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DIGITALIZATION AND PROFESSIONAL TRAINIGN IN UKRAINIAN UNIVERSITIES: A CASE STUDY IN THE HEALTH SECTOR

Abstract. The article featuresa research of the needs and ways to improve training programs on the use of digital technologies in the system of professional training of higher education institutions of Ukraine. The active implementation of information technologies in all areas of our life was also facilitated by the Covid pandemic and the introduction of martial law on the territory of Ukraine. Based on the analysis of scientific literature and the authors' own pedagogical experience, it has been proved that the dynamic development of information technologies in the world makes radical changes in the university system of professional training. This leads to the need to significantly adjust the content of educational disciplines and is associated with the development and improvement of specialized programs, applications, devices combined with digital technologies. The authors argue that the training of future professionals should be based on the assumption that, in addition to special professional training, students should pursue research, continuous self-education and self-development. This is due to the fact that digital technology is being developed and implemented at such a high speed in all areas of our lives that even between entering an educational institution and obtaining a specialist diploma,

there are significant changes in the use of information technologies in the professional field. It is important that the future specialists in any field be able to work properly and efficiently with a large amount of professional information. They are expected to be able to use modern digital technologies for continuous professional self-improvement.Summarizing the results of the experiment, the authors established the basic principles of professional self-improvement of future specialists by means of digital technologies: principle of consistency, principle of independence, principle of personal activity, principle of targeting, principle of intrinsic value, principle of reflexivity, principle of interaction. The authors conclude that all the defined principles are mutually conditioned and ensure effective use of digital technologies in higher education institutions of Ukraine. Prospects for further research are to analyze the state of implementation of virtual and augmented reality in higher education institutions and the development of appropriate applications for law enforcement sectors.

Keywords: higher education institutions, digital technologies, professional development, principles of education.

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ЦИФРОВИЗАЦІЯ ТА ПРОФЕСІЙНА ПІДГОТОВКА В УКРАЇНСЬКИХ УНІВЕРСИТЕТАХ: АНАЛІЗ НА ПРИКЛАДІ СФЕРИ ОХОРОНИ ЗДОРОВ'Я

Анотація. Стаття присвячена дослідженню потреб та шляхів вдосконалення навчальних програм з використання цифрових технологій в системі професійної підготовки закладів вищої освіти України. Активна імплементація інформаційних технологій у всіх сферах нашого життя також сприяла пандемія Covid та введенням воєнного стану на території України. На основі аналізу наукової літератури та власного педагогічного досвіду автори доводять, що динамічний розвиток інформаційних технологій у світі

призводить до радикальних змін в університетську систему професійної підготовки. Це призводить до необхідності суттєвого коригування змісту навчальних дисциплін і пов'язане з розробкою та вдосконаленням спеціалізованих програм, додатків, пристроїв у поєднанні з цифровими технологіями. Автори стверджують, що підготовка майбутніх фахівців має ґрунтуватися на припущенні, що, крім спеціальної професійної підготовки, студенти повинні займатися науковою діяльністю, постійною самоосвітою та саморозвитком. Це пов'язано з тим, що цифрові технології розвиваються та впроваджуються з такою швидкістю в усі сфери нашого життя, що навіть між вступом до навчального закладу та отриманням диплома спеціаліста відбуваються значні зміни у використанні інформаційних технологій у професійна сфера. Важливо, щоб майбутні спеціалісти будь-якої галузі вміли правильно та якісно працювати з великим обсягом професійної інформації. Передбачається, що вони зможуть використовувати сучасні цифрові технології для постійного професійного самовдосконалення. Підсумовуючи результати експерименту, автори встановили основні принципи професійного самовдосконалення майбутніх спеціалістів засобами цифрових технологій: принцип послідовності, принцип незалежності, принцип особистої активності, принцип цілеспрямованості, принцип внутрішньої цінності, принцип рефлексивності, принцип взаємодії. Автори дійшли висновку, що всі визначені принципи є взаємообумовленими та забезпечують ефективне використання цифрових технологій у вищих навчальних закладах України. Перспективами подальших досліджень є аналіз стану впровадження віртуальної та доповненої реальності у закладах вищої освіти та розробка відповідних додатків для правоохоронних для секторів правоохоронної діяльності.

Ключові слова: заклади вищої освіти, цифрові технології, професійний розвиток, принципи виховання.

Statement of the problem. The dynamic development of digital technologies on a global scale introduces fundamental changes in the system of professional training in higher education. This results in the need to significantly adjust the content of educational disciplines and is related to the development and improvement of specialized programs, applications, devices combined with digital technologies, etc. For instance, the use of new approaches within diagnosis, treatment and prevention of diseases requires a transition to a new strategy for training physicians to rewiew advanced technologies. The intellectual level of medical professionals is characterized by the amount of acquired fundamental natural and professional-practical sciences, the ability to use modern medical equipment for the diagnosis and treatment of diseases, ability to work with the latest information and computer technologies for the effective functioning of the Health Care sector and scientific research [1]. The Ministry of Digital Transformation of Ukraine emphasized the strategic directions of digital economy development in the

public discussion of the National Economic Strategy for 2030, namely: development of digital infrastructure; development of digital skills; development of the information and communication technologies sector and digitalization of all spheres of life and sectors of the economy. Improvement and active development of professional programs and applications in law enforcement requires adjustment of training programs in the field of human rights and freedoms, public and state interests, crime prevention, maintaining public safety and order through the formation of knowledge, skills and abilities for the use of modern digital technologies in police practice. This involves the need to improve the skills of professional work with computer devices, computer networks and electronic documents.

Obviously, the formation and development of skills for the professional and effective use of digital tools in professional training are the key to the necessary changes in the system of higher education of Ukraine.

Analysis of recent research and publications. Today, the problem of compliance of education with the introduction of information technology is the subject of a significant number of publications. The introduction of information technology in higher education institutions dealt with scientists such as S. Abuvatfa [1], S. Albert [2], V. Bykov [3], A. Bochevar [4], A. Deraman [9], A. Dobrovolska [6], S. Fadzli [9], M. Gonzalez-Sanmamed [2], H. Morokhovets [10], O. Slobodyanyk [10], V. Krasnoschok [8], L. Strelchenko [7], Ye. Semenov [13], M. Shyshkina [3], J. Yahaya [9] and others.

According to A. Dobrovolska [6], in the conditions of informatization of the medical industry, a new information technology function appears in the professional activity of a doctor. Within this process, doctors need to be able to work with modern hardware and software, consciously apply information technology in professional activities, i.e. have digital technology competence. O. Lenkova [10] in her work emphasizes information and communication competence as a separate component of professional competence.

Significant percentage of teachers in educational sphere use modern digital technologies to reach a high level in the formation of highly qualified specialists. Information technologies in institutions of higher education of Ukraine helps to solve a number of important issues, such as: the organization of student learning; creating effective conditions for intra-professional interaction of future specialists in various specialties, inter-professional interaction of specialists and communication of users of services in the relevant field with each other and with specialists by creating interactive groups; organization of virtual consultations, etc.

Therefore, **the aim of the article** is to consider theoretical and methodological foundations of the use of digital tools in the higher education system of professional training of Ukraine on the example of the medical field.

To achieve the objectives of the article, we employed a comprehensive set of both theoretical and empirical research methods. Throughout our research

endeavors, we conducted an in-depth analysis of pedagogical, methodological, and professional literature, with a specific focus on the literature related to the integration of digital technologies in the educational process [1 – 11]. This literature review encompassed the comparison of various perspectives regarding the incorporation of digital technologies within higher education, the formulation of fundamental principles for enhancing the professional development of future specialists through the utilization of digital tools, as well as the synthesis and development of professionally-oriented tasks involving the application of digital technologies within the educational context.

Furthermore, our empirical research methodologies included observation and surveys, comprising questionnaires, testing, and the execution of professionally-oriented tasks that inevitably involved the use of digital technologies. These empirical approaches enabled us to assess the level of professional development among future doctors through the utilization of information technology and to evaluate the effectiveness of meticulously designed pedagogical conditions for the integration of digital technologies.

Based on the outcomes of our research, we derived valuable insights into the integration of digital technologies into the educational process and their impact on the professional development of students. It was concluded that a well-structured integration of digital tools can significantly enhance the learning process and the preparation of future professionals. Our research highlighted opportunities for the development of specialized tasks utilizing digital technologies to improve the quality of students' professional training.

The significance of information technology in professional training is on the rise, paralleling the increasing integration of scientific and technological advancements across all sectors of the economy. However, there has been insufficient exploration by researchers into the utilization of digital technologies for merging scientific and practical knowledge, the implementation of contemporary computerized professional tools, and the utilization of specialized electronic equipment and professional software to facilitate the self-improvement of future professionals.

Let's delve into the application of digital tools within the framework of professional training for highly skilled specialists in Ukrainian higher education institutions, with a focus on the medical field as an illustrative example. In higher medical education institutions, the objectives of professional training extend beyond specialized medical education. They encompass fostering research endeavors, encouraging continuous self-education, and nurturing self-development among students. This approach is prompted by the rapid development and pervasive integration of information technology into every facet of our lives. Notably, the landscape of IT utilization in this field undergoes substantial transformation even within the duration of a student's journey from enrollment to obtaining a specialist diploma.

It is imperative that future specialists, irrespective of their field, acquire the competence to adeptly and efficiently manage copious amounts of information. Their ability to harness modern IT tools for continuous self-enhancement as professionals is paramount. Considering the prevailing trends in healthcare and ongoing reforms in the medical sector, the training process for future medical practitioners is intricate and multifaceted. Hence, the meticulous organization of this process is of utmost importance to maximize its effectiveness.

In order to determine the level of self-improvement of students of higher medical education using information technology, a questionnaire was developed [1], which was tested at the Donetsk National Medical University. The questionnaire was conducted anonymously, which made it possible to obtain fairly truthful answers from future doctors. Thanks to the questionnaire, it was possible to assess the following: understanding the importance of development of self-improvement, motives, the state of readiness for the development of professional improvement of future doctors using IT. The total sample of respondents consisted of 120 respondents of different levels of training (70 – first-year students, 20 – third-year students, 30 – sixth-year students).

The results showed the following. Analyzing the answers to the question "Are you able to carry out self-analysis, self-control and self-assessment of the results of self-improvement activities using information technology?" – 41% of students said they could, 59% – no; "Do you understand the basic requirements for your future professional activities, responsibilities and qualities?" – 87% of future physicians answered "yes", the remaining 13% – no; "Do you feel the need to achieve high results in education and practical professional activities?" – 88% of the future physicians answered "yes", 12% – no; "Have you thought about the role of information technology in healthcare and its role in self-improvement?" –- 26% of the participants answered "yes", 74% – no; "Have you used information technology in solving medical and biological problems?" – 26% of the future physicians answered "yes", 74% – no; to the question "What means do you use to develop self-improvement?" – 55% of the respondents answered that they use the material received from teachers, 25% – use information technology to search for additional information, 25% of the students chose the answer that they are not engaged in self-improvement. These results made it possible to formalize the qualitative characteristics of certain criteria, indicators and levels.

At the next stage of the scientific and pedagogical experiment, the levels of development of self-improvement of future doctors by means of IT were monitored in the experimental and control groups of respondents. During the experiment, the description, analysis, systematization and generalization of research results and statistical data processing were performed according to the algorithm described in [1]. Three institutions of higher medical education were chosen as the basis for the pedagogical experiment, namely: Donetsk National Medical University, International European University and I. Horbachevsky Ternopil National Medical University.

Theoretical and empirical methods were used in organizing the study. In particular, such theoretical methods as analysis, synthesis, comparison, generalization, classification, systematization of scientific and methodical literature to clarify the essence of the research problem and scientific substantiation of pedagogical conditions of development of self-improvement of future doctors by means of digital technologies; design and modeling to create a structural model for the development of self-improvement by means of IT; logical generalization and forecasting in formulating conclusions and recommendations.

From empirical methods we used: pedagogical observation of educational and cognitive activities of students; expert assessment and testing of students by teachers to determine the level of development of self-improvement of future doctors by means of digital technologies; pedagogical experiment to test the effectiveness of sound pedagogical conditions for the introduction of digital technologies.

At the beginning of the experimental study, control (CG) and experimental (EG) groups were created. The total number of participants who took part in the formative stage of the study was 173 people from three institutions of higher medical education in Ukraine with areas of training in the field of medicine.

In the process of our research, effective methodological approaches to the professional development of future doctors by means of information technology in the educational process of higher medical institution were identified and substantiated. The attention is focused on the fact that each of the stages has a goal, solves certain tasks and has its own peculiarities of implementation: conscious decision-making on professional improvement by means of digital technologies; development of a plan and/or program of personal professional improvement using digital technology, activities to implement a specific self-improvement plan; implementation of self-control and self-correction of professional activities. Important elements of each of these stages are the processes of self-knowledge, self-education, self-evaluation, self-design, self-coercion, self-regulation, self-analysis, self-control and self-correction.

The formative stage of the study showed the advantage of basic and sufficient levels of professional self-improvement of future doctors by means of digital technology, due to the lack of a systematic approach to the development of self-improvement of future doctors by information technology; insufficient development of educational and methodological support of the research process.

As a result, the educational and methodological manual "The development of future physicians self-improvement by means of information technology" [8] was created, published and tested. The manual contains a number of practical tasks in the discipline "Medical Informatics". There were also seminars using the Sectra Virtual Dissection Table according to the method described in [2], virtual laboratory work in natural sciences [12] and the original software product "Heart-lung machine SORIN C5" [11], which had a significant impact on professional development of future doctors and ensured the creation of a professionally motivating environment for the medical institution.

The professionally-oriented tasks of the medical field that we applied using digital technologies [9] are aimed at developing students' ability to classify the types and methods of processing medical information, understand the principles of coding medical information, create a list and describe the methods by which raw data can be processed to important information, understand the principles of coding biomedical information, use the International Classification of Diseases (ICD) or the International Classification of Primary Care (ICPC-2) to establish codes for the list of diseases proposed by the teacher, use information technologies of approximation and forecasting of medical and biological statistical data by means of the MS Excel spreadsheet processor, the ability to interpret data types, stages of statistical data analysis, types of distributions, stages of hypothesis testing, apply the laws, rules, methods and formulas of mathematical statistics for the processing of biomedical statistics.

In this context, digital technologies provide conditions for the professional development of future specialists, solve the problems of forming the worldview position of future specialists in the healthcare industry aimed at values to their own development. Digital tools are aimed at creating the necessary conditions for comprehensive, continuous, progressive and holistic development of the specialist, taking into account the needs, abilities, requests, interests and to ensure an effective process of self-realization of the specialist. This approach is provided to meet the interests and needs of students in professional development and improvement on the basis of integrated and individual approaches to the education and training of future physicians using modern digital technologies; taking into account the individual and age characteristics of each student in accordance with the personality-oriented approach; stimulating their initiative and creativity, enabling each medical student to realize himself as an individual through the disclosure of abilities, talents, individual inclinations in the process of using IT; providing the opportunity to determine the level of formation of personal qualities, identify characteristics, positive and negative qualities, analysis of their own capabilities, etc.; providing advisory assistance in compiling an individual algorithm for the development of self-improvement and developing a program for its implementation; formation of skills and abilities of self-educational activity by means of digital technologies; acquainting students with the methods and techniques of professional development and improvement, the formation of skills and abilities of introspection, self-esteem, using IT; providing psychological support to each student.

Special attention should be paid to the visualization of medical and biological data, processing and analysis of medical images, familiarity with the basic means of visualization of medical and biological data, processing and analysis of medical images, mastering the basic means of obtaining medical images and current trends; mastering knowledge of the medical image of organs, which is the main source of information in the diagnosis; the ability to interpret a medical image in a variety of processing it using IT. For example, consider and conduct a visual analysis of the

medical image (Fig. 1) in the program DICOM Image Viewer Plus and present the results in the form of a table (Table 1) [9].

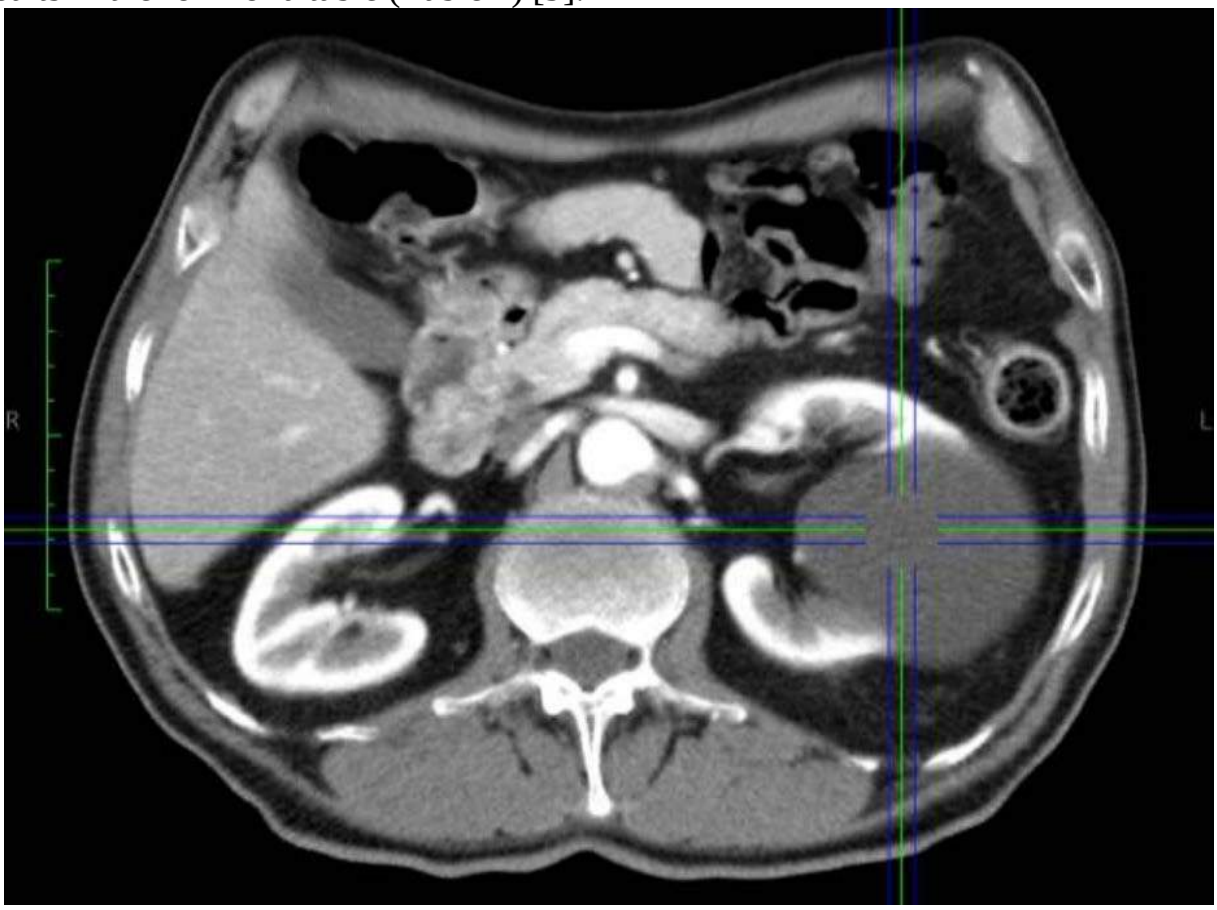

Fig. 1. *Practical tasks on visual analysis of medical images in the program DICOM Image Viewer Plus*

Table 1.

Visual analysis of medical images

File name	*Method of obtaining the image*	*Type of projection*	*Investigated body*	*Medical image objects*		*Visual signs of pathology*
				Static	*Dynamic*	

In summarizing the findings of the experiment, we have delineated fundamental principles that underpin the formation and cultivation of professionalism among future professionals through the utilization of digital technologies. These principles encompass:

The Principle of Consistency: this principle emphasizes the holistic approach to professional development, encompassing all facets and aspects of self-improvement using digital tools.

The Principle of Independence: it underscores the individual's proactive engagement in their own self-enhancement, self-assessment, autonomy, and personal responsibility for the outcomes of their self-improvement efforts, including the selection of a tailored path for professional development.

The Principle of Personal Activity: this principle revolves around the idea of continuous professional self-improvement through digital technologies, characterized by the tenacity and persistence of the individual.

The Principle of Personal Orientation: it centers on meeting individual aspirations for self-improvement through digital technologies, catering to individualized requests for the development of future professionals.

The Principle of Targeting: characterized by the adaptation of self-improvement methods, techniques, directions, and forms of digital technology application based on the unique characteristics of each individual.

The Principle of Intrinsic Value: it underscores the significance of every student's recognition of the personal value inherent in the continuous self-development process for their future profession and overall life.

The Principle of Reflexivity: this principle necessitates self-monitoring and self-assessment regarding the progress of professional development and the outcomes of self-improvement facilitated by digital technologies.

The Principle of Interaction: it acknowledges the multifaceted nature of the professional development process among future professionals, involving the reciprocal influence of external factors on an individual's inner world and vice versa.

It is important to note that these defined principles are interrelated and mutually reinforcing, collectively facilitating the effective integration of digital technologies within the educational landscape of Ukrainian higher education institutions to nurture highly qualified specialists.

Conclusions. An important component of the process of training highly qualified professionals competitive in the labor market is the organization of systematic and holistic formation of students' information and analytical knowledge, skills and abilities. Achieving this goal is possible primarily through the study of the disciplines "Information Technology in the specialty", "Information Technology in Professional Activity", "Fundamentals of Information Technology", "Modern Information Technology", "Information Systems and Technologies", etc. to the curricula of most specialties studied in the first year. It should be noted that the introduction of computer technology in the educational process of higher education contributes to the formation of professional competence of future professionals and is an objective process of development of highly qualified professionals competitive in the labor market.

Obviously, higher education institutions feel the need for change and this is reflected in the introduction of a large number of elective IT courses, which are represented by a number of universities, namely: "Computer Science", "European Standard for Computer Literacy", "Computer Science and Statistics" (Danylo

Halytsky Lviv National Medical University); "Modern information technologies in medicine", "European standard of computer literacy" (Bogomolets National Medical University); "Medical and biological physics, medical informatics", "European standard of computer literacy" (State Institution "Dnipropetrovsk Medical Academy of the Ministry of Health of Ukraine"); "WEB-design", "European standard of computer literacy" (Bukovinian State Medical University); European Standard for Computer Literacy (Poltava State Medical University).

It is crucial to emphasize that digital technology is not confined solely to the teaching of professional or natural sciences; it constitutes an integral part of the legal enforcement sphere. Proficiency in digital tools, specifically, is instrumental in the effective mastery of legal technology and expedites access to primary sources of information related to legal developments.

In terms of the future research outlook, our objective is to advance the theoretical and methodological foundations for training prospective legal professionals across various fields of legal practice. This includes the examination of individual student attributes that impact the outcomes and dynamics of professional self-improvement through digital technology in the realm of law enforcement and legal activities.

This expanded perspective underscores the significance of digital technology in legal education and highlights the role of technology proficiency as a catalyst for acquiring legal knowledge swiftly. Furthermore, it reinforces our commitment to developing robust theoretical and methodological frameworks for enhancing professional training in the legal field while recognizing the unique attributes of individual students that shape their progress in professional self-improvement through digital tools.

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