems, multi-agent intelligent systems, and intelligent adaptive systems. Lubko and Sharov (2021) conclude that intelligent systems based on artificial intelligence and personalisation effectively enhance lifelong learning quality.

Based on these scholars' research results, digital competences have already secured the status of an integral component of higher education institutions' modern professional training system. The effectiveness of the process is determined by the success of the adopted pedagogical methodologies, the readiness of the teaching and management staff in higher education to adapt to the dynamics and significant changes in the educational process, and the level of support at the state level. Despite the positive dynamics of digital optimisation of the educational environment, this issue still needs to be researched in Ukraine.

6 Conclusion

The modern system of professional training requires higher education students to master hard skills, soft skills, and digital skills. The primary digital skills necessary for successful and prospective professional realisation in today's labour market include communication competences, information and content processing skills, problem-solving abilities using digital tools, transaction management skills, digital financial literacy, and ensuring security and legality in online actions.

The theoretical and methodological foundations for forming digital skills in university students are seen in the active integration of digital tools into the educational process, the implementation of targeted tasks aimed at developing competences, continuous self-education, and the application of case studies and electronic tools in the learning process.

Integrating innovative pedagogical solutions into higher education environments enhances students' motivation, stimulates the development of critical thinking, adaptability, and the capacity for self-education, and intensifies responsibility and self-organisation. Such solutions include online platforms, flipped practice-oriented learning and self-education, immersive technologies, distance or blended learning, project and social methodologies, and personalised learning.

The active use of innovative technologies in the educational process influences the formation of essential digital skills in students – such as mobility, the ability to find necessary information quickly, and competence in using digital tools and services for professional and personal development.

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Primary Paper Section: A

Secondary Paper Section: AM