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Digital Competence of Higher Education Applicants: New Opportunities and Challenges for Future Education

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Abstract: As a result of the spread of the Covid-19 pandemic and the introduction of distance learning, the issue of digital competence, which both modern educators and students should possess, has become especially relevant. Digital competence is important in the education system, because having it, students can adequately respond to modern global challenges and transformations. The study aims to analyze the state of digital competence of higher education applicants through the prism of modern challenges and opportunities. The work is based on the use of general theoretical and empirical research methods. Analysis, synthesis, abstraction, and concretization were important among

theoretical methods. Based on the predictive method of research the main ways of digital competence formation and specifics of future use were characterized. At the same time, to determine the level of digital competence, a questionnaire and survey of students based on digital literacy diagnostic techniques were conducted. The results considered the problem of theoretical justification of the digital competence phenomenon, offered their own understanding of this term, determined the structure of formation of basic competencies in higher education applicants, based on the use of modern techniques, characterized the state of digital literacy of students. The results also indicate that mostly the respondents of the experiment had an average level of digital competence. Despite this, many respondents were not fully acquainted with the manipulative possibilities of information resources. The practical value of the work lies in the development of practical recommendations that can be applied in further work to improve the level of mastery of digital competence.

Keywords: digital literacy, students, situation, features of formation, challenges of education

Introduction

Research Problem

The development of today's information society has led to the widespread use of digital technology. Working with them requires additional training because new perspectives are also associated with new dangers. This is especially relevant for applicants for higher education, because they are in a kind of risk zone, perceiving the work with the Web through the prism of entertainment culture. At the same time, the appeal to learning and awareness of the difficulties and threats of working with the Internet forms digital competence. Its research is not definitively completed, as the further rapid development of digital technologies produces new challenges, the answers to which are among the urgent tasks of modern research.

Research Focus

The article emphasizes the importance of forming digital competence based on the processing of sociological information and empirical data. The main attention is focused on highlighting this phenomenon as a structured combination of skills, knowledge, and skills of working with modern technologies. Separately, digital competence affects the formation of critical thinking skills and soft skills (social skills related to communication), which are now especially relevant for higher education students.

Research Aim and Research Questions

The study of the phenomenon of distance learning, and consequently the process of formation of digital competencies of education applicants is not new. For example, Braun (2021) investigated the development and implementation of distance learning based on the analysis of modern information platforms. Renigere and Cela (2019) analyzed the main conditions, aspects, ways, and problems of modern competence formation. The authors paid key attention to the peculiarities of the formation of environmental competence. Araújo and Bizzo (2015), using modern methods, described the position of environmental competence. However, Kem (2022) investigated the development of the modern education system, pointed out the main trends and changes in this area of human activity. At the same

time, Kirshner (2021) characterized the transformation of the education system due to the challenges of the Covid-19 pandemic. Anghel et al. (2021) investigated the characteristics of becoming a graduate student. Also Ben-Amram and Davidovitch (2021), with a thorough case study, identified the formation of digital competencies in students, while also characterizing the attitudes of students and parents towards distance learning. Bigirwa (2020) investigated the main opportunities for the development of distance education, with special attention paid to the study of the peculiarities of the formation of digital competence. Schumacher and Ifenthaler (2021) characterized the main opportunities to improve the education system. At the same time, Sagre et al. (2021) analyzed current trends, forms, methods, and ways of acquiring linguistic competence with the active use of distance learning. The authors paid some attention to the definition and characterization of the formation of digital skills in linguistic students. Broadbent et al. (2021) compared the acquisition of professional competencies by higher education applicants during traditional and distance education systems. Nevertheless, little research has been done on identifying the main ways to build digital competencies, characterizing the state of these skills among students, and exploring the challenges and prospects of implementing digital literacy among higher education applicants.

Research Methodology

General Background

The theoretical part of the study is formed on the use of general pedagogical research methods: analysis, synthesis. The concept of digital competence and its components are defined based on concretization. With the help of the predictive method of research further challenges and opportunities for the formation of digital literacy in students are defined. At the same time, the practical part of the study is formed on the use of empirical research methods: surveys and questionnaires conducted among students.

To investigate the state of digital competence in higher education applicants, an empirical analysis was conducted in digital format. The digital format was chosen for several reasons:

1. The spread of the Russian-Ukrainian war made it impossible to conduct face-to-face research
2. The use of the Google platform for the survey influenced the fact that geographically remote regions were covered.

Sample / Participants / Group

This study involved 120 people who were divided according to the following criteria: age, gender, place of residence. All respondents were students of higher education (75% - bachelor’s, 25% - Master’s) (See Table 1). In conducting this study, the authors of the article were not limited to a single geographical location.

Table 1

Diagnostic Data of the Empirical Study Participants

Age of participants in the empirical study				
Under 17 years old	17-18 years old	19-20 years old	21-22 years old	Above 22 years old

Absent	10%	45%	22%	23%
Level of education of respondents				
Middle	Incomplete basic	Basic (Bachelor)	Incomplete higher education	Higher (master)
Absent	Absent	45%	22,5%	32,5%
Gender of the participants of the experiment				
Men			Women	
57%			43%	

Source: made by the authors of the article.

Respondents already had some experience in mastering digital tools and skills of working with information and digital sources in the field of education.

Instrument and Procedures

The determination of the level of students' digital competence was based on the use of modern digital resources, in particular the Google survey platform. Open and closed questions on modern methods of determining digital competence were developed on it.

The empirical analysis of the state of digital competence of higher education applicants was carried out in several stages. In the first stage, a theoretical definition of digital competence was implemented, and the general state of digital literacy of Ukrainian students was characterized. However, the second stage included research and refinement of empirical referents of digital competence and the formation of methodological tools. The third stage of the study involved characterizing the state of the respondents' digital competence, analyzing the level of digital literacy, and establishing the connection between them. Also at this stage, further opportunities for the development of digital literacy were established, and the key challenges to its transformation were identified.

Data Analysis

To determine the digital competence of applicants for higher education, methods of system analysis, induction, and deduction, and a number of modern methods of identifying digital literacy were applied. In particular, the study pays much attention to the use of Papakitsa (2012) "Responsibility for Information Use". On its basis, the state of responsibility for work in the information sphere is determined. This methodology was developed by the Ukrainian researcher Papakitsa (2012) and is aimed at diagnosing the moral foundations of the respondents in the distribution and analysis of information on the Internet. Respondents had to assess their level of agreement or disagreement by answering special statements. This methodology allows to form the level of ethical beliefs of respondents on information dissemination.

Of separate importance was the application of the Digital Competence Index (hereinafter referred to as DCI) developed by H. Soldatova, which was substantiated by Ukrainian researcher Krasniakova (2022). It is focused on determining the level and state of digital literacy and Internet skills. The methodology made it possible to investigate the state of respondents' satisfaction with their personal knowledge. For example, the methodology focuses on the legal and ethical bases of interaction with the network and digital materials, functional norms of using computer techniques, digital competence skills in accordance with the situation of fraud in the network space. Based on this methodology it is possible to trace the desired level of digital competence of the experiment participants.

Research Results

To be successful in the large-scale educational space, today's competitive universities must be partners in the digital context (Anghel et al., 2021). The European experience confirms the relevance of some educational cases providing the application of digital platforms in traditional education.

At the same time, in shaping the requirements for the development of digital competence, the educational institution, the state, and employers have notable importance, who can limit or terminate offline access to educational services and provide only online access (Kem, 2022).

Key areas of digitalization of higher education involve the application of subject relationships and partnership pedagogy through interaction, mutual education, complementarity, etc. This, in turn, involves the use of digital platforms and the formation of online tools aimed at providing rapid access to digital materials (Schumacher & Ifenthaler, 2021). Consequently, digital literacy and digital competence skills are now relevant.

In general, digital literacy contains digital skills (a key attribute of digital competence) and consists of social and cultural components (refers to digital communication practices with characteristic value orientations) (McGrew, 2021). However, the educational sphere plays a key role in the formation of professional and interdisciplinary competencies of an individual (Schumacher & Ifenthaler, 2021). Table 2 reflects the structure of personal competence formation based on the educational sphere.

Table 2

The Process of Forming Student Competence in the Educational System

Structure of personal competence formation in the educational system		
Subject competence	Interdisciplinary competence	Key competencies
Formed as part of the research and study of a particular specialty	It is based on the implementation of interdisciplinary links	They take place in an integrated training system

Source: made by the authors of the article.

The term “digital competence” is defined as a dynamic combination of abilities, knowledge of skills, and ways of thinking in the field of information, communication, and digital technologies, which forms the ability of an individual to successfully organize professional activities and socialize using digital technologies (Araújo & Bizzo 2015). At the same time, some scholars believe that digital competence is the convinced, complete, in-depth use of information and communication technology (ICT) tools in professional activities, learning, science, leisure, etc. Given these definitions, “digital competence of students” is defined as a set of abilities, knowledge, and skills in the use of digital technologies for the purpose of communication and professional development, associated with the search, formation, creation, distribution of digital information resources in the primary process, implementation of educational-scientific research (Renigere & Cela, 2019). Thus, digital competence refers to the multifunctional, transversal, and metacognitive skills of the individual. According to contemporary researchers, digital literacy is a multifunctional category and can be used in a variety of human activities (Ben-Amram & Davidovitch, 2021). On the other hand, it is transversal, that is, it results in the transfer of an individual's acquired knowledge, skills, and cognitive abilities to solve complex situations that arise in the real world (Kirshner, 2021).

Digital literacy can be viewed as a system of knowledge, skills, and abilities that can be used in professional activities. It also influences the formation of the ability to research, analyze, compare, classify, use, and systematize various information software technologies (Bigirwa, 2020). Also, digital competence has been shown to be effective in the practical use of the knowledge and skills acquired (Amez & Baert, 2020). Consequently, it allows the confident and at the same time critical use of information and communication technologies in order to form, search, create, process, interpret, and share information in work and public spaces, based on private communication. At the same time, it is also related to information education, safe searching skills on the Internet or cyberspace, awareness of ethical principles of information handling (respect for copyright, intellectual property, etc.) (Bowen et al., 2021).

Today's competitive, successful higher education aspirants must demonstrate stable skills in the application and use of information and digital technologies, critical analysis, tactical planning, and have the skills to respond flexibly to contemporary global transformations in society (Boyle et al., 2021). We believe that in addition to basic digital competencies (talking about preparing texts, worksheets, tests, presentations, etc.) students should be exposed to the latest innovative methods of implementing digital, blended, asynchronous, adaptive, mobile, cloud, virtual learning models (Boyle et al., 2021).

The content of the student's digital competence consists of the ability to obtain information from various sources and interpret it understandably, to think creatively and critically, to be able to evaluate information, to apply the latest digital tools in professional activities, to treat such tools responsibly, to behave competently and morally in online spaces (Sagre et al., 2021).

Today's students, studying on distance learning platforms, work with many information resources. Therefore, it is important to determine the state of their digital literacy, understanding all the negative aspects of working with information located in the public domain. According to the results of Papakitsa (2012) revealed the average level of digital literacy in students. In fact, according to this methodology, it was found that the participants of the experiment have mainly an average level (48%), high (25%), low (27%) (See Table 3).

Table 3

Results of the Study of Digital Competence in the Experimental Group According to the Method of Papakitsa (2012)

Level	Number of persons	%	Total number of respondents
High	30	25%	120
Medium	57	48%	120
Low	32	27%	120

Source: made by the authors of the article.

Consequently, the results showed that the majority of the participants in the experiment have an average level of responsible attitude when working with digital information materials. The chosen methodology for determining the level of digital competence is generalizable and suitable for students of different specialties. Despite the average level of digital literacy proficiency, most respondents noted that they were not always responsible in searching, analyzing, and interpreting information.

This study demonstrated that students were not fully aware of the concept of academic virtue and were partly unaware of the theft (“borrowing”) of information property.

The participants in the experiment who demonstrated a low level of digital literacy proficiency were mostly unaware of the importance of the information space for education, unaware of modern information and communication technologies, and unaware of the harmful effects of the digital space. Nevertheless, a high level was achieved by 25% of respondents. This level demonstrates full understanding, effective and adequate use of information resources, understanding the positive and negative impact of information Internet resources.

Considering the index of digital competence, it is also revealed that 60 respondents have an average level. At the same time, a high (ideal) level was found in 28 people. The CIC system investigated such elements of competence as knowledge, motivation, responsibility, and skill. When characterizing the level of digital literacy, the authors of the article adhered to a thorough explanation of the elements of the CIC, in which the low level - scored 0 - 35 points, the average level - 35-55, the high level - more than 55 points. Consequently, it can be summarized that according to the results of the SCI, 28 people have a high level, while the majority of participants have an average level. The results of this study are reflected in Table 4.

Table 4

The Results of the Study of Digital Competence in the Experimental Group (According to the Digital Competence Index)

Level	Number of persons	%	Total number of respondents
High	28	24%	120
Medium	60	50%	120
Low	32	28%	120

Source: made by the authors of the article.

Therefore, modern students mostly have an average level of digital competence. However, the acquisition of this competence depends on the level of skills in the digital space and the knowledge gained. The authors of the article assume that most of the participants of the experiment received certain knowledge (as evidenced by clear answers), but do not exclude that the new digital experience for some students has become a kind of engine for acquiring new skills and knowledge.

Discussion

We can agree with Kirshner's (2021) conclusions about the important transformational role that the COVID-19 pandemic has played in changing the global education system. Thanks to the introduction of distance learning, the prospects for its separate development (and not only as a certain supplement to the already existing traditional forms of classes) have emerged. The problem of acquiring digital competence has had several common “solutions”. Ben-Amram and Davidovitch (2021) rightly pointed out the possibilities of homeschooling by comparing it to traditional learning. These researchers, based on an analysis of the Israeli experience, believed that the pandemic had clearly brought homeschooling out of the shadows, equating it with attending school, college, or university. At the same time, an

underestimated factor was precisely the acquisition of the necessary competencies for working at home, including digital competencies (Braun, 2021).

Based on this analysis and sociological research, it was found that digital competence for higher education applicants is a set of skills, knowledge, and abilities that are used to work or process material using digital technology. It also affects students' communication and professional development, search and formation, and active use of information resources for education or research. Responsible use of information and information resources, in general, is a characteristic indicator for those with digital competence. Some of the proposed results resonate with the Bigirwa (2020) study conducted in Uganda. The importance of this methodology also lies in the fact that there is political and military instability in Uganda, while Ukraine is also a victim of Russian military aggression. Accordingly, the acquisition of digital competence in the context of crisis and societal challenges is about the same. The difference in the results lies in the fact that Ukrainian society is much more digitalized. For this reason, the rate of further growth of digitalization in Ukraine is much higher. So, the degree of demand for potential employees is much higher.

The analysis of digital competence in the experimental group (with a certain score on the Digital Competence Index) indicated an average level of digital competence in higher education applicants. It was proved that the specified indicators refer to the definition of the levels of skills in the information space and personal knowledge. The correlation is direct - the higher the values of digital skills and knowledge, the higher the indicators of digital competence. Kem (2022) also established a similar relationship but added an educational element as well. That is, gaining competencies was not just due to an increase in knowledge, but specifically due to an increase in academic knowledge. We cannot directly prove or disprove the proposed statement, because H. Soldatova's methodology for determining the "Digital Competence Index" was addressed primarily to find out the degree of digital literacy of higher education applicants using the ethical framework of interaction with online and digital content and personal knowledge. but without a specific definition on their academic competence. We believe that the educational element (acquiring necessary competencies through learning) plays a leading role, but separating academic learning from experiential or other types of learning experimentally is difficult (Kirshner, 2021). This issue will require additional research in the future, as this problem is relevant to future publications on digital competence acquisition.

Based on the experiment, it was assumed that higher education students primarily received the knowledge they needed. This is confirmed by the provision of clear answers to the questions prescribed in the questionnaire. At the same time weighty was the personal digital experience of each of the students. It was he who provided independent motivation for the students under study, became a certain engine in obtaining updated knowledge and skills. The importance of motivation was repeatedly emphasized in Boyle's et al. (2021) article on successful training experiences. We believe that the proposed additions can be successful, but only if higher education applicants are willing to learn. We note that digital competence is in demand on the labor market in Ukraine: many software companies, IT firms, and other organizations have many offers from interested potential employees. Consequently, mastering additional competencies are important positive factors that employers pay attention to. The study showed that students (young people), although mediocre in digital competencies, are willing to change for the better and learn.

Conclusions and Implications

Consequently, digital competence is a dynamic structured combination of skills, knowledge, and ways of thinking in the field of information, communication, and digital technology. It affects the formation of successful professional work, socialization. Separately, digital competence affects the formation of critical thinking skills and soft skills, which are especially relevant today. The formation of digital literacy in students is influenced by such factors as: information competence, information handling skills, communicative competence, responsible, adequate application of information resources, skills to solve various learning tasks through the correct use of information.

The empirical study showed that the vast majority of today's students have an average level of digital competence. At the same time, unfortunately, the respondents were not fully aware of the negative influence of mass media and were not sufficiently familiar with the phenomenon of academic non-virtue. Consequently, the weighty task of modern pedagogy is to develop students' affirmative knowledge of academic virtue. At the same time, modern educators must pay great attention to media education and practically acquaint modern students with the manipulative technologies of the media, which are now actively spreading on the Internet.

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