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DEVELOPING DIGITAL COMPETENCE OF FUTURE TEACHERS IN THE MODERN DIGITAL LEARNING SPACE

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ABSTRACT

*The article is devoted to the problem of formation of future teachers' digital competence in the modern learning space. The **purpose** of the article is to determine the essence and content of a teacher's digital competence on the*

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basis of scientific literature analysis, to analyze the possibilities of formation of digital competence of students of pedagogical specialties in the modern learning space.

The purpose realization involves the following tasks: to define and compare different definitions of the term “digital competence” by scientists; to reveal the essence and content of future teachers’ digital competence; to identify and characterize the ways, methods, forms, and means of formation of digital competence among the students of pedagogical specialties.

Methodology. *To achieve the purpose a complex of theoretical and empirical research methods was used. The theoretical methods included: analysis, comparison, generalization, systematization of scientific works and regulatory documents to determine the key concepts of the research and clarify the authors’ point of view regarding the essence of a teacher’s digital competence. In addition to the specified theoretical methods, empirical methods of scientific knowledge were used: the study of future teachers’ professional training, questionnaires, interviews with those who received pedagogical education, expert evaluation – in order to study the process of future teachers’ digital competence formation.*

Results. *The analysis of international legal documents and scientific works of various scientists proves that the concept of “digital competence” is interpreted ambiguously. In particular, the first European framework of teachers’ digital competence states that digital competence is a specialist’s personal formation that integrates the following components: professional involvement, working with digital resources, teaching and learning with the use of these resources, evaluation of results, expansion of students’ opportunities, the development of digital competence in subjects of education. The formation of digital competence of students of pedagogical specialties is provided in various ways: teaching special courses, involving future teachers in educational activities based on the use of various digital tools, organizing students’ work with digital textbooks, reference sources and multimedia information systems, electronic simulators, digital laboratory tools, encouraging specialists to receive non-formal education.*

Conclusions. *In the article, a future teacher’s digital competence is understood as a personal formation that integrates relevant motives, values, attitudes, knowledge of various digital resources, means, tools, technologies, as well as the ability to apply them in practical pedagogical activities on the basis of critical analysis and evaluation. The formation of future teachers’ digital competence involves a systematic combination of various methods and forms of education, constant rethinking of approaches to the organization and content of this process, ensuring an organic combination of methods of formal, non-formal and informal education.*

KEYWORDS: *Digital Competence, Future Teacher, Learning Space, Formal Education, Non-Formal Education, Informal Education.*

INTRODUCTION

At the current stage of social development, digitalization of education has turned into a global trend, the importance of which is constantly growing. This process is meant to meet the new demands of the state, in particular, the needs of the economy of the new technological order. It is also important to emphasize that digital learning tools make it possible to significantly increase the effectiveness of education, diversify it, optimize managerial operations of teachers and activities of education institutions administrators in general.

The process of education digitalization is characterized by the introduction of such important innovations:

- further development of the digital learning space contributes to the formation of a complete digital infrastructure in which technical and social components interact, which makes it possible to create and use new digital technologies in education, to connect new agents outside universities to this field;
- intensive shifts in the organization of education change the main roles of a teacher, who first of all becomes not an imparter of new information, but a moderator, consultant, facilitator, capable of providing effective pedagogical support to students in educational activities;
- supplementing existing information and digital technologies with virtual reality technologies;
- transition from the formation of hard skills in students to soft skills, which are general skills and abilities closely related to one's personal qualities, in

particular, critical thinking skills, digital communication skills, teamwork, etc.;

- elimination of territorial and temporal obstacles in acquiring necessary knowledge by a person due to massive open online courses;
- possibility of individualizing students' learning trajectories, primarily of students with disabilities;
- the dominance of blended and distance learning formats, penetration of elements of online education into the traditional (offline) education system (Docebo, 2019; Kostikova et al. 2022; Sobchenko et al, 2022; Sobchenko, & Vorozhbit-Horbatiuk, 2022; Plavčan et al, 2022; Tkachov et al, 2022; Ulianova, 2022).

According to the results of the conducted research, in recent years there has been an intensive growth in the consumption of digital means by the population. However, the increase in the number of computer and mobile devices and the expansion of the Internet network contribute to users' digital skills development only at the operational level, but do not ensure the development of an individual's ability to critically search and select information and use promptly in practical activities (Van Deursen, 2010; Skov, 2016). This confirms the necessity to ensure purposeful formation of digital competence among the participants of the educational process.

The success of implementing digital learning in education institutions largely depends on the level of teachers' digital competence formation. Therefore, there is an urgent need for teachers to acquire digital competence at all levels of continuous education, where the leading place belongs to education institutions. The analysis of the scientific literature (Baran et al, 2019; Basilotta-Gómez-Pablos

et al, 2022; Nagel I., 2021; Chernenko, 2021; Shevchuk, 2021; Sobchenko et al, 2022) confirms that this issue is not sufficiently covered by scientists. In particular, the issue of specifying the content of a teacher's digital competence as well as the ways and methods of its formation require further study (Howard et al., 2021; Novella-García & Cloquell-Lozano, 2021).

According to the results of a pilot study conducted by the authors of the article, in which 124 students of pedagogical specialties took part, it was found that, in general, future teachers have a low level of digital competence.

Thus, while conducting the survey and interviews, it was found that almost half of the respondents experience various difficulties when using digital tools in educational activities and self-education. 68.7% of the respondents admitted that they are not sufficiently prepared methodologically to use of digital technologies in future pedagogical activities.

The results of the assessment of the level of students' digital competence formation by experts, who were competent and experienced university teachers, also proved the need to increase its level. Therefore, the problem of future teachers' digital competence formation is really topical and requires an urgent solution.

The **purpose** of the article is to determine the essence and content of a teacher's digital competence on the basis of scientific literature analysis, to analyze the possibilities of formation of digital competence of students of pedagogical specialties in the modern learning space.

The purpose realization involves the following tasks:

- to define and compare different definitions of the term “digital competence” by experts;

- to reveal the essence and content of future teachers' digital competence;
- to identify and characterize the ways, methods, forms, and means of digital competence formation of students of pedagogical specialties.

METHODOLOGY

To achieve the purpose a complex of theoretical and empirical research methods was used. The theoretical methods included: analysis, comparison, generalization, systematization of scientific works and regulatory documents to determine the key concepts of the research and clarify the authors' point of view regarding the essence of a teacher's digital competence.

In addition to the specified theoretical methods, empirical methods of scientific knowledge were used: the study of future teachers' professional training, questionnaires, interviews with those who received pedagogical education, expert evaluation – to study the process of future teachers' digital competence formation.

RESULTS

Due to the fact that the views of leading national scientists on the problem under consideration are widely covered in Ukrainian scientific thought, and being under the conditions of the country's active integration into the European learning space, the primary attention in the article is paid to the analysis of the relevant views of Western European researchers. It was discovered that their works offer different interpretations of the concept of “digital competence”.

Thus, A. Skov claims that digital competence is a combination of a person's knowledge, skills and attitudes related to their effective and creative use of computer technology to perform tasks, solve existing problems, communicate

and cooperate with other people, manage information, create and exchange content. As the scientist points out, knowledge is the result of an individual's receiving and assimilating information in the process of learning.

According to A. Skov's conclusions, a person's digital competence includes the following knowledge: knowledge of facts, theories, principles of working with digital tools, communicative knowledge needed by a person in order to use digital tools for communication and cooperation with others; informative knowledge, in particular about various search systems, methods of storing information, strategies for assessing its reliability; productive knowledge which includes, for example, information about new digital technologies that can be successfully used in professional activities (Skov, 2016).

According to the author, an important component of an individual's digital competence is a combination of relevant skills that ensure their ability to solve tasks or actual problems in practice. A. Skov singles out the following groups of digital skills: productive skills, which in particular ensure the user's ability to use various programs to create and edit various types of multimedia; communication skills, such as the ability to use various methodological approaches, strategies and applications to solve existing communicative tasks; informative skills, including the skills of using logins, finding sources to complete a task, converting a file into another format (ibid.).

As stated by A. Skov, a person's attitude reflects their ways of thinking and motivation to perform certain actions, ethical priorities and personal values. Digital competence includes the following attitudes: attitude to online communication (for example, being aware of the value and meaning of

communicating with other people by means of the media); attitude to information (manifesting an active, analytical or critical position of searching and storing digital information); attitude to digital production (reflects ethical considerations regarding production and distribution of a digital product (ibid.).

According to Kirschner and Neelen, digital competence is an individual's personal formation that is manifested in their ability to use digital technologies successfully, as well as in the presence of appropriate motives and values, a manifestation of the need to constantly increase their awareness in the field of digital technologies, understand their strengths and weaknesses (Neelen et al, 2016).

According to the conclusions of other scientists (Dede, Erstad, Mishra, Voogt), digital competence is a combination of a set of appropriate simple information and communication skills (using software to find the necessary information, analyze it, transform it, save it and control its distribution) and more advanced skills, including the ability to properly analyze, evaluate and interpret different digital genres and media forms by means of critical and creative use of digital tools and media (Voogt et al, 2013).

The analysis of modern scientific works by Western European scientists shows that in defining the concept of "digital competence" most of them are guided by international normative legal acts on education, primarily by European Union documents, in which, since 2006, digital competence has been recognized as one of the eight key competences that are vitally important for every member of society.

Thus, in the document "Working Group on Education: Digital skills for life and work" (Atchoarena et al., 2017), created under the

auspices of UNESCO, it was determined that digital competence is an individual's personal formation that integrates the following components:

- information literacy (an individual's being aware of their information needs; the formation of the following skills: to be able to find and obtain the necessary information and content from various digital sources; to evaluate and formulate judgments about the relevance and reliability of information sources; to store, manage and organize digital information; to manage digital data in the process of working with digital technologies, exercising control over data and information from the perspective of data privacy and digital identification);
- readiness for digital communication and cooperation (the formation of such skills and abilities as being able to use digital technologies to interact and exchange information with others, to be a constructive member of online communities, to promote collective understanding of digital users' responsibilities in relation to each other based on being aware of each participant's individual needs, etc.);
- ability to create digital content (ability to publish digital content, edit, improve and integrate the processed information and content into the existing body of knowledge individually and within a group, contribute to updating the content of information on used platforms, create digital educational environment, etc.);
- ability to ensure digital security (understanding the risks and dangers of working on the Internet, in particular the legal consequences of copyright infringement, compliance with digital security requirements, starting from demonstrating the ability to protect information and privacy of personal data based on the use of appropriate security tools and anti-virus software to demonstrating awareness with social welfare issues, assimilation of information about potential sources of harm on the Internet (malicious websites, consumer fraud, etc.), awareness of the impact digital technologies have on the environment;
- awareness and realization of digital rights by the citizens (being aware of their rights as a person and a consumer of digital services, which are implemented on the basis of compliance with the principle of equality regardless of gender, age, race, sexual orientation and other differences; the ability to promote collective understanding of responsibilities of digital users in relation to one another (Atchoarena et al., 2017).

The document "Digital Skills and Competence, and Digital and Online Learning" (Brolpito, 2018) was also useful in the research. The document outlines the generally accepted position and strategic approach of the ETF (European Training Foundation) in the field of DOL (digital and online learning), where it is noted, that digital competence is a person's ability to confidently, critically, consciously and responsibly apply digital knowledge, skills and attitudes in a certain professional field (for example, in education). This competence primarily includes such basic digital skills and abilities as working with information and various data sets, implementing online communication and interaction with other people, creating digital content, ensuring safety of one's

activities, choosing optimal ways to solve existing problems (Brolpito, 2018).

An important event in the development of digital education was the development of the first European Framework for the Digital Competence of Educators (DigCompEdu) by the Joint Research Center in 2017.

We'd like to point out that document identifies six groups of competencies that educators must master, namely:

- 1) professional involvement (organizational communication, professional cooperation, reflection practice, digital continuing professional development);
- 2) working with digital resources (resources selection, creation and editing, implementation of management, protection and exchange processes);
- 3) teaching and learning (teaching, career guidance, joint learning, self-organized learning);
- 4) assessment (choice of assessment strategy, analysis of collected materials, feedback and planning);
- 5) expansion of students' opportunities (ensuring accessibility and inclusiveness of education; implementation of education process differentiation and personalization, active involvement of students in pedagogical interaction);
- 6) development of digital competence among subjects of education (formation of their information and media literacy, development of communication skills, ability to create content, ability to use information and digital resources responsibly, ability to successfully solve problems in this field) (Brolpito, 2018).

On the basis of the analysis of teachers' scientific and methodological developments and our own teaching experience, it was concluded that in the process of future teachers' digital competence formation, it is possible to use various means of formal and non-formal education.

In this regard, the joint work of Spanish teachers C. Romero-Garcia, O. Buson-Garcia and P. de Paz-Lugo is of interest. The work describes their experience in future teachers' digital competence formation. In particular, for this purpose, they actively use the following digital tools in their pedagogical work: Perusall (a service that helps organize group work with documents and automatically assess students' activity), collaborative digital wall linoit, Collaborative mind map, using the Mindmeister tool, Designing a motivational video to present the content of a unit plan, Preparing an escape room in Google Sites, Creating evaluation problems using learning platform The Kahoot, etc. (Novella-García, 2021).

In the context of the above-mentioned problem, the study of scientists (M.J. Gallego-Arrufata, N. Torres-Hernandez, T. Pessoa), dedicated to identifying the level of future teachers' awareness in the field of digital security, aroused considerable interest. According to the results of these scientists' scientific investigations, almost half of the interviewed teachers do not have sufficient skills in the specified field. These results coincide with the results of authors' research works. Therefore, scientists plan to create and teach a training course aimed at increasing future teachers' awareness in the field of digital security (Gallego-Arrufat, 2019).

The national higher education has also accumulated valuable methodological developments in the future teachers'

digital competence formation. Thus, higher education pedagogical institutions teach special training courses aimed at formation of this competence among students. For example, in Kharkiv National University they teach such subjects as “Information and Communication Technologies in Education and Science”, “Modern Information Technologies”, “Pedagogical Information Technologies”, “Means of Digital Training”, “Management of Distance Learning”, “Cybersecurity in Education”, “Graphic Design and Advertising”, etc.

The increase in the level of digital competence of students of pedagogical specialties is also facilitated by involving them in work based on the use of various digital tools such as data storage and sharing services, cloud-based services, instant messaging services, creation of multimedia presentations, etc. Future teachers' involvement in working with digital textbooks, reference and information search multimedia systems, electronic simulators, tools of digital laboratories, etc. contribute to the successful solution to the mentioned problem.

A prominent place in the process of future teachers' digital competence formation is occupied by involving them in work on various platforms of distance and blended forms of learning: Moodle, Google Classroom, Edmodo, etc. In particular, Kharkiv National University and Kharkiv State Academy of Physical Culture actively use the Moodle platform. It is convenient to upload didactic materials in various formats (text, audio, video, presentations) and students' works, monitor and evaluate students' educational achievements, and implement interactive interaction with them on this platform.

University teachers also motivate future teachers to get involved in various types of

non-formal and informal education, which ensure an increase in the level of students' digital competence.

In particular, massive open online courses (MOOCs) – distance interactive educational courses that require students to perform various types of educational activities, are of great interest in this regard. Ukrainian platforms and resources created for the organization of a teacher's self-education include: Vseosvita, Coursera, Prometheus, Webinars with mozaBook and mozaWeb from EdPro, etc.

DISCUSSIONS

The analysis of the provisions of international legal documents (Docebo: Elearning market trends and forecast 2017 – 2021, 2019; Working Group on Education: Digital skills for life and work, 2017), conclusions of Western European scientists (Voogt et al, 2013; Novella-García, 2021; Gallego-Arrufat, 2019) regarding the definition of the essence and content of a teacher's digital competence makes it possible to improve and enrich Ukrainian scientists' ideas about this phenomenon, to specify the content components of the competence. The scientific and methodological works of researchers, in which the authors' techniques of future teachers' digital competence formation are analyzed, typical drawbacks of this process are identified and the ways of their elimination are determined, are also of great value.

CONCLUSIONS

Summarizing the results of the conducted research, we note that different definitions of the concept of “digital competence” are offered in scientific literature. Taking into account the scientists' different points view, it was concluded a future teachers' digital competence is a personal formation that integrates relevant motives, values, attitudes, knowledge

about various digital resources, means, tools, technologies, as well as the ability to apply them in practical pedagogical activity based on critical analysis and evaluation. The formation of future teachers' digital competence involves a systematic combination of various methods and forms of education, ensuring an organic combination of formal, non-formal and informal education tools. Since

digital competence is a dynamically changing phenomenon, the process of its formation among teachers requires constant rethinking of approaches to the organization and content of this process. In the future, it is planned to develop and implement in practice the authors' technique of formation of digital competence among the students of pedagogical specialties.

CONFLICT OF INTERESTS

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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АНОТАЦІЯ / ABSTRACT [in Ukrainian]:

ФОРМУВАННЯ ЦИФРОВОЇ КОМПЕТЕНТНОСТІ МАЙБУТНІХ УЧИТЕЛІВ У СУЧАСНОМУ ОСВІТНЬОМУ ПРОСТОРУ

Стаття присвячена проблемі формування цифрової компетентності майбутніх учителів у сучасному освітньому просторі. **Мета** статті – на основі аналізу наукової літератури визначити суть і зміст цифрової компетентності вчителя, проаналізувати можливості формування цифрової компетентності студентів педагогічних спеціальностей у сучасному освітньому просторі.

Реалізація поставленої цілі передбачає виконання таких **завдань**: визначити й зіставити різні визначення фахівцями поняття «цифрова компетентність»; розкрити суть та змістове наповнення цифрової компетентності майбутніх учителів; виявити та схарактеризувати шляхи, методи, форми, засоби формування цифрової компетентності у студентів педагогічних спеціальностей.

Методологія. Для досягнення сформульованої мети було використано комплекс теоретичних та емпіричних методів дослідження. Так, серед теоретичних методів використовувалися такі: аналіз, зіставлення, узагальнення, систематизація наукових праць та нормативних документів для визначення ключових понять дослідження й уточнення авторської точки зору щодо розкриття суті цифрової компетентності педагога. Поруч із зазначеними теоретичними методами застосовувалися емпіричні методи наукового пізнання: вивчення професійної підготовки майбутніх педагогів, анкетування, бесіди зі здобувачами педагогічної освіти, експертне оцінювання – для дослідження процесу формування цифрової компетентності майбутніх учителів.

Результати. Аналіз міжнародних нормативно-правових документів і наукових праць різних учених засвідчує, що поняття «цифрова компетентність» трактується неоднозначно. Зокрема, у першій європейській рамці цифрової компетентності педагогів визначено, що цифрова компетентність є особистісним утворенням фахівця, що інтегрує в собі такі складники: професійну залученість, роботу з цифровими ресурсами, викладання і навчання на основі використання цих ресурсів; оцінювання результатів, розширення можливостей учнів; розвиток цифрової компетентності в суб'єктів навчання. Формування цифрової компетентності студентів педагогічних спеціальностей забезпечується різними шляхами: викладання спеціальних навчальних курсів; залучення майбутніх учителів до навчальної діяльності на основі використання різноманітних цифрових засобів; організація роботи студентів із цифровими підручниками, довідниковими й інформаційно-

пошуковими мультимедіа-системами, електронними тренажерами, засобами цифрових лабораторій; заохочення фахівців до отримання неформальної освіти.

Висновки. У статті під цифровою компетентністю майбутнього вчителя розуміється особистісне утворення, що інтегрує в собі відповідні мотиви, цінності, ставлення, знання про різні цифрові ресурси, засоби, інструменти, технології, а також уміння оптимально застосовувати їх у практичній педагогічній діяльності на основі критичного аналізу й оцінювання. Формування цифрової компетентності майбутніх учителів передбачає системне поєднання різних методів і форм навчання, постійне переосмислення підходів до організації та змісту цього процесу, забезпечення органічного поєднання засобів формальної, неформальної й інформальної освіти.

КЛЮЧОВІ СЛОВА: цифрова компетентність, майбутній учитель, освітній простір, формальна освіта, неформальна освіта, інформальна освіта.

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