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The impact of online resources on students' digital competence: an empirical study

Вплив онлайн-ресурсів на цифрову компетентність студентів: емпіричне дослідження

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Abstract

This article examines the role of online resources in developing students' digital competence skills. It discusses the importance of digital competence in today's society and the need for educational institutions to provide students with the necessary skills and knowledge to thrive in the digital age. The study involved a survey of 147 first-year university students to assess their level of digital competence. The findings reveal that the majority of students have a moderate level of digital competence, with some demonstrating a high level and others requiring additional support. The article concludes by emphasizing the need for ongoing efforts to enhance students' digital competence through the effective integration of online resources in educational settings.

Keywords: online resources, digital competence, principles, approaches, functions, levels of

Анотація

У статті розглянуто роль онлайн-ресурсів у розвитку навичок цифрової компетентності студентів. У ньому обговорюється важливість цифрової компетенції в сучасному суспільстві та потреба навчальних закладів надавати студентам необхідні навички та знання для процвітання в епоху цифрових технологій. У ході дослідження було опитано 147 студентів першого курсу вищих навчальних закладів для оцінки рівня їх цифрової компетентності. Результати показують, що більшість студентів мають помірний рівень цифрової компетентності, причому деякі демонструють високий рівень, а інші потребують додаткової підтримки. На завершення статті наголошується на необхідності постійних зусиль для підвищення цифрової компетентності учнів шляхом ефективної

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formation of digital competence, future specialists, information and digital technologies.

інтеграції онлайн-ресурсів у навчальні заклади.

Ключові слова: онлайн-ресурси, цифрова компетеність, принципи, підходи, функції, рівні формування цифрової компетентності, майбутні фахівці, інформаційно-цифрові технології.

Introduction

In modern conditions, processing and storage technologies are developing, and access to information is increasing. Since the development of information and digital technologies makes the educational process more effective and contributes to the development of new learning tools, the higher education system is one of the public institutions influenced by information (Yefimova & Zhernovnikova, 2018).

Digital education is the key to the foundation of a new life in society, building a different reality, because today the world is undergoing a rapid educational transformation to digital, from traditional. Since modern education is the most important tool for society's socio-economic, value, cultural, and political development it, in the future perspective, based on the forecast requirements of the social sphere of the country and the economy, has an anticipatory character. The development of formation and digital competence, and the use of online resources in the formation of digital competence skills of specialists of all industries is the main task of the world level. It is digital competence based on highly developed skills, a high level of information management, logical thinking, and mastery of digital technologies (Henseruk & Martyniuk, 2020).

In modern conditions, the importance of the ability to innovatively solve various problems, scientific and critical thinking, and coordinated actions is growing in citizens. The digital transformation of education, which is rapidly developing, in particular, contributes to the use of online resources in the formation of digital competence skills of the future specialist, contributes to the creation and effective use of online resources, the transfer of the educational process to a distance form of learning, requires updating, development of services and tools and improvement the level of digital competence of future specialists, education organizers, and higher school teachers.

Nowadays, to achieve success in the digital society, it is mandatory for every person, student, and specialist, to possess digital competencies. Nowadays, modern professions require the ability not only to cooperate and communicate with the help of gadgets but also to critically evaluate information, to process large data sets available on the Internet and other media, to program and manage "smart things", and to understand the needs of cyber security.

In 5 years, society will have a shortage of personnel with digital professional competencies. Formed digital competencies for specialists of all fields, researchers, and students are important for the development of scientific education in a digital society, for cooperation, effective professional communication, use of online resources, virtual laboratories, digital tools and services, artificial intelligence, augmented and virtual reality, robots during the conduct and organization of the cognitive research process during life (Hrynevych et al., 2020).

The development of the influence of online resources on the digital competence of students is currently an urgent issue of theory and teaching methods in the educational process. Based on this, we considered the following questions in the article:

1. The content and importance of digital competence of future specialists in educational and professional activities.
2. Levels of digital competence and tasks at all levels of education reflect the needs of educational activities, particularly scientific and methodological support of education when using modern online resources.
3. Principles of designing a digital educational environment and principles, approaches, functions, and levels of formation of digital competence of the future specialist.
4. The content of online resources that are important in the formation of digital competence skills of specialists.

5. The main advantages of online resources.
6. The influence of online resources on students' digital competence was experimentally tested.

Literature Review

The analysis of scientific research indicates the existence of a large number of approaches of scientists to the study of the essence of the concept of "digital competence".

Scientists have not paid enough attention to the role of online resources in forming digital competence skills, and the problem of developing digital competence in the conditions of the digital educational environment of future specialists.

Thus, in the conditions of a digital educational environment, the problem of the development of the digital competence of future specialists was actualized by H. Henseruk, & S. Martyniuk (2020) by providing this process with new resource support. Regarding the formation of the digital competence of specialists, an analysis of international documents was made, and the approaches of scientists regarding the interpretation of the concept of "digital competence" were determined. The public need for the transition to developing future specialists in digital competence and digitalization of education at all levels of the education system is formulated. The ways of designing a digital educational environment, one of the aspects of developing a person's digital competence, are revealed. The principles that must be followed are highlighted while creating a digital educational environment. In training future specialists, the advantages of the digital environment are highlighted: individualization of the educational process; intensification of interpersonal communication; and increasing the efficiency of the educational process. Strategies for updating methodical and substantive components of higher education, and developing and creating a digital educational environment have been determined.

O. Zhernovnykova, L. Peretiaha, A. Kovtun, M. Korduban, O. Nalyvaiko, & N. Nalyvaiko (2020) conducted a scientific analysis of the essence of the concepts "digital competence", "digital training of the future teacher", "gamification of education" and it was convincingly proven that the main the factor that contributes to the effective development of the educational process in a modern institution of higher education is the formation of digital competence in future specialists using gamification since the ideology based on the digitalization of education and gamification prevails in higher education, where traditional specialists are replaced by "game specialists", coordinators of online resources, online platforms, and educational trajectories. It has been proven that the formed digital competence is the result of the formation of digital training of future specialists. The results of the conducted testing, questionnaires, and surveys made it possible to theoretically substantiate and develop "the technology of forming the digital competence of future teachers using gamification, which is implemented at the following stages: professional-motivational, content-activity, reflective-corrective".

The conditions for the formation of the digital competence of a specialist in postgraduate education were defined by I. Vorotnykova (2019) and the European framework of digital competencies for citizens was considered, UNESCO international standards were analyzed from the university level of education, and the criteria for evaluating and determining digital competence in future specialists were summarized. The main requests of specialists regarding developing and forming individual trajectories of professional development of specialists made it possible to decide on the conducted questionnaire to increase digital competence. In the system of postgraduate pedagogical education, the conditions for the formation of digital competence of specialists are defined: digitization of education, the availability of documents regarding the requirements for the digital competence of a specialist, the need to implement and develop criteria for the development of digital competence of specialists, the readiness to ensure the formation of digital competence of specialists through postgraduate education, the developed IT infrastructure of educational institutions, ways of motivating a specialist to self-assessment, continuous professional development, and digital competence are clarified.

Considering the concept of specialist motivation, the ability to use ICT to deepen and develop knowledge, the Norwegian researcher R. Krumsvik (2012) defines the digital competencies of a specialist from the point of view of their professional development. Influences the plan of training specialists of different countries – expansion of the concept of digital competence. For example, in Norway, digital competencies at all levels of education and in all subjects are the fifth basic competence, changing the basic conditions of learning and teaching in modern education. By introducing a holistic model, the scientist developed and

expanded the definition of the digital competence of a specialist, which combines the prerequisites for individual ability and analytical levels, together with scientists from different countries of the world, J. Tondeur, K. Aesaert, B. Pynoo, N. Fraeyman, & O. Erstad (2015) conducted international research to prepare future teachers to integrate ICT into education. The researchers substantiated the two-component structure of the teacher's digital competence: in educational planning – competence in the use of ICT, competence in supporting students to use ICT in the classroom and noted: "that the obtained empirical data indicate that pedagogical workers often do not feel well prepared for the effective inclusion of ICT in their professional activities and this indicates a gap between technical and pedagogical skills among teachers and requires an emphasis on teaching methods of using digital technologies".

L. Hrynevych, N. Morze, & M. Boiko (2020) substantiated the concept of "digital competence" and proved the need for the introduction of scientific education in educational institutions under the conditions of the digital transformation of education, presented an overview of innovative pedagogical technologies that are introduced in education for distribution to a wider list of academic subjects of scientific thinking and the purpose of effective application of innovative competences, STEAM education and as the main idea of forming key competences of future specialists. The authors provided a list of skills, knowledge, and activities, and explored the theoretical foundations of the concept and components of digital competence, which contribute to quality STEAM education. It has been proven that for the formation of the specialist's digital competence, it is advisable to use the research-cognitive method, problem-based learning, and the method of educational projects in the educational process of a higher school. When implementing scientific education in universities, the features of innovative technologies based on modern tools and digital technologies are shown. The practice of using and mastering such technologies among teachers was studied to study modern educational trends and identify needs and appropriate digital tools for providing innovative pedagogical technologies.

I. Hrebenyk (2019) considered the features of the digital competence of managers, particularly: the concept of "digital literacy of the head of an educational institution", the principles of forming digital competence were revealed; the functions of digital competence are highlighted. The essence of the concept of "digital competence" is revealed. The main aspects of digital competence are shown as the basis of a new paradigm in education, namely: the justified, effective application of digital technologies in educational activities, the presence of a high level of functional literacy in the field of ICT, understanding of digital technologies for solving professional tasks, which is aimed at the development of students of higher education as subjects of the information society. three levels of digital competence of the manager are distinguished. The ways of formation of digital competence in the heads of educational institutions are identified, and the components of digital competence of heads of educational institutions are formulated. The analysis of the essence of non-formal education, the formation of digital competence of the heads of educational institutions was carried out, the "structural model of the methodology of the formation of digital competence of the heads of educational institutions" was developed, the practicality of using andragogic principles of adult education was taken into account.

O. Ivanytsky (2019) defined the "digital competence of a physics teacher" as the ability of an individual to safely, critically, and expediently choose new ways of innovation in education and in the professional activity of a specialist, proposed ways of creating and changing digital resources, ways of managing them, distributing them, contributing to the formation of digital competence of future specialists and expanding the opportunities of educational space acquirers. The components of the physics teacher's digital competence are substantiated: communicative, media, information, and technical competence.

O. Plakhotnik, V.Zlatnikov, I. Strazhnikova, N. Bidyuk, A. Shkodyn, & O. Kuchai (2023) in their article considers the main ways of using information technologies in education (creation of information environments in each educational institution. The factors without which the modern implementation of educational information technologies is impossible are singled out. Emphasis is placed on the most effective means of educational multimedia systems in classes (automated learning systems; computer simulators; multimedia presentations; educational films; video demonstrations, etc.).

I. Palshkova, D. Bidyuk, O. Balalaieva, O. Shynkaruk & V. Karhut (2023) examines digital learning technologies, shows the effectiveness of information technologies, introduces the aspects of digitalization of the educational space, analyzes the current state of the use of information technologies in the conditions of digitalization of education.

Therefore, the analysis of literary sources allows us to draw conclusions that the researchers have analyzed international documents and defined approaches to interpreting the concept of "digital competence". We observe the absence of a single scientific opinion in explaining the idea of "digital competence" and its components. The social need for the transition to developing future specialists in digital competence and digitalization of education at all levels of the education system is formulated. It has been proven that the formed digital competence is the result of the formation of digital training of future specialists. The system of postgraduate pedagogical education defines the conditions for the formation of digital competence of specialists.

Scientists have not paid enough attention to the role of online resources in forming digital competence skills, and the problem of developing digital competence in the conditions of the digital educational environment of future specialists.

PURPOSE OF THE RESEARCH: elucidation of the role of online resources in the formation of digital competence skills of specialists and elucidation of the ways and levels of students' digital competence formation.

Methodology

A complex of general scientific theoretical, statistical, and empirical methods was used to conduct the pedagogical experiment: to form the main provisions of the work – conceptualization, and synthesis of theoretical knowledge; for educational motivation and obtaining results – a pedagogical experiment; to process the results that were obtained during the pedagogical experiment – mathematical and statistical methods.

A study was conducted among students in the first year to determine the level of digital competence of higher education students.

A total of 147 respondents took part in the survey. Google Forms software was used to collect the information required for the study.

Data entry and processing were carried out using Microsoft Excel programs.

Questionnaires of specialists regarding the conditions for the development of digital competence and the needs of the individual made it possible to identify the main conditions for the formation of digital competence in formal and informal education:

We use the experimental research method, which assumes that in the context of the conducted research, it is important and necessary to get the respondents' opinions regarding their personal vision of the ways and levels of the formation of digital competence.

The experiment was conducted in Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, V. N. Karazin Kharkiv National University, Pavlo Tychyna Uman State Pedagogical University. The conduct of the experiment is permitted by the scientific councils of the universities in order not to violate ethical considerations in institutions of higher education.

Results and Discussion

1. The content and importance of digital competence of future specialists in educational and professional activities.

The digital transformation of education for making effective and quick management decisions based on Big Data technologies involves the primary transformation of teaching methods and the educational process, a new level of cooperation with all participants in the educational process, and meeting the academic needs of students – expanded opportunities with the introduction of adaptive learning technologies. All these processes require an understanding of the operation of services, the ways of using digital technologies, the use of online resources, and the current trends in developing digital technologies and techno trends (Bykov et al., 2020). Such tasks are solved by introducing the latest educational technologies, particularly digital ones, into a person's education and professional activity, which is possible due to the growing role of

scientific education. The best international experience in leading educational systems captures these positions. Based on the comparison and analysis of various DigComp documents for all citizens and practitioners, a European framework was developed in 2017 to determine the digital competence of teachers (DigCompEdu). We implemented research based on these materials.

DigCompEdu is a science-based database that can be directly adapted to curriculum implementation, and national and regional tools and helps guide policy. The DigCompEdu database provides an approach and a common language that facilitates sharing best practices and dialogue across borders. The DigCompEdu framework is aimed at professionals at all levels of education, from adult education to early childhood education, including special needs education, vocational and general education, and non-formal learning contexts. It can provide a common reference point for the developers of digital competence models, i.e. Member States, institutions, regional governments, and interested parties (Punie & Redecker, 2017). The formation of the specialist's digital competence in education and professional activity is widely discussed and researched by the international community of scientists.

C. Scott (2015) believes that "digital competence is a professional quality that indicates a level of proficiency from basic visual perception and practical skills to more critical, evaluative and conceptual approaches to the use of ICT, and also includes attitudes and awareness in the field of ICT".

Digital competence, as defined by the European Commission, involves the responsible, safe, critical use of digital technologies for participation in society, work, and education.

Digital competence involves the development of abilities, not just basic technical skills:

- View, manage, evaluate information;
- Create digital content;
- Communicate and cooperate with information;
- Solve problems in informal, formal, informal learning contexts;
- Keep safe.

Digital competence comprises communicative, information-operational, practical-active, productive-creative, and cyber security components (Samoilenko, 2023).

Digital competence, according to the recommendations of the European Parliament and the Council of the EU, includes critical, confident, responsible use of digital technologies, and gives access to interaction with education, work, and participation in society of every person (Kravchenko et al., 2022). Digital competence includes communication and collaboration, data and information literacy, digital content creation (including programming), security (including cybersecurity-related competencies), and problem-solving. S. Carretero Gomez, R. Vuorikari, & Y. Punie (2017) consider digital competence as the ability to critically evaluate and understand various aspects of media content and digital media, to use information and computer technologies and digital media, and to communicate effectively in various contexts. S. Prokhorova (2015) emphasizes: "digital competence is a teacher's ability to effectively and efficiently use ICT in his pedagogical activities and for his professional development".

Scientists A. Martin, & J. Grudziecki (2006), including values, abilities, strategies, and human awareness, interpret digital competence as a set of attitudes, skills, and knowledge that are necessary for using digital media and ICT to solve problems, communicating, performing tasks, manage information, creation and distribution of cooperation content.

Digital competence includes the following knowledge:

- Understanding the importance of the potential of digital technologies for innovative activity;
- Interaction of digital technologies and understanding of their general structure;
- For designing the educational process – the ability to use programs;
- Basic understanding of the reliability and reliability of the received information.

For this, emphasizing the transition to the development of digital competence and digitalization, it is necessary to improve the education system at all levels of the educational space: to institutions of higher education and from school. Therefore, by digital competence, we mean digital skills that effectively,

confidently, safely, and critically ensure the ability and readiness of an individual to use digital technologies throughout life in all spheres of life. It is becoming increasingly obvious that the digitalization of society entails the most radical changes in general and the educational space in particular, which undoubtedly affect the professional education system (Henseruk & Martyniuk, 2020).

2. Levels of digital competence and tasks at all levels of education reflect the needs of educational activities, particularly scientific and methodological support of education when using modern online resources.

We will define three levels of digital competence of a specialist, by the standards defined by UNESCO (2018):

- Acquisition of knowledge by students of education;
- Deepening of knowledge during life;
- Creation of knowledge in the professional activity of a person.

Each level is considered according to 5 aspects: curriculum and assessment, understanding of ICT in education policy, application of digital skills, pedagogy, management and organization, and professional training of specialists.

Educational sciences face special tasks in digital transformation and informatization of education, which at all levels of education reflect the needs of educational activity, particularly scientific and methodological support of education. Among the main ones, we note:

- To meet the educational needs of those seeking higher education, methodological support, and theoretical justification of various models of the information and educational environment;
- Increasing the speed of information processes;
- The emergence of new innovative conceptual models of higher education, which must be constantly coordinated with the science of the XXI century;
- The synergy of educational activity, particularly scientific and methodological education support (Vasylieva & Kotenko, 2023).

3. Principles of designing a digital educational environment and principles, approaches, functions, and levels of formation of digital competence of the future specialist.

The training of competitive specialists is the main task of a higher education institution. therefore, one of the aspects of solving the problem of quality training of a competitive specialist is the design of a digital educational environment for the development of digital competence of future specialists to form and develop the digital competence of future specialists. Modern online resources play an important role in this process (Polishchuk et al., 2022).

During the creation of a digital educational environment for the development of the digital competence of future specialists, the following principles must be followed when using modern online resources:

- Determination of the future specialist when using modern online resources as an active subject of knowledge;
- Emphasis on the subjective experience of students, learning in the context of future professional activity through the use of modern online resources, taking into account the individual characteristics of students;
- Focus on self-development, self-improvement, and self-education of future specialists (Henseruk & Martyniuk, 2020).

We will emphasize the basic principles of forming a person's digital competence: self-development, continuity, systematicity, activity, and approaches: activity-based, competence-based, problem-based, and personally-oriented approaches.

These approaches defined a set of principles. Let's consider them:

- The principle of self-development is that in the process of forming digital competence for future specialists, it is necessary to create professional conditions that contribute to supporting a person's desire to understand the impersonal significance of the need to realize his potential, to acquire digital competence, and to strive for continuous professional self-development throughout his life.
- The principle of continuity helps digital competence formed at the highest level, continuous improvement; depends on the connection with the constant improvement of information technologies;
- The principle of systematicity ensures the integral character of the formation of the components of digital competence, the need to simultaneously pay attention to each element of the specialist's digital competence, ensures the interdisciplinary nature of such a process;
- The principle of activity contributes to the formation and manifestation of digital competence in the experience of the specialist's transformative activity.

We will highlight the functions of digital competence based on the role and place of application of online resources in the educational process and professional activity of a specialist:

- The adaptive function of digital competence ensures compliance with the requirements of the social order, the requirements of the professional standard, on the labor market – the competitiveness of the specialist, adaptation to activities and conditions in the modern world;
- The developing function of digital competence contributes to the development of the specialist's professional competence, abilities, intelligence, initiative, independence, etc., that is, the desire for professionalism, harmonious and comprehensive development of the personality;
- The cognitive function of digital competence provides an opportunity to deepen and supplement the existing system of skills, abilities, knowledge, experience, and methods of professional activity of a specialist;
- The evaluation function of digital competence contributes to the qualitative evaluation and realization of a person's potential, prospects, professional abilities, and professional and educational trajectory of continuous improvement and success in the modern world – personal awareness of the meaning of constant self-development.

The digital competence of a future specialist can be formed at three levels:

- General pedagogical level: awareness of the practicality of using online resources in professional activities; the ability and willingness to constantly use online resources to interact with colleagues in the educational process; use of online resources for learning on distance courses and exchange of pedagogical experience;
- General user level: compliance with work rules and use of techniques with ICT tools, troubleshooting, safety techniques, etc.; compliance with legal and ethical norms for the use of online resources; Internet and database search skills; mastery of audio-video-text communication (conference, two-way communication, delayed and instant messages, automated translation and text correction); systematic use of online resources and existing skills in a professional and everyday context;
- Subject-oriented level: the ability to assess the quality of use of online resources, and digital resources about the tasks of their use; experience of virtual laboratories in setting up and conducting an experiment; using computer statistics tools to develop numerical data processing skills; mastering specialized technologies and online resources, knowledge of quality information sources (Hrebenyk, 2019).

We encountered the fact that during the preparation for bachelor's, in the practical activity of using modern online resources, many first-year higher education applicants do not have digital technologies, do not know how to use programs on tablet computers, do not know how to use modern online resources in the educational process resources, but are ready to master the digital toolkit. Therefore, during the training of a contemporary specialist, it is important to form digital competence in students.

Among the digital competencies of future specialists in the modern professional space, we have highlighted the following effective system-forming digital competencies that are important when using modern online resources:

- The ability of students to distinguish digital educational resources, in particular their main types, and to apply them to the tasks and goals of the educational process;

- The ability to create and design interactive tasks using modern online resources;
- The ability to organize the use of modern online resources and conduct group activities in a digital educational environment;
- The ability to organize students' project activities using modern online resources;
- The ability to design educational and professional processes using digital technologies;
- The ability to motivate students to use modern online resources creatively.

In our opinion, it is advisable to use an interactive whiteboard, mobile applications, and tablet computers in an educational and research environment, during the organization of academic and research activities together with circuit modeling systems, which will make it possible to increase the level of digital competence of students through the use of modern online resources. to master information processing, basic research procedures, and natural-scientific methods of cognition.

The experience of using modern online resources changes the specialist's position: expands the scope of knowledge, and deepens professionalism. The specialist becomes the creator of the use of information, the creative process of its processing, and a more active participant in the educational, professional process of acquiring knowledge and skills, the formation of personality, and ceases to be a "source of knowledge".

Students must use modern online resources every day, and this requires the creation of a digital educational environment in institutions of higher education, where, with the help of the involvement of a wide range of online resources, a digital education system is built that is dynamic and takes into account organizational, managerial, infrastructural, content, personnel, educational and methodological positions.

The following aspects are relevant to this process:

- A radical change in the content and systematic components of higher education;
- A new organization of the educational process, which is technological;
- Providing the educational cluster with innovative infrastructure.

When developing the digital competence of future specialists, at the current stage of human life, the use of modern online resources and, as a result, the creation of a digital educational environment that will provide an opportunity to retrain and train personnel for digital education in innovative conditions is relevant (Henseruk & Martyniuk, 2020).

4. The content of online resources that are important in the formation of digital competence skills of specialists.

Let's consider effective online resources that are important in the formation of digital competence skills of specialists.

- ***Inspiration*** – a program that serves as a visualization of the educational process and provides opportunities for the teacher to create diagrams, schemes, and cards in classes together with students;
- ***Plickers*** is a mobile application that reads special cards with students' answers in seconds and displays statistics on the teacher's phone screen. To quickly check and understand – whether students master key skills, whether they understand concepts using the application;
- ***Kahoot!*** – the program used in education and consisting of games allows making a series of questions with several options for answers. The number and format of questions depend on the person who creates the question. It is possible to add diagrams, images, videos;
- ***H5P*** – facilitates the use of HTML5 content and programs, promotes their creation and distribution, and provides such interactive content, which is divided into several categories: multimedia, questions, games, and social networks;
- ***Poodll*** – a set of tools for developing dynamic courses for language teachers. This is one of the technologies of video shooting, online audio that are available for the educational process;
- ***TurnItIn*** is a tool that helps teachers and students themselves to check papers for plagiarism or misquotation. The program contains the most accurate database to evaluate and check texts, in particular, Turnitin allows teachers and students to find out what part of the checked work is not original and indicates the volume of material that coincides with the content of the database, notes sources and highlights textual borrowing in different colors;

- ***Moodle*** is an online resource platform for educational activities, which provides a developed set of tools for computerized learning: teachers, administrators, users of educational space, in particular, distance education;
- ***Open edX*** – a free course management system used for a small educational audience, for hosting open mass online resources, for educational modules;
- ***PhET*** – a set, for studying the material and comprehensive professional training based on scientific research in chemistry, physics, mathematics, and other sciences, interactive computer models of PhET simulations, which can always be launched online or downloaded for free from the PhET website;
- ***Graasp*** is a platform that enables teachers and students, using open mass online resources, to create virtual research and learning spaces structured according to the phases of the educational process. Students can use links to these spaces in groups and individually.

5. The main advantages of online resources.

Online education is a tool for developing the information society and the digital economy. Online resources that are effective and significant in the formation of digital competence skills of specialists.

Among the main advantages of online resources are:

- Flexibility of training;
- The development of online resources to form the digital competencies of specialists is one of the urgent requirements of the modern information society;
- Availability of education for all levels of the population;
- Possibility to use for training at any time;
- The possibility of accessing online resources, taking into account the construction of one's own learning trajectory;
- The possibility of choosing a variety of online resources that meet the interests and needs of a person, which ensures a variety of learning;
- Saving money and time, because compared to traditional education, online education can be less expensive;
- The possibility of interactive dialogue between the participants of the educational process, exchange of messages in real time between the information system and the student;
- Interactivity of training – use of modern information technologies, online resources, Internet resources for the organization of online training;
- The possibility of constant acquisition of new skills and professional development with the help of online resources.

In the conditions of the formation of the digital economy, the task of higher education is the development of the future specialist's ability to work in conditions of constant changes and crises, in conditions of uncertainty, to meet the requirements of the modern information society (Vasylieva & Kotenko, 2023).

With the massive spread of online resources – tools for organizing the educational process, new opportunities have opened up (without wasting time traveling to a higher education institution, to get knowledge from anywhere in the world) for students of higher education. In addition, online resources for innovative learning can be used from a personal room without moving to an educational institution. On the plus side, online education is cheaper than traditional education and allows you to attract even more people who want to pursue higher education. (Vasylieva & Kotenko, 2023).

Society's demands for innovative knowledge acquisition in connection with the rapid development of digital technologies require teachers and students to develop digital competencies constantly.

The digital competencies adopted in the European framework and the change in the regulatory legal framework of digital competencies about the standards published by UNESCO, the development of relevant standards in the world, the ability of a specialist to decide for himself, which institutions how and when to improve qualifications, contribute to the definition of new innovative approaches to the construction of personal individual development routes digital competence of specialists (Vorotnykova, 2019).

6. Experimental research.

The presented research results were carried out using empirical methods: surveys (interviews and questionnaires), and observation.

A study was conducted among students in the first year to determine the level of digital competence of higher education students.

A total of 147 respondents took part in the survey. Google Forms software was used to collect the information required for the study.

Data entry and processing were carried out using Microsoft Excel programs.

87% of professionals, who make up the majority, are interested in learning and professional activities related to the use of ICT, particularly online resources, and need skills in assessing their digital competence. Questionnaires of specialists regarding the conditions for the development of digital competence and the needs of the individual made it possible to identify the main conditions for the formation of digital competence in formal and informal education:

- Digitization of education, use of online resources in training, availability of regulatory documents: regarding requirements and standards for the digital competence of a specialist (national, institutional, international); criteria for the development of a specialist's digital competence (questionnaire), sanitary norms regarding the use of digital technologies in the educational process;
- The readiness of higher education to ensure the formation of digital competence among specialists: the presence of subjects, and institutions that provide advanced training for the formation of digital competence;
- Implementation of international and domestic projects on the use of ICT;
- Educational and methodical, scientific, and professional resources for the formation of digital competence;
- IT infrastructure of higher education; developed IT infrastructure of educational institutions (information and educational environments, digital laboratories, software, hardware, high-speed Internet connection, online resource support, etc.);
- Continuous professional development of a specialist throughout his life to master digital methods and technologies for their use;
- Information culture of higher education students;
- Motivation of the teacher to develop digital competence and student professional development.

We use the experimental research method, which assumes that in the context of the conducted research, it is important and necessary to get the respondents' opinions regarding their personal vision of the ways and levels of the formation of digital competencies.

During the survey, questions were proposed that make it possible to assess respondents' digital skills.

Respondents were offered a rating scale from 1 to 3 points:

1 point – I need constant help in completing tasks, I do not have basic digital skills;
2 points – I can perform the tasks proposed by the teachers, I have an average level of digital skills;
3 points – I can independently create and develop websites, online libraries, programs, use online resources, etc., with the help of information technologies I can satisfy my own requests, I have a high level of digital skills

From the survey, most respondents are knowledge seekers and rate their digital skills at a sufficient level, although there is a high and an initial level.

- 91.1% of respondents positively evaluated distance and mixed learning, because it allows rational redistribution of time according to the scheme: study-work-leisure;
- 12.8% of respondents had a fairly high level of digital competence.
- 78.7% of respondents had an average level of digital competencies.

As a result of filling out the questionnaire, the respondents received the following answers:

1 question: "*Evaluate your ability to work with information and communication technologies, skills in using online programs, online resources, and online courses, and set yourself an appropriate score*".

1 point (% of respondents) – 9.6% of respondents;
2 points (% of respondents) – 71.2% of respondents;
3 points (% of respondents) – 19.2% of respondents;

2 question: "*At what level do you have digital competence?*"

1 point (% of respondents) – 10.5% of respondents;
2 points (% of respondents) – 76.7% of respondents;
3 points (% of respondents) – 12.8% of respondents.

3 question: "*Evaluate the possibilities of using online programs, online resources, online courses, case methods, discussions, webinars, tests, smart methods, and online platforms in the distance learning process in the world process*".

1 point (% of respondents) – 12.6% of respondents;
2 points (% of respondents) – 80.9% of respondents;
3 points (% of respondents) – 6.5% of respondents.

4 question: "*Assess your ability to work independently*".

1 point (% of respondents) – 10.8% of respondents;
2 points (% of respondents) – 74.4% of respondents;
3 points (% of respondents) – 14.8% of respondents.

5 question: "*Assess your ability to work in a team*".

1 point (% of respondents) – 4.3% of respondents;
2 points (% of respondents) – 61.9% of respondents;
3 points (% of respondents) – 33.8% of respondents.

6 question: "*Assess your opportunities for lifelong learning and the development of digital competence acquired in a higher education institution, and do you consider this process necessary*".

1 point (% of respondents) – 22.3% of respondents;
2 points (% of respondents) – 52.2% of respondents;
3 points (% of respondents) – 25.5% of respondents.

7 question: "*Assess the importance of using online resources in forming digital competence skills*".

1 point (% of respondents) – 3.3% of respondents;
2 points (% of respondents) – 70.2% of respondents;
3 points (% of respondents) – 26.5% of respondents.

8 question: "*At what level do you have the technical level of the new concept of mixed and distance learning education?*"

1 point (% of respondents) – 8.9% of respondents;
2 points (% of respondents) – 53.5% of respondents;
3 points (% of respondents) – 37.6% of respondents.

We believe that for the formation and development of digital competence among young people, it is necessary to improve the competencies of the acquirers – to improve the legal framework, use online resources, conduct training, seminars, and other events in offline and online formats in educational institutions, at the workplace, etc.; implement digital literacy courses and disciplines; develop digital

literacy and program certification by state and business institutions, which will make it possible to avoid low-quality online programs, online resources, and online courses.

Conclusions

The meaning and importance of digital competence of future specialists in educational and professional activities are revealed. DigCompEdu is a science-based database that can be directly adapted to curriculum implementation, and national and regional tools and helps guide policy.

The levels of digital competence and tasks at all levels of education reflect the needs of educational activities, particularly scientific and methodological support of education when using modern online resources, are considered.

Emphasis is placed on the basic, necessary principles of forming a person's digital competence: self-development, continuity, systematicity, activities, and approaches: activity-based, competence-based, problem-based, and personally oriented.

The functions of digital competence are distinguished based on the role and place of application of online resources in the educational process and professional activity of a specialist.

The digital competence of the future specialist can be formed at three levels.

Among the digital competencies of future specialists in the modern professional space, we have highlighted effective system-forming digital competencies that are important when using modern online resources.

The content of online resources, which are important in the formation of digital competence skills of specialists, is disclosed.

The main advantages of online resources are shown.

A study was conducted among students in the first year to determine the level of digital competence of higher education students.

A total of 147 respondents took part in the survey. Google Forms software was used to collect the information required for the study.

Data entry and processing were carried out using Microsoft Excel programs.

Questionnaires of specialists regarding the conditions for the development of digital competence and the needs of the individual made it possible to identify the main conditions for forming digital competence in formal and informal education.

We used the experimental research method, which assumed that in the context of the conducted research, it is important and necessary to get the respondents' opinions regarding their personal vision of the ways and levels of the formation of digital competence.

Ways to create a digital educational environment that will provide an opportunity to retrain and train personnel for digital education in today's innovative conditions will require further research.

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