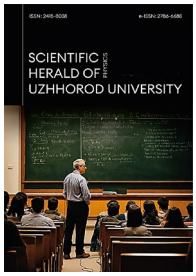
Scientific Herald of Uzhhorod University
Series "Physics"
Journal homepage: https://physics.uz.ua/en
Issue 55, 2576–2587
Received: 20.10.2023. Revised: 28.01.2024. Accepted: 17.03.2024



DOI: 10.54919/physics/55.2024.257xp6

Digitalisation and professional training of medical specialists in Ukrainian universities: A case study in health education

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Abstract

Relevance. The COVID-19 pandemic and the introduction of martial law in Ukraine have contributed to the increased use of digital technologies in all spheres of life, including education.

Purpose. The purpose of this study was to identify ways to improve professional training in Ukrainian higher education institutions in the context of digitalisation of education, specifically in the healthcare sector.

Methodology. To fulfil this purpose, the methods of analysis and synthesis, as well as the interview method and the author's questionnaire were used.

Results. This paper covered the changes in the professional training of Ukrainian students caused by the active development of distance education and digital technologies. To obtain information on the professional training of specialists in the context of digitalisation, a study was conducted among 263 students of Ukrainian medical institutions. The findings of this study showed that students face difficulties in using modern technologies both when studying and in professional practice. Dynamic changes in the use of modern technologies in professional training require greater involvement of educational institutions in this process, namely: creating courses, electives, conducting trainings for students, holding online meetings with leading experts, introducing technologies such as artificial intelligence and virtual reality into the educational process.

Conclusions. It was found that effective training of specialists in the context of digitalisation of the educational process should be based on the following principles: the principle of consistency, the principle of activity, consciousness and independence, the principle of purposefulness, the principle of interaction between classroom, and independent learning activities. These principles are interdependent and ensure effective training of future specialists and develop in them the desire for self-education and lifelong development. The findings of this study can be used by the management of higher education institutions and teachers to improve the educational process in the context of digitalisation, as well as by students for professional self-improvement.

Keywords: higher education institution; didactic principles; modern technologies; future specialists; educational process.

Suggested Citation:
Dudina O, Haborets O, Lunhol O. Digitalisation and professional training of medical specialists in Ukrainian universities: A case study in health education. *Sci Herald Uzhhorod Univ Ser Phys.* 2024;(55):2576-2587. DOI: 10.54919/physics/55.2024.257xp6

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Introduction

The dynamic development of digital technologies in the modern world is making fundamental changes to the system of professional training of future specialists. Changes are also taking place in Ukraine's educational system. The COVID-19 pandemic contributed to the digitalisation of the education sector, and the introduction of martial law confirmed the need for fundamental changes in curricula and the importance of developing students' information and communication competencies. The development of these competences is especially important for medical students, as future healthcare professionals are responsible for the correct and timely detection of disease, its treatment and prevention, which requires a prominent level of knowledge that may be more difficult to acquire through distance education. Only a prominent level of mastery of modern technologies can affect the quality of the distance education process, allow students to acquire new knowledge and effectively carry out their future professional activities.

Covering methods of improving the quality of distance education in their study, O.A. Povch et al. [1] note that medical education has certain features of the educational process, which requires more attention to online learning for medical students and the introduction of innovative approaches to professional training. The researchers consider a combination of classroom and distance learning, as well as the introduction of innovative elements in the educational process, as a prospect for improving medical education under martial law. Exploring the theoretical aspects of digital transformation in higher education institutions, I. Shyshenko and I. Kharchenko [2] concluded that the use of digital technologies by teachers in the modern educational process is necessary, and students can expand their professional opportunities and self-improvement on their basis. The researchers also note that in today's world, a competitive specialist must be proficient in information and communication technologies, which will not only increase their value in the national and international labour market, but also affect their professional efficiency. O. Haborets [3], in her dissertation on the self-improvement of future specialists through information technology, also notes that mastery of modern methods of diagnosis and treatment of diseases not only increases the competitiveness of Ukrainian specialists but can also be the basis for changes in the healthcare system of Ukraine. However, in digitalisation, educational institutions, teachers, and students may face certain challenges that hinder this process and slow down changes in the healthcare sector.

Covering the challenges faced by participants in the educational process in digitalisation, V. Areshonkov [4] notes that the problems that an educational institution may face are as follows: changing traditional forms of education, the need to find new methods and approaches to the implementation of curricula, the need to form the structure of a "digital university" and the effective combination of components of this structure. V. Kremen et al. [5], investigating the scientific and methodological features of the digitalisation of the educational process, noted that the problematic aspects are the insufficient level of material and technical support of educational institutions, the insufficient level of information and communication competencies of teachers and students, which can lead to a decrease in the quality of educational services. O.V. Slobodianyk et al. [6], studying the effectiveness of the use of digital technologies, specifically software, in the educational process, concluded that modern technologies can be an effective method of improving teaching methods, and can also empower teachers to teach students, model certain elements, and motivate students to improve their knowledge and skills. S.I. Abuvatfa et al. [7], covering the features of using Sectra Table software, also note that digitalisation facilitates the educational process, improves students' skills in working with modern equipment, allows expanding the knowledge and skills of future professionals, motivating them to learn and improve themselves.

Thus, the educational process of Ukrainian higher education institutions has been radically changed by the COVID-19 pandemic and the introduction of martial law. This requires adaptation to new conditions and improvement of the professional training process. The material and technical base of educational institutions, curricula, and teaching methods also need to be changed. The digitalisation process is important for medical students because, firstly, they need to effectively acquire knowledge through distance education, and secondly, modern technologies can be actively used in the professional activities of doctors to bring about qualitative changes in the healthcare system of Ukraine. Proceeding from this, the purpose of this study was to cover the theoretical and methodological foundations of the use of digital technologies in the professional training of Ukrainian specialists on the example of the medical field.

Materials and Methods

To fulfil the purpose of this study, a set of theoretical and empirical research methods was used. Theoretical methods include methods of analysis and synthesis, empirical methods include interviews and the author's questionnaire. The method of analysis was used to determine the current state of higher education in the context of digitalisation, as well as to cover the specific features of digitalisation in medical education. This method also helped to describe modern technologies and specific features of their use in the professional training of students, identify their disadvantages and advantages, as well as the prospects for their application in the educational process and professional activities of future specialists.

The study was conducted among 263 students of Ukrainian medical institutions. Among them were 58 2nd year students, 55 3rd year students, 69 4th year students, 36 5th year students, and 45 6th year students. First-year students did not take part in the study due to a lack of experience in distance education within a higher education institution, as well as a lack of in-depth knowledge in the medical field, as first-year students usually study general disciplines without gaining in-depth professional knowledge and without much practice. The age of the surveyed students is from 19 to 27 years old, with 156 male and 107 female respondents. All students had different experiences of using modern technologies in the

educational process and during professional practice, as well as different ideas about the possibilities of their application. The author's questionnaire (Table 1), which included 25 questions, was used to determine the level of mastery of modern technologies, the possibilities of their use in the educational process and professional activity.

Table 1. The author's questionnaire form for determining the level of proficiency in modern technologies

Year of study:	Age:		
No.	Question	Yes	No
1	Are you satisfied with the educational process at your institution?		
2	Do you know what modern technology is?		
3	Do you know how to use modern technology?		
4	Do you have experience of using modern technologies in the educational process?		
5	Do you have experience of using modern technologies in your professional activities?		
6	Is your experience of using modern technologies more positive than negative?		
7	Does your educational institution have all the conditions for using modern technologies?		
8	Does your educational institution promote the use of modern technologies?		
9	Do you receive feedback from teachers when using modern technologies?		
10	Do you think modern technologies are important in the work of a medical professional?		
11	Do you think that modern technology is the future?		
12	Do you plan to use modern technologies after graduation?		
13	Do you feel the need for professional development and self-improvement?		
14	Do you engage in professional self-development and self-improvement?		
15	Does your educational institution promote your self-development and self-improvement?		
16	Do you use modern technologies in self-development and self-improvement?		
17	Do you use modern technologies in your clinical practice?		
18	Do you use modern technologies in your research?		
19	Do you use modern technologies when preparing for exams?		
20	Do you have experience in distance education?		
21	Is the process of distance education easy for you?		
22	Did your educational institution provide you with resources for distance education?		
23	Did you acquire the necessary knowledge and skills during your distance education?		
24	Has distance education influenced your self-perception as a specialist?		
25	Have your ideas about the role of modern technology changed over the past 3 years?		

This questionnaire helped to determine the level of students' understanding of the digitalisation of the educational process and the possibilities of using modern technologies in educational, professional, and scientific activities. The results of the questionnaire also demonstrated the level of involvement of the educational institution and teachers in the digitalisation of the educational process and in helping students master modern technologies. The results showed the extent to which students strive for self-improvement and self-development, and the role of modern technologies in this process. The questionnaire was also useful for understanding the problems that arise in distance learning and determining its effectiveness in acquiring knowledge and skills by medical students.

To confirm the results of the study and provide recommendations for improving the professional training of students in Ukrainian universities in the context of digitalisation, an interview was used, which included 3 questions:

1. What difficulties do you face when using modern technologies and how do you overcome them?
2. How does your educational institution promote the use of modern technologies?
3. In your opinion, how can the professional training of future specialists be improved with the use of modern technologies?

The answers to these questions gave an idea of the difficulties students face in using modern technologies, and helped to understand how the educational institution trains students in the context of the digitalisation of the educational process and how it can be improved.

The method of synthesis was used to summarise the results of the study, formulate recommendations for the modernisation of student training in higher education institutions, and formulate the conclusions of the study.

Results

The importance of information technology is growing in parallel with the changes taking place in modern society. The COVID-19 pandemic and the introduction of martial law in Ukraine have affected the role of digital technologies in the educational process. Students are forced to acquire knowledge and skills remotely, which can affect not only the quality of the educational process, but also the emotional state and motivation to learn of future professionals. The professional training of future medical professionals is distinguished by a special form of organisation of the educational process, namely many practical classes, the need to visualise theoretical information, the need for clinical practice and interaction with patients and highly qualified medical professionals. Furthermore, effective medical activity should be based on the use of modern methods and technologies that are useful for diagnosing and treating diseases. The above aspects require more attention to the distance education process of medical students, greater involvement of the educational

institution and teachers, as well as the use of innovative methods to develop holistic knowledge and skills.

In higher education institutions, the professional training of future healthcare professionals goes beyond merely obtaining a specialised medical education. Students develop an interest in scientific and research activities, professional self-improvement, and encourage continuous self-education and self-development. This is caused by the digitalisation of modern society: approaches to the use of information and communication technologies are constantly changing, and even having developed the ability to use them in a higher education institution, one cannot be sure that the skills they have acquired will be relevant after a certain period of time. Dynamic changes in the use and implementation of digital technologies require professionals to be capable of adapting to ongoing modifications, which can only be developed by constantly developing and gaining new knowledge. Training of healthcare professionals should be continuous, focused on evidence-based knowledge and understanding of the latest innovative tools and approaches [8]. Therefore, the digitalisation of the educational process in the medical field is necessary and important for the quality training of future specialists. At the same time, however, there is an opinion that educational institutions and students are not ready to use modern technologies, both in the educational process and in their future professional activities. To identify the problems faced by medical students in digitalisation, a survey was conducted among 263 students, which showed the following results.

Knowledge of modern technologies was formed by 84% (221 people) of respondents, but only 67% (176 people) said they knew how to use modern technologies. Modern technologies were used in the educational process by 86% of students (226 people), but only 57% of future specialists (150 people) used them in their professional activities (e.g., during professional practice). This difference may be conditioned by distance learning: students who have had experience of this form of education have in any case been exposed to the use of modern technologies in one way or another. In possible professional activities, students may not have sufficient resources to use modern technologies, e.g., due to insufficient material and technical support of the practice base, or lack of trust of the institution's staff in students and their skills. This points to the need to improve students' practical skills in the learning process, which can be facilitated by modern technologies, as well as the creation of specialised medical courses, trainings, and electives where students can acquire the necessary skills and practice using innovative methods and approaches. However, 57% of students (150 people) said that their educational institution does not have the necessary conditions for the use of modern technologies, and the same number of students said that the institution does not promote their use. This demonstrates the insufficient level of readiness of higher education institutions for the digitalisation process and may also be the reason for the inability to apply modern technologies in practice. 91% of students (239 people) said that modern technologies are the future, while 89% (234 people) said that they plan to use them in their professional activities after graduation. This proves the need to develop students' information and communication competences, because only by possessing them will future specialists be able to meet the requirements.

It was also expedient to investigate the specific features of distance education in higher medical education institutions, as distance learning may not develop sufficient practical skills in medical students. 95% of students (250 people) said they had experience of distance education, but it was easy for only 66% of respondents (173 people). According to the results of the survey, 70% of students (184 people) acquired the necessary knowledge and skills in distance education. Such results may indicate that distance learning is really difficult for medical education specialists and does not develop the necessary knowledge and skills. There is a need to improve the process of distance education and introduce more practical classes and innovative technologies that will help to gain practical skills even during online learning. However, only 68% of students (179 people) said that the institution provided them with resources for quality distance education. This proves that educational institutions are not fully prepared for the digitalisation process.

The need for professional development and self-improvement is felt by 85% of the surveyed students (223 people), but only 66% (173 people) are engaged in it. 55% of students (144 people) believe that their educational institution promotes their self-development and self-improvement. These results demonstrate a prominent level of student motivation for self-education and self-development, scientific and research activities, but a lack of resources to make this process more effective. Digitalisation of educational activities may become an aspect that will affect the effectiveness of students' self-development and provide more opportunities for improving their professional performance. Modern technologies were used by 55% of the surveyed students (144 people) during clinical practice, 78% (205 people) – during research, and 65% (171 people) – during preparation for exams. This indicates a lack of practical application of modern technologies in professional activities, while modern technologies are used more actively for research purposes or exam preparation. Over the past 3 years, 86% of students (226 people) have changed their perceptions of the role of modern technology. This proves the need to use them both in the educational process during the training of future specialists and in their future professional activities as an effective tool for improving the healthcare sector.

Thus, students understand the need for digital technologies, actively use them in the educational process (for research, preparation for exams), but the average results showed that most students are unable to use them in their professional activities, which may affect the quality of healthcare services in the future (Figure 1).

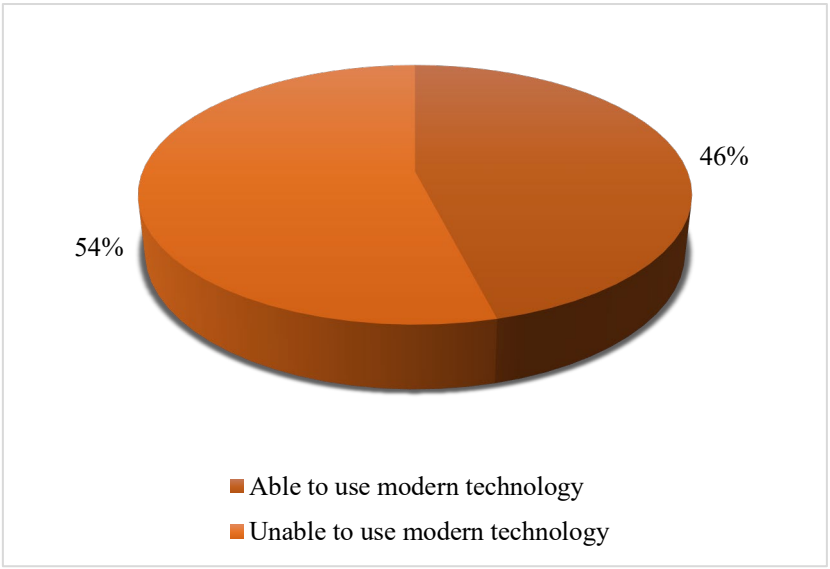

Figure 1. Percentage of students who are able or unable to use modern technologies in the educational process and professional activities

According to the majority of students, the institution does not promote the use of modern technologies and does not provide sufficient resources for this (Figure 2).

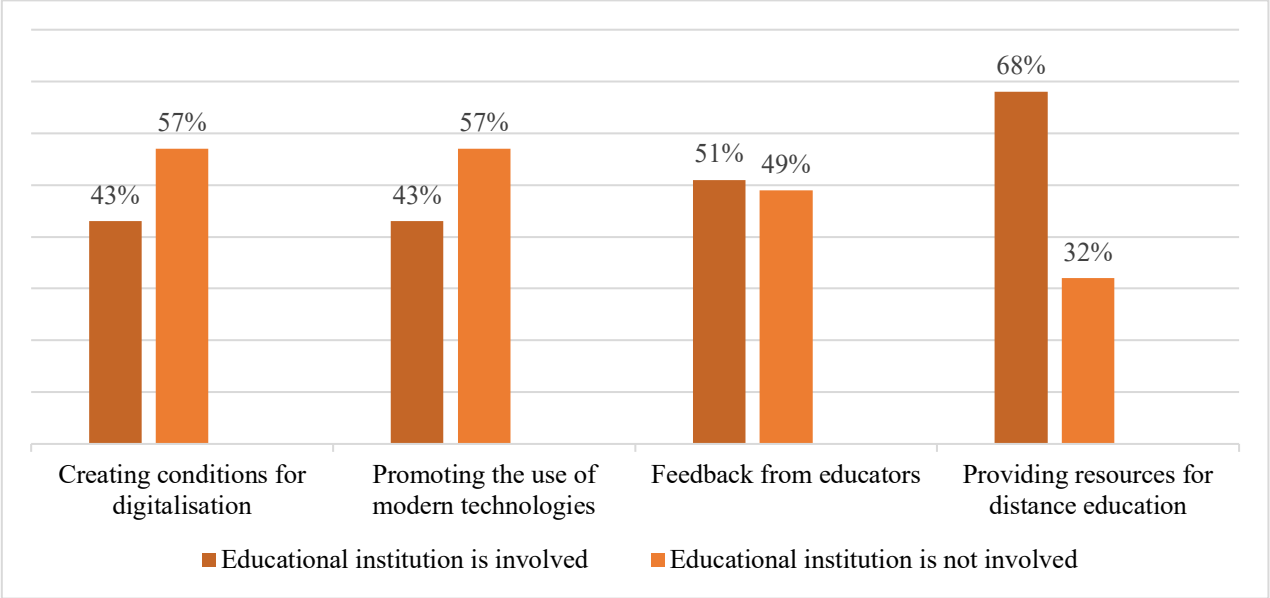

Figure 2. The level of involvement of the educational institution in the digitalisation process according to the surveyed students

Students have a prominent level of aspiration for self-development and self-improvement, but not all students have sufficient resources for this (Figure 3).

Figure 3. Percentage of students who seek self-improvement and self-development and students who are engaged in it

Therefore, the modernisation of the professional training of future specialists should be aimed not only at the active use of modern technologies and increasing the involvement of the educational institution in this process, but also at creating conditions for students' self-development and unlocking their potential.

To confirm the results of the study, an interview was conducted, which included 3 questions. Among the difficulties that students face in using modern technologies, the most frequently mentioned were weak material and technical base of the educational institution, uncertainty and fear of making mistakes when using technologies in their professional activities, lack of understanding of the possibilities of using modern technologies and/or lack of understanding of the algorithm of their work. Most often, students overcome these difficulties through self-education, watching educational videos on the Internet (most often YouTube (103 students), Osmosis (66 students)), taking online courses (most often Coursera (65 students), Ukrmedinfo (17 students), Prometheus (16 students), Complete Anatomy (5 students)), as well as communication with more experienced medical professionals (most often relatives, friends, senior students, reputable teachers of the educational institution). This demonstrates the high ability of students to self-educate, their motivation to learn and gain new knowledge, but the lack of involvement of the educational institution in the digitalisation process.

Students believe that their educational institution promotes the use of modern technologies by providing platforms for distance education, equipping classrooms with modern computers, interactive whiteboards, projectors, and by conducting educational work on the use of technologies in social networks (an additional 14 students identified the university's social media as a general promotion of the use of modern technologies). Less frequently, students mentioned the organisation of trainings or meetings with specialists, as well as the organisation of clinical practice.

According to the students, it is possible to improve the professional training of future specialists with the consideration of the digitalisation process by creating a special all-Ukrainian platform for doctors, which will include videos, text materials (lectures, articles), tests on various topics, courses, announcements of medical conferences and seminars. Future specialists also noted the need to create online laboratories where they could gain practical knowledge remotely. Given that due to the introduction of martial law, not all students can be in the city where their educational institution is located, some respondents noted that cooperation with practice sites in different Ukrainian cities and abroad could be an effective method of improving professional training. Students also noted a need to revise educational programmes, modernise them, and build them based on modern technologies.

The findings of this study showed that the improvement of professional training of future specialists should take place in three areas: increasing the involvement of educational institutions in the digitalisation process, increasing practical classes with the use of modern technologies to develop skills in their use, and promoting self-education and self-development of students. An educational institution can be involved in digitalisation by modernising its curricula, introducing elements that will facilitate the use of modern technologies, and their active use in the educational process and professional activities (Figure 4).

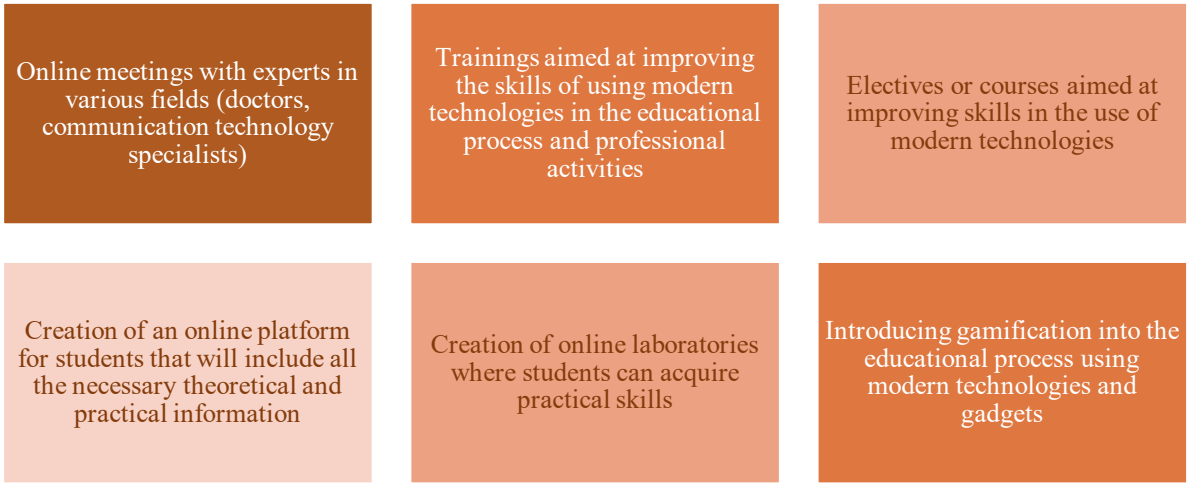

Figure 4. Elements that can be introduced by an educational institution into the educational process to improve it in the context of digitalisation

Scientists note that it is advisable to introduce technologies into the educational process that can be used not only in education but also in professional activities, such as artificial intelligence and virtual reality [9; 10].

Artificial intelligence is a technology that can perform processes that are usually performed by humans, analysing previous mistakes and improving its work. In the educational process, artificial intelligence can be used to develop an individual curriculum for each student, search for necessary information, and prepare for exams. In the medical profession, artificial intelligence can scan and analyse medical images, medical histories, and laboratory test results, which can accelerate the diagnosis process and automate certain processes, such as keeping records of medications and scheduled examinations.

Virtual reality is a technology that can create a sense of presence in another space, controlling one's actions and seeing their results. In the educational process, virtual reality can be used to simulate situations that may arise in professional activities, such as surgeries, various diagnostic procedures, which will help bring students closer to the problems they may face in real life and improve their practical skills [11-14]. In professional activities, virtual reality can be used to visualise medical data, which will allow for a comprehensive study of the disease and can be used to make a diagnosis or draft a treatment plan. Virtual reality can also be used in the rehabilitation of patients, e.g., to immerse them in a relaxing environment [15; 16].

That is, the digitalisation of the educational process can be effective both for improving learning activities and for the prospects of using modern technologies in future professional activities. However, as it was established, digital technologies are dynamic and can change regularly, as well as the algorithm of their use. For the effective digitalisation of the educational process, professional training should be based on the following principles: the principle of consistency, the principle of activity, consciousness and independence, the principle of purposefulness, the principle of interaction between classroom and independent learning activities [10; 17].

The principle of sequence is based on a step-by-step presentation of the material: from simple to complex, from theoretical foundations to practical application. This principle helps students to gradually master modern technologies, starting with their use in the educational process and then applying them in life situations and their own professional activities. The principles of activity, consciousness, and independence are based on the ability of students to acquire knowledge independently and actively, and to consciously apply it in their professional activities. This principle can help students acquire the necessary knowledge of modern technologies and adapt to changes in their use even after graduation. The principle of purposefulness is based on the targeted acquisition of knowledge in a particular area to fulfil a certain purpose. In the medical field, it can be useful for developing students' knowledge, understanding of their activities, and subordinating digital technologies to the purpose of medical work. The principle of interaction between classroom and independent learning activities is based on a combination of teacher-led learning and independent learning. Only by combining classroom learning and independent learning and practical activities will students be able to achieve high results and actively use digital technologies in their studies and professional activities [18-20]. Together, these principles will develop students' ability to learn throughout their lives, analyse current trends and actively apply modern technologies in life situations, education, and further professional activities.

Thus, in combination with changes in the curriculum that can be implemented by the educational institution, the introduction of more practical classes with modern technologies (such as artificial intelligence or virtual reality), as well as adherence to the principles of professional training to develop their independence, the digitalisation of the educational process in higher medical education institutions of Ukraine will be most effective and useful for the healthcare system of the country.

Discussion

In the educational process, digitalisation is an integral part of high-quality training. By applying innovative technologies, teachers not only encourage students to actively learn and develop, but also prepare them for further professional activities, which will also include the

use of modern technologies. Furthermore, the COVID-19 pandemic and the introduction of martial law have contributed to the digitalisation of the educational process through the introduction of distance education, which proves the need for further modernisation of the educational process. Studying the importance of integrating modern technologies into higher education, R. Chowdhury and A. Singha [9] note that the digitalisation of the educational process is effective, and teachers and students prefer modern technologies. According to the researchers, students are particularly positive about digitalisation. Today's young people are focused on the use of innovative technologies, including gadgets and Internet resources, which is why the transition to the use of innovations in the educational process is mostly easy for them [21; 22]. Furthermore, it allows students to gain knowledge from anywhere in the world, choose interesting and useful technologies and develop in their chosen fields more effectively. Digitalisation is making learning easier for both teachers and students, and businesses are seeking to change their workflows so that most of it is based on modern technology, which requires skilled professionals who can use it [23-25].

L. Chao and W. Jienan [11], investigating the transformation of modern information technologies in higher education, also concluded that digitalisation is necessary and has many advantages, namely: students can interact with each other and with teachers in different ways, attend online lectures by leading teachers and specialists in their field, and receive more information in a shorter period of time. M. Vladu and S. Popescu [12], analysing the theory of modern learning and special technologies, concluded that students are ready for innovation, which is consistent with the results obtained in this study. And teachers believe that the digitalisation of the educational process has made learning more effective. According to the researchers, the use of modern technologies makes the learning process more flexible and helps to engage future professionals in prolific activities, which is identified in this study as an effective condition for digitalisation. Researchers have identified the following benefits of digitalisation in an educational institution: the ability to store teaching materials on a cloud drive, which makes access to them faster and protects them from loss; the ability to update courses and presentations automatically for all users, which saves time; the ability to establish effective communication between teachers and students; and the ability to create their own platforms and applications that are necessary in the educational process.

Studying innovative learning models and their impact on the transformation of the educational process, A. Sharma et al. [13] identified the following benefits of digitalisation of the educational process: development of outside-the-box thinking in students, encouragement of teamwork, motivation for self-development and self-education, the possibility of personalising the educational process, promoting lifelong learning, which affects further professional development and the possibility of using modern technologies in professional activities, which correlates with the findings of the present study. However, along with the advantages, researchers have also identified certain disadvantages of the digitalisation of the educational process. M. Chen et al. [14], studying the digitalisation of medical education, identified such a disadvantage as the inability to apply the acquired knowledge in practice. According to the researchers, it is difficult for students to acquire effective skills during distance education, and their ability to apply them in their professional activities may be limited. This is in line with the results obtained in the study: the effectiveness of practical skills acquired in distance education may be lower. A. Sharma et al. [13] identified the following disadvantages of the digitalisation of the educational process: the inability of some educational institutions to obtain expensive equipment necessary for the educational process and practical training, lack of leadership over the digitalisation process in the educational institution, reduced socialisation and communication skills, reduced concentration and retention of information by both students and teachers, limited accessibility (some modern technologies may not be available to students due to their location, special educational needs, lack of resources, including material ones).

According to M. Oliveira et al. [15], who investigated modern medical university curricula, most of the shortcomings of the digitalisation of the educational process are caused by the conservatism of medical schools. Most medical school managers and teachers may not accept modern technologies and consider traditional forms of education to be effective [26]. However, changes in medical education are necessary and important, as medical institutions are currently modernising, using modern equipment and digitising their work processes to the maximum extent possible, which requires qualified specialists focused on modern technologies and high-quality patient care [27-29]. To improve the existing educational programmes in the context of digitalisation, it was proposed to introduce trainings, electives, courses aimed at improving the skills of applying modern technologies, holding online meetings with leading experts, creating a special educational platform, online laboratories, gamification of the educational process and the introduction of technologies such as artificial intelligence and virtual reality.

As for gamification, S. Daniel and K. Bangalore-Krishna [16], in their study of the use of game-based learning in medical education, found that in the modern world, the educational process requires innovation, including the introduction of game elements that are interactive and motivate students to learn. The researchers determined that the Kahoot! app is one of the game-based learning platforms that can increase the effectiveness of the educational process. Kahoot! can be used to consolidate or test the knowledge already acquired through a quiz that activates students' cognitive processes, makes them actively seek answers to questions and work in a team. I. Pizzola et al. [17] studied the artificial intelligence in medical education, concluding that artificial intelligence is effective in modern medicine. Medical students need to have a lot of information and be able to analyse it and apply it in practice [30; 31]. Artificial intelligence can simplify this process and take over the analysis of information and its provision. However, according to researchers, artificial intelligence should be used with caution. The inclusion of artificial intelligence in the educational process and professional activities should not exclude human activity.

Artificial intelligence and human knowledge should be combined in medical education and medical practice [32-34].

Virtual reality, according to V.R. Curran et al. [18], who investigated its use in medical education, is effective in improving practical skills. The researchers consider the possibility of using virtual reality in neurosurgery, otolaryngology, urology, and orthopaedics. Virtual reality can include video tutorials in which students can perform certain actions, learn practical techniques and aspects of diagnosis and treatment of certain diseases [35; 36]. However, the researchers note that the use of virtual reality should be motivated and have a clear time frame, as frequent use of this technology can lead to health issues, such as dizziness, headaches, and vision problems. L. Cercenelli et al. [19], investigating anatomical education in augmented reality, proposed the AEducaAR tool, which is based on the combination of virtual reality with real anatomical elements printed on a 3D printer. The combination of virtual reality and real-world subjects will help students gain high-quality practical knowledge, both during classroom training and distance education, increase the efficiency of the educational process and motivate students to learn [37].

Thus, scientists unanimously agree on the need to digitalise the educational process and the high efficiency of modern technologies, both in the educational process and in future professional activities. The advantages of digitalising the educational process include accessibility, efficiency, the ability to personalise learning, increased student motivation, the ability to communicate effectively with teachers and other students, and the ability to attend online meetings with leading experts or take online courses [38; 39]. Furthermore, students consider innovative technologies to be quite effective and necessary in the modern world [40]. Therewith, scholars have outlined the following shortcomings of the digitalisation of the educational process: lack of material and technical resources of educational institutions and inability to provide students with all the necessary modern technologies, reduced concentration and retention of information, inability to use modern technologies in practice. Scholars agree that effective methods of improving curricula in the context of digitalisation can include the introduction of trainings, courses, the creation of a special educational platform, online laboratories, gamification of the educational process, and the introduction of technologies such as artificial intelligence and virtual reality. Modern technologies can be a factor that will positively affect the educational process in educational institutions, increase the efficiency of student training and improve their future professional activities. However, digitalisation should not exclude human activity, but rather complement it and exist in synergy with it.

Conclusions

The present study covered the specific features of professional training of specialists of Ukrainian higher education institutions in the context of digitalisation on the example of the medical sphere. It was found that the use of modern technologies and innovative approaches in the educational sphere is important not only for students to acquire knowledge, but also for the development of the ability to apply it in their future professional activities. The activities of healthcare professionals should include the use of modern technologies and methods for the correct and rapid diagnosis of diseases, their effective treatment and prevention.

To assess the state of digitalisation in Ukrainian higher education institutions, a survey was conducted among 263 medical students in the 2nd-6th year of study using a questionnaire and interviews. The results of the survey showed that 54% of students (142 people) are unable to use modern technologies, which demonstrates the need to modernise the professional training of future specialists. To confirm the results, an interview was conducted, which showed that the main difficulties faced by students in applying modern methods and technologies are as follows: lack of support from the educational institution, lack of information about the possibilities of using modern technologies, as well as problems of their application in professional activities, lack of practice and fear of mistakes, which demonstrated the need for more practical training in the educational process. The low involvement of educational institutions in the digitalisation process was also identified as a problem: 57% of respondents (150 people) said that their educational institution does not promote the use of modern technologies in the educational process, and distance learning is difficult, specifically, with insufficient modernisation of the teaching process and lack of material and technical support. However, students' motivation for self-development and self-education is high, which can simplify the process of digitalisation and professional training.

Proceeding from the findings of this study, it was proposed that educational institutions introduce courses, trainings and electives aimed at developing information and communication competencies, create online platforms and online laboratories, hold online meetings with leading experts, and introduce elements of gamification, artificial intelligence and virtual reality into the educational process, which will help to master practical skills, but can only be effective if combined with prolific human activity. In addition, to improve the professional training, it was proposed to base the educational process on the following principles: the principle of consistency, the principle of activity, consciousness and independence, the principle of purposefulness, the principle of interaction between classroom and independent learning activities. Adherence to these principles in the professional training of future specialists can make the digitalisation process more efficient and accessible to students and develop the capability of lifelong learning.

Prospect for further research is to analyse the introduction of innovative technologies (virtual reality, artificial intelligence) into the educational process in higher education institutions and to develop specialised platforms and applications for the development of information and communication competencies in future specialists in all fields.

Acknowledgements

None.

Conflict of Interest

None.

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Діджиталізація та професійна підготовка медичних фахівців в українських університетах: Кейс з медичної освіти

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Анотація

Актуальність. Пандемія COVID-19 та введення воєнного стану в Україні сприяли активізації використання цифрових технологій у всіх сферах життя, зокрема й в освіті.

Мета. Метою цього дослідження було визначення шляхів удосконалення професійної підготовки фахівців у закладах вищої освіти України в умовах цифровізації освіти, зокрема у сфері охорони здоров'я.

Методологія. Для досягнення поставленої мети було використано методи аналізу та синтезу, а також метод інтерв'ю та авторську анкету.

Результати. У статті висвітлено зміни у професійній підготовці українських студентів, спричинені активним розвитком дистанційної освіти та цифрових технологій. Для отримання інформації про професійну підготовку фахівців в умовах цифровізації було проведено дослідження серед 263 студентів українських медичних закладів. Результати цього дослідження показали, що студенти стикаються з труднощами у використанні сучасних технологій як під час навчання, так і в професійній практиці. Динамічні зміни у використанні сучасних технологій у професійній підготовці потребують більшого залучення навчальних закладів до цього процесу, а саме: створення курсів, факультативів, проведення тренінгів для студентів, проведення онлайн-зустрічей з провідними експертами, впровадження в освітній процес таких технологій, як штучний інтелект та віртуальна реальність.

Висновки. З'ясовано, що ефективна підготовка фахівців в умовах цифровізації освітнього процесу має ґрунтуватися на таких принципах: принцип системності, принцип активності, свідомості та самостійності, принцип цілеспрямованості, принцип взаємодії між аудиторною та самостійною навчальною діяльністю. Ці принципи є взаємозалежними і забезпечують ефективну підготовку майбутніх фахівців та розвивають у них прагнення до самоосвіти і розвитку впродовж життя. Результати дослідження можуть бути використані керівництвом закладів вищої освіти та викладачами для вдосконалення освітнього процесу в умовах цифровізації, а також студентами для професійного самовдосконалення.

Ключові слова: заклад вищої освіти; дидактичні принципи; сучасні технології; майбутні фахівці; освітній процес.