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DIGITAL LITERACY AMONG STUDENTS IN MEDICAL INSTITUTIONS OF HIGHER EDUCATION IN DISTANCE LEARNING SITUATIONS

Digital educational technologies are an innovative way of organizing the educational process, based on the use of electronic and information systems, which ensure visibility of the formation of digital skills among students of higher education institutions.

The article analyzes the use of digital technologies by students of medical institutions of higher education when studying natural sciences in the conditions of distance learning, using the example of the educational component «Medical and biological physics; Medical information technologies».

The analysis and synthesis of search results in information systems was carried out in order to define research concepts, methods of expert evaluation, observation, modeling, and forecasting. The principles of the «digitalization of Ukraine» policy were considered, the components of the concept of «digital information literacy» were defined, and the effectiveness of the use of digital programs and devices in the educational process in medical institutions of higher education was investigated. The survey method was used for the research. A structured questionnaire in the form of a Google form was developed to collect information. The role of digital learning technologies in the educational space and their application in the educational process was determined. It was found that the number of e-books in the respondent's home reduced the probability of weak skills, but had no relationship with strong skills. Frequency of using digital skills at university reduced the likelihood of weak skills, but there was no association with strong skills. This suggests that the use of digital technologies in the university can protect against low productivity, but does not guarantee high qualifications. Students' general cognitive abilities are positively related to their digital self-efficacy accuracy. Students with more experience in the informational Internet space demonstrate more accurate digital self-efficacy. It is shown that digital technologies in the educational space, due to their visibility, accessibility and orientation to the individual abilities of students, are a necessary condition for increasing the efficiency and effectiveness of the educational process. The use of digital technologies by students of medical institutions of higher education on the example of studying the educational component «Medical and biological physics; Medical information technologies» increase students' motivation to study, contribute to the development of digital practical skills in future specialists.

Keywords: *digital literacy, educational component, student, higher education institution.*

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Problem statement. It is currently generally accepted that we live in an information and computer society in which computer digital technologies are involved in education, health care, industry, commercial and other human activities. The ability to use digital technologies to search, evalu-

ate, use and create information implies significant changes in the strategy of providing both general and specialized education, including medical education, which is based on the professional and digital literacy of future professionals. Currently, medical education is one of the most discussed topics in

the field of healthcare, the department of education and related institutions, which entails the development of educational methods, tools for assessing the professional competencies of future doctors. Changing demographics and disease patterns, new technologies, new innovations in healthcare delivery, increased drug consumption, patient empowerment, autonomy, a focus on efficiency, are just a few of the challenges healthcare professionals face every day. Medical education is facing the dilemma of mastering digital information literacy due to the current information explosion, which has led to a sharp increase in the number and volume of knowledge. The competence of future medical professionals requires knowledge not only in the field of medicine technology and medical practice, but also in the field of digital literacy.

Digital information literacy is defined as the ability of an individual to effectively and critically navigate, evaluate, absorb and create information using a range of digital technologies. This type of competence requires a specialist to be able to recognize, use and manipulate digital means, digital media, transform them, distribute and easily adapt to new forms [22, 2]. The ability to work with digital tools requires mastering complex cognitive, motor, sociological and emotional skills necessary both for survival in a digital environment and for completing tasks and solving current problems [11].

The development of information and communication technologies such as the Internet, e-mail, blogs, educational platforms, repositories/digital libraries, social networks, etc., their omnipresence, requires the user, especially future doctors, whose professional competence is not directly related to digital literacy, acquiring a set of new skills that are important for the effective implementation of tasks in the modern digital environment. Such skills acquired by medical students in the process of studying at the university, such as the accumulation of knowledge through searching and learning on educational platforms on the Internet, user interfaces, teaching virtual digital games, searching databases, creating and sharing content on the Internet, communication in medical specialized chat rooms, etc., have become important for the acquisition of digital professional competences, especially in distance learning settings [9, 6, 10].

The relevance of the study of the use of digital technologies for the formation of digital literacy among students of medical institutions of higher education when studying natural sciences in the conditions of distance learning is due to the fact that the medical field of modern society is an inseparable component of society in which includes

the need for digital competence, which is used in professional activities of doctors, because this doctors are worked in the electronic health care system, which is the largest IT system in Ukraine. IT system of Ukraine in which about 35 million Ukrainians are registered, and about 300 thousand medical and pharmacy workers are worked, and more than 900 million medical and statistical records and reports have already been entered, involves high level of digital literacy of medical workers [5, 7]. In order to support sustainable and effective adaptation of education and training systems, the European Union has issued an action plan in the field of digital education (2021-2027), which focuses on promoting the development of a highly effective digital education ecosystem, as well as improving digital skills and capabilities digital transformation [12].

In the process of mastering the educational component «Medical and Biological Physics; Medical information technologies», digital content is easily created by teachers and students with the help of various mass media and various Web 2.0 tools are the information technologies that allow users to create and distribute their own content on the World Wide Web. Creating and introducing content with digital content can be an important and effective method of improving teaching and learning [4], which allows teachers to master digital skills of the 21st century and help students master digital content [14, 1, 2]. Giving students the opportunity to create and use digital content in the classroom can increase engagement and encourage the development of skills necessary for a technological society. For example, students can create video content with easy-to-use and free video editors that allow you to add effects, soundtracks, titles and smooth transitions, such as Windows Live Movie Maker, XMedia Recode, VirtualDub, to name a few. In addition, the use by students of digital resources of online learning platforms, in a distance learning environment, makes it easier for teachers to conduct more practical classes by reducing the time for lecturing.

The purpose of the article is to analyze the theoretical essence and content of the concept of digital information literacy of future doctors in the field of digital medical education; the consideration of the acquisition of digital competence by students of higher education institutions of Ukraine. To find out digital information literacy skills among students of the 1st Faculty of Medicine of the Kharkiv National Medical University while studying the educational component «Medical and Biological Physics; Medical information technologies»; find

out the purpose and frequency of students' use of digital information resources. To find out the digital difficulties faced by medical students when accessing the digital online platform Moodle.

Research methods. In accordance with the logic of the research, a set of interchangeable methods was used to solve the tasks: theoretical and methodological analysis of the literature on the researched problem; study of documents and regulatory materials determining the presence of digital information literacy of students when studying the educational component and practical acquisition of digital information literacy by medical students; conducted analysis and synthesis of search results in information systems in order to determine the basic concepts of research; methods of expert assessment, testing, questionnaires, observation, modeling, forecasting. The survey method is used for research. A structured questionnaire was developed for collection. The students (n=40) were randomly selected. All students consented and received a link to a Google Form questionnaire. The collected data were classified, analyzed and tabulated using the Linear Regression Model package [17].

The main results of the study. Digital literacy is the ability to process information, as well as synthesize and combine information obtained from various digital sources [16, 19]. This definition emphasizes two basic skills: synthesis and integration of information, which are closely related to the information process.

Digital information literacy does not replace traditional forms of literacy. It is built on the basis of traditional forms of literacy. Digital information literacy is a combination of two terms: digital and literacy. Digital information is a symbolic representation of data. The ability to use digital technologies, communications or networks to search, evaluate, use and create information. The ability to understand and use information in different formats from a variety of sources when it is presented through a computer. A person's ability to effectively perform tasks in a digital environment. Literacy refers to the ability to read in order to obtain the necessary knowledge, to write coherently and to critically interpret what is written. Literacy includes the ability to evaluate, read and interpret media, reproduce data and images with the help of digital manipulations, and also apply Digital literacy can be defined as a survival skill in the age of digital technologies. Digital literacy is a network of skills and strategies that students/pupils use in the digital environment. The skills and strategies that students/pupils without that will not be able to

survive, in the era of the ubiquity of technologies used in all aspects of life, starting from the personal to the educational and professional environment [15, 18]. Digital literacy can be considered as «the ability to understand and use information in various formats from various sources when it is presented through computers or the Internet» [13].

In order to understand what role digital literacy plays in the professional competence of future doctors, it is necessary to first consider the question of what constitutes digital literacy and a digitally literate person when he receives education. Although there are many definitions of the concept of digital literacy, in one way or another they all overlap with the definition given by Gilster [13]. new knowledge obtained in a digital environment.

Moreover, to fully understand what digital literacy is, we must also understand why the students/teachers/persons makes in life the notion «digitally literacy». To borrow the words of O'Brien and Sharber (2008), «a digitally literate person is one who can create blogs, wikis, and podcasts; or activities that are comprehensible to people with digital literacy, such as digital storytelling or social networking» [20].

Buckingham, D. argued that digital literacy should be considered as part of a broader rethinking of literacy and the use of technology in education, as the ability to understand, access and create communication in different contexts, which includes the skills and competences necessary to find media content with using available technologies and appropriate software [8].

According to a study conducted in 2012 [21], digital literacy can be divided into several categories: 1) determining the location of digital content, 2) creating digital content, and 3) transmitting digital content. Using these categories, students should be able to evaluate and navigate the digital content they use in their work. For the successful development of digital literacy, critical thinking is necessary for interaction with online resources. The ability to correctly find and consume digital content on the Web resource occupies a central place in effective work with the Internet. Strategic information search and critical assessment of Internet search trends, effective web search skills are necessary digital professional competence for success in learning in a modern digital community. Mastery of these competencies can guarantee that students have mastered important skills for discovering and using digital knowledge in the subject area, working knowledge of how to use search engines, basic literacy skills, and general knowledge of available resources on the Internet. In ad-

dition, relying on the ability to create productive web search conditions, the search should include the ability to use not only direct search methods, but also modeling, differentiation between domain names and requests on sites, and the ability to use the accuracy of requests.

The introduction of the ability to create digital content can become an important and effective method in improving the mastery of the studied material, teaching and learning. Digital resources can become important tools in the teacher's work, allowing him/her to reduce the time spent on reading lectures and devote more time to the direct training of students. Digital content is easy to create with the help of various media and various tools.

Providing opportunities for students/learners to create and use digital content in practical classes can increase engagement and encourage the development of skills in future professionals, necessary for a technological society. For example, students can create video content and video reviews, presentations with the help of easy-to-use video and text editors. If students do not have a sufficiently high bar for technical knowledge, they can spend more time on the quality of the content and on the process of learning a new tool.

The online questionnaire was sent to 40 students of the 1st year of the Kharkiv National Medical University of the 1st faculty studying the educational component «Medical and biological physics; Medical information technologies» in 2022-2023 using a Google form. The discipline «Medical and biological physics; Medical information technologies» is offered for study by students of the 1st year and is normative. The online questionnaire consists of 25 questions on a 4-point and 5-point Likert scale. The number of respondents was as follows: female students 65.4%, male students 34.6%. The condition of digital literacy was answers to questions with the choice of 'likely' and 'very likely', 'helpful and 'very helpful', 'agree' and 'strongly agree'. It was found that the majority of respondents, 72% of students, use platform 5 once a day. While 28% of students use the Moodle platform once a day. The results in Table 1 show the logistic regression models for weak and strong digital literacy skills and self-assessed possession of the computer skills of future doctors. That the higher the students' level of digital literacy, the more they demonstrate accurate self-efficacy. The survey showed that medical students, on average, tend to overestimate their digital competence.

Tabl. 1

Logistic regression models for weak and strong digital literacy skills and self-assessed possession of the computer skills of future doctors

	Weak skills R-squared = 0.08			Strong skills R-squared = 0.12		
	b	s.e.	OR	b	s.e.	OR
Level of formal education	0.35	0.09	1.47	0.62**	0.18	2.0
Quantity of e-books at home	0.18*	0.08	0.65	0.24*	0.07	0.7
Digital skills use at university	0.60	0.22	0.71	0.52**	0.10	0.54
Digital skills use outside university	0.28*	0.15	1.39	0.27*	0.14	1.00

Note: **p < 0.01; *p < 0.05.

According to these results, it can also be seen that the number of e-books in the respondent's home decreased the probability of weak skills, but had no relationship with strong skills. Strong skills were more typical the higher the formal degree the respondent had. Frequency of using digital skills at university reduced the likelihood of weak skills, but there was no association with strong skills. This suggests that the use of digital technologies at university can protect against low productivity, but does not guarantee high skill. The R-squared (0.12) was slightly higher with the probability of strong skills. In this study, variables related

to respondents' attitudes toward learning were missing from the models.

Fig. 1 shows the frequency of students' use of the Moodle platform from the given task. The study showed that 1) Students, on average, tend to overestimate their abilities in processing digital information and communication.

2) Students who have a higher actual abilities in digital information processing very often underestimate themselves. In this time, while their lower ability counterparts overestimate themselves.

3) Students with higher factual abilities in digital literacy processing and communication

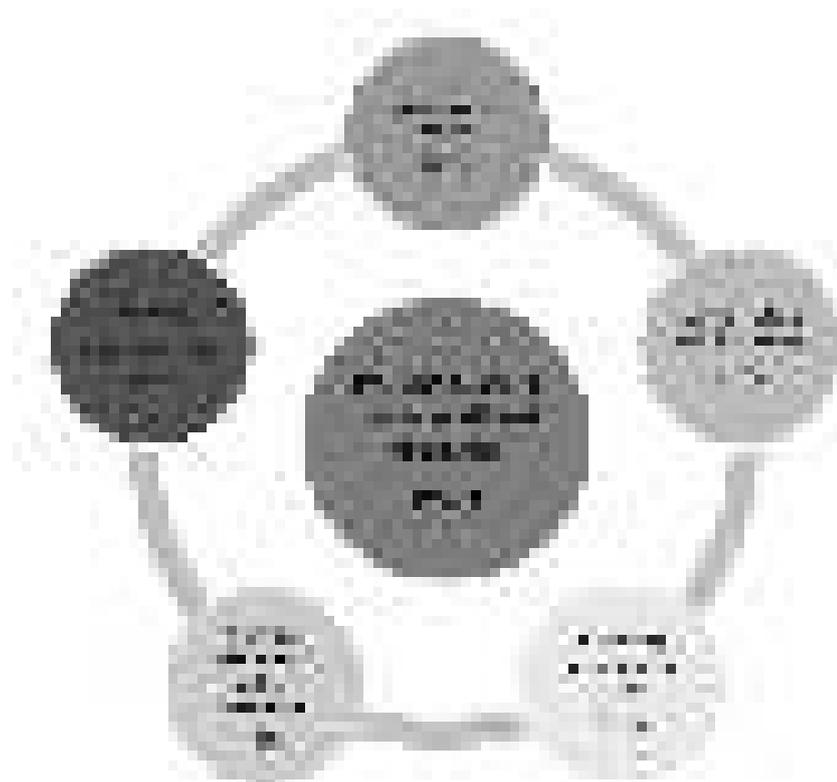


Fig. 1. Purpose of using Moodle platform

more accurately demonstrate their digital competence than their peers with lower abilities.

4) Male students demonstrate lower accurate digital information literacy self-efficacy than female students.

5) Students' general abilities at studies on educational discipline «Medical and biological physics; Medical information systems» are positively related to their digital information literacy.

6. Students with more work experience in the informational Internet space demonstrate more accurate digital self-efficacy.

Although the creation of digital content is becoming increasingly simple and accessible to any young specialist, the personalization of learning requires the user to find and use various digital resources to meet the needs of the learning process. Acquiring digital competence, just as the personalization of work with digital medical content requires more time from students in terms of investigation appropriate rubrics for performance-based learning, also requires increasing the skill of the students through the creation of digital content [1, 3, 7].

Conclusions. The tools for training and approaches to treatment that served yesterday's doctors in their practice are not suitable for tomorrow's doctors. Medical schools must respond to this ever-changing world with exciting edu-

cational innovations; must respond to rapid social, economic and technological changes in the healthcare profession. Cultivating competent specialists requires good medical education with new approaches. Research results show that the higher the level of digital literacy of students, the higher self-efficacy they demonstrate in the field of using digital technologies. The results show that students with lower levels of digital literacy and digital competence may be highly overestimated, while students with higher abilities seem to overestimate themselves less. In addition, the results indicate that medical students with the highest levels of digital literacy underestimate themselves.

The use of digital technologies in the process of training future medical workers, on the one hand, meets the requirements of modern standards of education of medical workers of Ukraine. On the other side, digital educational technologies are an innovative way of organizing the educational process, based on using electronic systems that provide visibility. The purpose of using digital technologies is to increase the quality and efficiency of the educational process, as well as the successful socialization of students. Digital technologies offer new tools for the development of universities and other educational institutions around the world.

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**ЦИФРОВА ГРАМОТНІСТЬ СТУДЕНТІВ МЕДИЧНИХ ЗАКЛАДІВ ВИЩОЇ ОСВІТИ
В УМОВАХ ДИСТАНЦІЙНОГО НАВЧАННЯ**

Цифрові освітні технології – це інноваційний спосіб організації навчального процесу, заснований на використанні електронних та інформаційних систем, що забезпечують наочність формування цифрових навичок у студентів закладів вищої освіти.

У статті аналізується використання цифрових технологій студентами медичних закладів вищої освіти при вивченні природничих дисциплін в умовах дистанційного навчання, на прикладі освітнього компоненту «Медична та біологічна фізика; Медичні інформаційні технології».

Проведено аналіз і синтез результатів пошуку в інформаційних системах з метою визначення понять дослідження, методів експертного оцінювання, спостереження, моделювання, прогнозування. Розглянуто принципи політики «цифровізації України», визначено складові поняття «цифрова інформаційна грамотність», досліджено ефективність використання цифрових програм та пристроїв у навчальному процесі у медичних закладах вищої освіти. Для дослідження використовувався метод опитування. Для збору інформації було розроблено структуровану анкету у вигляді Google форми. Було визначено роль цифрових технологій навчання в освітньому просторі та їх застосування у навчальному процесі. Отримано, що кількість електронних книг удома респондента зменшила ймовірність слабких навичок, але не мала зв'язку з сильними навичками. Частота використання цифрових навичок в університеті зменшила ймовірність слабких навичок, але не було зв'язку з сильними навичками. Це свідчить про те, що використання цифрових технологій в університеті може захистити від низької продуктивності, але не гарантує високу кваліфікацію. Загальні пізнавальні здібності студентів позитивно залежать від їхньої точності цифрової самоефективності. Студенти з більшим досвідом роботи в інформаційному інтернет-просторі демонструють точнішу цифрову ефективність. Показано, що цифрові технології в освітньому просторі, завдяки їх наочності, доступності та орієнтації на індивідуальні здібності студентів є необхідною умовою для підвищення ефективності та результативності навчального процесу. Використання цифрових технологій студентами медичних закладів вищої освіти на прикладі вивчення освітнього компоненту «Медична та біологічна фізика; Медичні інформаційні технології» підвищують мотивацію учнів до навчання, сприяють розвитку у майбутніх фахівців цифрових практичних навичок.

Ключові слова: цифрова грамотність, освітній компонент, студент, заклад вищої освіти

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