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Formation of Digital Competence in Higher Education Students as a Basis for the Transformation of Education of the Future

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Abstract: The education informatization together with the rapid spread of computer technology actualizes the need for thorough information training of future teachers. The purpose of the study is to analyze the applicants for higher education digital competence based on the features of modern education. In the work were used general scientific methods: analysis, synthesis, deduction. By means of prediction method, further opportunities for the development and improvement of the digital competence of students are characterized. The study contains a systematic literature review on the development of digital competence in higher education students, published over the past decade. Based on a full-text analysis of 20 articles published in known databases, the study identifies the need for developing digital literacy skills in undergraduates. The results define the role and importance of digital competence for future specialists' formation, outline the structure of digital literacy, highlight the main tasks of digital competence: the creation of digital content, digital culture of communication and cooperation, formation of information control and interpretation skills, etc. Although the digitalization of education is active in Ukraine, but the study highlights the possibilities of its development: improving the legislative framework, state support for the implementation of digital products, the development of digital educational content, the development of innovative material and technical base, etc. To conclude, the effectiveness of the development of digitalization of education is provided by the continuity, consistency, and coherence of preparation for the digital transformation. At the same time, digital competence is a necessary condition for the formation of the teacher of the future: they should be able to analyze information, work in network communities to design and form a digital educational environment in order to form a new generation of progressive teachers.

Keywords: digital competence, education seekers, informative technology; components; digital literacy, challenges, education.

Introduction

Research Problem

The rapid development of public goods, digital technologies, and learning innovations require each specialist in the field of education to acquire special professional knowledge and skills, and the institution of higher education - to review approaches to the formation of students professional competence. The use of digital technologies contributes to the effectiveness of the educational process at all levels and the formation of professional competence of future teachers. Pedagogical institutions of higher education face the task of implementing such an organization of the learning process, which will be able to create conditions for specialists training who easily learn and quickly adapt to changing conditions and content of work, who are interested in continuous education; who skillfully use modern computer technologies in their own professional activities, freely navigate in the information space, possess knowledge, professional skills and skills in searching, processing, and storing data. Given this, the problem digital competence formation among future teachers as a necessary condition for ensuring a competitive specialist in the modern labor market becomes urgent. Thus, there is a need to form the ability of applicants to systematically use information technologies, because the presence of digital competence allows them to be successful in professional activities that are carried out in the informational space, to search, to consciously use information, to quickly make decisions, to form important life competencies. Due to today's conditions, where there is a rapid pace of development of digital technologies, the number of various devices that simplify the life of a modern person is constantly increasing, affecting all areas of life, including education.

Research Focus

The recent years events have brought unprecedented improvements to educational activities in the world in general and in Ukraine in particular, making online education not only necessary, but also in some cases the only possible way to ensure the continuity of the educational process, the implementation of educational programs and pupils and students access not only to educational materials, but also to learning as such. The impossibility of conducting education in the classical way in classrooms at desks presented educators with an unprecedented challenge: to find a meaningful way to continue education online. The sudden need for digital solutions in the field of education has led to the emergence of various digital networks and online platforms, their role consist in providing the educational process is currently difficult to overestimate. However, without delving into the history of digitalization of education, it is worth noting that some 15 years ago, online courses and elements of distance education in Ukraine were few, if not advanced.

Research Aim and Research Questions

Increasing the level and quality of knowledge, the formation of competences, in particular the ability to acquire information and effectively use it in professional activities is the main task of the education reform of a competitive country. At the same time, the development of professional knowledge and competences of future teachers, creativity, competitiveness, mobility, ability to independence, self- determination and self-education is a significant feature of the modern higher school. The digital competence is one of the traits that must be possessed by a person who can successfully adapt to the constantly changing conditions of life. The formation of digital competence is based on the idea of continuity of education, the driving force of which is students' awareness of the need to move to the next level of overcoming the discrepancy between the level of mastering theoretical knowledge and practical skills. The principle of continuity is based on the idea of ensuring its movement from ignorance to full assimilation of knowledge, self-learning, and the formation of competencies.

Research Methodology

The theoretical and methodological basis of the study of digital competences have become the fundamental provisions of modern theory, the work of leading Ukrainian and foreign scientists and practitioners in the field of higher education, the future development of education, the digitalization of the society and the competencies that people can achieve.

In this article general scientific research methods were used, namely: system analysis, synthesis, deduction (analyzing personal educational environment). First, using system analysis and synthesis one analyzed the digital competences and their implementation. Next, to show education environment impact on abstract person one used deduction and to illustrate the environment formation under individual efforts one used induction.

The method of forecasting was also important. Based on forecasting method, further opportunities for the development and improvement of digital competence of higher education applicants were reflected. The axiological method was also used. By means of this method, the basic values and skills that the digital education of the future will develop were attracted. Through this method, the competencies that will be needed in the digital society are also characterized. These competences are supposed to be a worthy response to the challenges of globalization.

The study was implemented in several stages. The first one outlined the meaning of digital competence, characterized the main components and structure of digital literacy, the second one investigated the current considerations on the role and place of digital competence in the future teacher training system, described the main prospects and ways of development of digital literacy. In the last stage, the results of the study are made.

Research Results

The skill to use digital technologies at work is gradually becoming necessary for most specialties and professions. Digital literacy in the modern information (digital) society is one of the main competencies. Educators are role models of the new generation. Therefore, they must demonstrate exemplary digital competence in order to equip those who receive education with the appropriate tools and skills; to be the most active actors of the digital society and encourage pupils and students to do so.

In a broad sense, digital literacy is a person's skill to use digital tools in the smallest possible way with benefit for oneself and professional activity.

Digital competence is interpreted as a dynamic combination of knowledge, abilities, skills, ways of thinking, attitudes, and other personal qualities in the field of information, communication and digital technologies, which determines the ability of a person to successfully socialize, to carry out professional and/or further educational activities using such technologies (Yevstratiev, 2020). According to the European framework of digital competence of educators, the digital competence of a teacher in the broad sense sees the ability to use digital technologies not only to improve learning, but also for professional interaction with colleagues, students, parents and other stakeholders; for personal professional development and collective good, as well as continuous innovations in the organization of training.

Talking about Ukraine, it is necessary to mention that nowadays there are six key areas within digital competence. They cover various aspects of the professional activity of educators: – professional involvement; – digital resources; – organization of learning; – assessment; – expansion of educational opportunities; – formation of digital competence of education seekers. Being competent in the field of digital education, teachers should take into account the general educational environment in which educational meetings take place on online platform. Therefore, a significant part of the digital competence of teachers is, before giving students the opportunity to take an active part in life and education in the digital era.

Another aspect of their digital competence is the use of all the advantages of digital technologies in order to improve pedagogical activities as well as to advance organizational strategies (Fostikova, 2020). The use of digital technologies is effective in improving the effectiveness of communication with higher education students, their parents, and third parties. Digitization of education promotes cooperation, development and improvement of organizational communication strategies in assistance with other educators, exchange of knowledge, opinions and experience of innovative pedagogical practices (Chekan et al., 2017).

Digital competence involves the ability to individually and collectively reflect, give a critical assessment and ensure the active development of one's own digital pedagogical practice, one's own educational community and a digital-friendly educational environment. The need to use digital sources and resources for continuous professional development is undeniable at the moment, because at the

disposal of a modern teacher there are many digital educational resources that he can use in the educational process.

One of the key digital competency skills that any modern educator needs to develop is to embrace such a variety of online platforms, digital learning materials and tools; effectively identify the resources that best suit his own pedagogical goals and the learning goals of specific higher education students and match these resources to his own teaching style; structure digital learning materials, establish connections between them and modify them; add and develop own digital resources to support personal continuous learning.

At the same time, the teacher must responsibly use digital content and manage it, involving respecting copyright and promoting it during the use, modification and sharing of resources, as well as taking care of the protection of confidential content and data, for example - the results of digital exams or other student evaluations. The next component of digital competence is the ability to select digital resources, which consists in the ability to identify, evaluate and select digital resources that are adequate for specific teaching and learning purposes. For this, the teacher must take into account the realities of a specific educational task, its context and parameters, choosing digital resources for its implementation.

Modification of digital resources involves the skill and ability to modify and expand existing resources with an open license or resources that allow this.

To create or co-create new digital educational resources, the teacher must take into account the specific educational goal, pedagogical approach and target audience when designing digital resources and planning their use in the initial process (See Table 1).

Table 1

The Structure of the Digital Competence

The name of the competence	The description the component
Information literacy	View, search and filter data, information and digital content; Evaluation of data, information and digital content; Data, information and digital content management; Interaction using digital technologies.
Communication and cooperation	Exchange using digital technologies; Involvement of citizenship with the help of digital technologies; Collaboration using digital technologies.
Creation of the digital content	Development of digital content; Integration and processing of digital content; Copyright and licenses; Programming.

Security	Device protection; Protection of personal data and confidentiality; Protection of health and well-being; Environmental Protection.
Solving problems in the digital space	Solving technical problems; Determination of needs and technological responses; Creative use of digital technologies; Identifying gaps in digital competence.

Source: created by authors.

The management, protection and sharing of digital resources require the teacher to be able to organize digital content and create adequate ways to access it for higher education students, parents, stakeholders and colleagues. To effectively protect digital content, the educator must respect and comply with confidentiality and copyright; understand the rules for the use and creation of open licenses for digital products and open educational resources, including compliance with the rules of proper reference and citation (Vuorikari, 2016). Considering the chosen pedagogical strategy or approach, the formed digital competence of the teacher also consists in the effective organization of the use of digital technologies at various stages and in different conditions of the educational process (Ovcharuk et al., 2018). The real potential of digital technologies is to shift the focus of learning from teacher-driven processes to learner-driven processes. In this way, the role of the digitally competent educator is transformed into one of mentoring, mediation, and mentoring for learners in their increasingly autonomous learning endeavors. In this sense, digitally literate educators must be able to develop new digitally enabled ways to mentor and support learners, individually and collectively, and to initiate, support and monitor both self-regulated and collaborative learning activities.

Digital competence occupies a key place in the system of professional and general competences, is the basis for professional development in any field of activity of a modern specialist. For example, an important characteristic of becoming a future specialist in the field of education is digital competence, which is part of the ten basic competencies prescribed in the Concept "New Ukrainian School" (Ministry of Education and Science of Ukraine, 2016). Therefore, the digital competence is recognized as one of the key competences of a modern person and occupies a leading place in their list. The main tasks of the digital competence can be described with such main tasks of the digital competence as: common activity, creation of the digital content, cooperation and communication, the control over the information, solving of the problems and satisfaction of the needs.

Thus, at the current stage of the development of digital technologies, the concept of "digital literacy" should include a number of such aspects as the organization of work in the digital space; security in the digital environment; analysis and synthesis of the received information, the ability to use the acquired knowledge in professional and private life; communication and respect for all participants in the process of interaction in the digital space. In addition, digital literacy becomes the basis for the development of human information culture (Kuchyn et al, 2022). That is, the digital competence of an individual today can act as the "new literacy" of a modern person, where the vast majority of social relations "transition" into the digital dimension.

It is important to note that "digital competence" as a concept related to the formation and application of ICT is undergoing a transformation along with the deepening of scientific research in this area. It is worth emphasizing that, for the most part, scientists who study the digital competence of a

person and its manifestations in professional and private life focus on the subjective characteristics of this concept in the context of their research (Bouton et al., 2021). That is, the content of the definition of this complex concept is reduced to the goals and needs of a specific researcher, which in turn leads to biased and misleading results, where the very concept of "digital competence" is interpreted too narrowly or too broadly.

Today, such collisions in the defined concept of "digital competence" give even greater relevance to research, which aims not to adjust to the obtained results, but primarily to the content analysis of multiple definitions of this concept and systematization in accordance with the current realities of the development of education and technology in the digital space. Another important aspect related to digital competence and its formation is its reflection in the content of education and the system of effective training of education seekers, because it is no secret that now there are many opinions and positions of different scientists regarding the competence related to "digitalization » of all areas of human social life (Calmer, 2021). Next, let's consider different definitions of digital competence by leading scientists in the field of pedagogical and other sciences. Ovcharuk (2019) gives a consolidated definition of digital competence as "the proven ability to work individually or collectively, using tools, resources, processes and systems that are responsible for accessing information (information and data) and its evaluation, to apply such information to solve problems, creation of information-oriented solutions, products and systems, as well as for obtaining new knowledge.

Discussion

As the results of the study show, digital literacy (given the current educational trends) is the main key in the system of preparation of the teacher of the future. Many researchers agree with this statement. According to Tytova & Mereniuk (2022), the growth of digital literacy in the future will be intensive, and especially among the representatives of higher education applicants (primarily teachers). At the same time, in the study of Laufer et al. (2021) digital literacy is almost the most important competence of the specialist of the future. In addition, the possibilities of the digitalization of education are well-known in current research. For example, Ben-Amram and Davidovitch (2021) highlighted the potential applications of this form of learning in the realities of large-scale digital use.

However, it is worth noting the importance of digital technology for the development of critical thinking and creativity. In the first case, the contemporary youth has the greatest access to information in the history of mankind, so it is important to pay special attention to the process of critical perception of the received information (Gupta et al., 2021). In order to develop these skills, it is possible to introduce special subjects (intended to give knowledge and skills in the field of analysis and use of received information) in educational institutions. Regarding the development of students' creativity, modern digital technologies and educational tools create opportunities for creativity, development and implementation of own ideas without investing significant resources, today almost everyone has gadgets that can satisfy these needs, their intelligent use in the educational process can significantly enrich the arsenal of effective ways of building national education. This opinion is shared by Ifenthaler et al. (2020).

In the context of students' development of digital competence and in the process of intensive development of education, it is necessary to analyze the design of a student's personal educational environment (PLE). Under the personal educational sphere of a person, it is necessary to understand a part of the global information educational space, used and created by the subject of activity in it on the basis of available means of communication on individual needs and opportunities to ensure the dual

nature of life- realization of one's personality in the chosen profession and continuous self-education throughout life. PEE is a set (construct) of resources of the global Internet, which each student fills independently from the proposed or randomly selected resources of the network, based on their preferences, thereby forming an individual design of educational tools (Kergel et al., 2022). The filter of PLE elements is produced by the student on the basis of his own values; is based on a certain level of subjectivity of the student.

Modern researchers note that PLE creation provides an opportunity to construct their own knowledge necessary to adapt to the current labor market, the use of open educational online platforms and other resources of the global Internet (Andros, 2022). The construction of a PEE dictates the need for the development of digital competence, since the PEE is initially formed spontaneously, but after a while, when the subject has a sufficiently large number services and tools of the personal environment, the question of selection, ordering and systematization in their application, which requires digital skills and critical thinking, which means that building a PEE allows you to acquire knowledge skills at all digital competence levels. The development of digital competence and the construction of a PEE are interdependent processes: without a certain level of digital competence, rational construction of a PEE, but only with the help of a PEE is it possible development of a higher level of digital competence, as this process is associated with the acquisition of activity and personal experience.

Speaking about the prospects for the use of digital technologies in domestic social relations, whether it is the education, it is necessary to clearly understand what are the strengths and weaknesses of this complex entity, what are the resources for their development, etc. In the context of the above, when considering issues related to the Central Committee of an individual, it is worth mentioning such an important indicator of the country's readiness for the development and implementation of information and communication technologies in social relations, as the Network Readiness Index (WEF-INSEAD Network Readiness Index (NRI)). Since 2001, the World Economic Forum (WEF) has published an annual report "Global Information Technologies", its purpose was to measure the drivers of development in IR technologies around the world using the Network Readiness Index (NRI) (Kaplan, 2022).

The obtained results with the help of NRI make it possible to determine the prior areas of development in order to more fully use IR technologies for the sociological development of the state. It is important to note that the place in this rate can be an indicator of society readiness and the state to participate in the development of IR technologies. In this ranking, Ukraine ranks 59th according to the data of the KNOEMA website, which shows a significant increase in dynamics compared to 2025.

But despite the positive dynamics of the introduction of digital technologies into domestic social relations according to the NRI, Ukrainian society must make a lot of efforts to further implement digital technologies in all spheres of his life. The main opportunities to improve the situation could be: improvement of the domestic legal framework related to the functioning and professional activities in the digital space, state support for the implementation of real digital products through approbation in the education sector, compiling training resources and platforms to develop digital educational content, use of innovative material and technical base, etc. (See Table 2).

Table 2

Opportunities to Develop Digital Competence

The main opportunities for the development of digital competence
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Improvement of the domestic legal framework related to the functioning and professional activities in the digital space
State support for the introduction of real digital products through their testing in the public sector and education
Formation of educational resources and platforms for the development of digital educational content
Implementation of innovative computer learning methods
Use of innovative material and technical base
Development and implementation of distance learning
Formation of a digital educational environment

Source: authors' development.

Thus, major opportunities to improve digital competence in the future include: improvement of the domestic legal framework related to functioning and professional activity in the digital space, which also needs improvement and integration with international legal institutions regarding intellectual property law, which very often negatively affects the motivation to “get” digital products to the market; state support for the introduction of real digital products through their approbation in the public sector and in education in particular; improvement requires "real" training of both IT specialists and ordinary users, it is necessary to explain and motivate in an understandable way to improve their own digital skills, which in the future can become the basis of the digital culture of the individual (Zhernovnykova 2020). According to the WEF report mentioned above, the development of a country's information and digital environment directly determines its competitiveness in the plan and in general. According to the above- mentioned WEF report, the development of the country's information and digital environment directly determines its competitiveness in plan and in general.

Conclusions and Implications

As a basis for assessing the digital literacy of future teachers of humanitarian specialties, one used the foreign researchers' experience, whose approach is based on the assessment of such indicators as:

- Informative competence (knowledge, abilities and skills, responsibility related to the search, understanding, organization, archiving of digital Pedagogy formation of a creative personality in higher and secondary schools of information and its critical understanding; creation of information objects using digital resources, compliance with copyright during citation);

- Computer skills (ability to install the necessary programs and applications in accordance with the tasks of professional and everyday life);

- Media competence (understanding the diversity of information sources, forms, channels of its distribution, the ability to find new information, check its completeness and reliability, to be critical of information messages);

- Communicative skills (knowledge, abilities, skills necessary for communication through various channels (e-mail, chats, blogs, forums, social networks, messengers, etc.), awareness of the presence of special ethics and norms of communication in the digital environment);

- Technological skills (free use of digital tools depending on the platform/interface of knowledge, the ability to effectively and safely use technical software tools to solve various tasks; understanding of technological trends, readiness to work with new modern technologies, applications, gadgets, etc.).

In the conditions of confronting educational and social challenges, contemporary reality actualizes the need for digital transformation of all spheres of human life reality Digital competence formation among future teachers of humanitarian specialties is of particular importance. Certainly, the effectiveness of this process is ensured by the continuity, systematic approach, and integrity of the process preparation for digital transformation. Digital devices and mobile technologies are integral attributes of a modern student, therefore future teachers of humanitarian disciplines with a goal effective implementation of professional activities must have knowledge about the capabilities of computer technology and mobile devices, understand the role digital educational environment, to be able to analyze information, design and create own educational environment, work in network pedagogical communities, improve qualifications through self-education on online courses.

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