

FUNCTIONING OF THE DIGITAL EDUCATIONAL ENVIRONMENT IN A HIGHER EDUCATION INSTITUTION: SUBJECTIVE COMPONENT

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Abstract. The feasibility of implementing a digital educational environment in higher education institutions is determined by the strategic direction of education modernization, which necessitated a comprehensive analysis of the essence of the digital educational environment, the study of its structure, and functional characteristics. The authors offer to identify the human factor, primarily the social and psychological aspects of interaction between participants in the educational process, as the main factor in the successful implementation of a digital educational environment at universities. The functional characteristics of the digital educational environment are described through the interaction of participants in the educational process. The digital educational environment is viewed as a system that integrates the subjective and objective resources of the educational process into a single whole, ensuring their interaction based on digital technologies. The subjects are students, scientific and pedagogical workers, stakeholders, employers, administrative and managerial staff of a higher education institution (administration, representatives of the dean's office, system administrators). Each of them is characterized by needs (cognitive, communication, information ones, etc.), functional purpose, level of involvement in education and other characteristics that define them as a subject resource of the digital educational environment. The authors have substantiated that it is the subjects of the digital educational environment that form a digital community interpreted as an association of individuals who have common goals, values and interests in the field of education through access to digital technologies and modern content, the involvement of specialists from different fields, as well as their ability to cooperate regardless of spatial and temporal limitations. It shows how system-forming relationships are formed between participants in a digital educational environment, which, differing in nature (functional, informational, causal), ensure the integrity, effective functioning, and development of this environment. The survey results showed that educators are selectively ready to implement digital tools within the digital educational environment. This determines the need for training courses for various categories of participants in the educational process, aimed at implementing the ideas of digitalization of education.

Keywords: digitalization of education, digital educational environment, higher education student, digital technologies, subject of the digital educational environment, teacher's professional training.

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Introduction

In modern society, digital technologies are integrated into all activities and fields of knowledge, requiring a new generation of specialists who will be able to work with innovative tools and develop information products. In this context, there is a growing interest among scientists in studying the processes of digital transformation and professional training of future specialists, which is confirmed by the increase in the number of publications in Ukrainian scientific publications and in international scientometric databases.

Thus, in the work [1] five clusters are identified that reflect the content of these studies: problems related to humans and the impact of digital technologies on them; digital economy; digital innovations; development of digital technologies; digitalization of education. Technological progress and the need to provide high-quality modern educational services determine the digital transformation of education as one of the priorities of domestic state policy (Fig. 1).

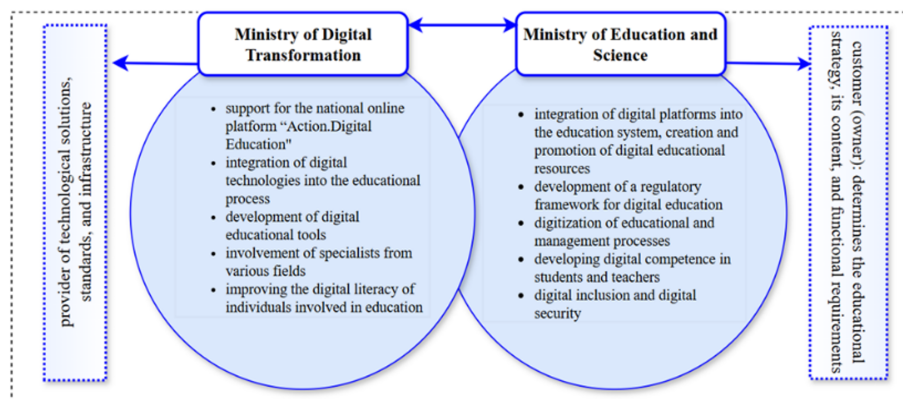


Fig. 1. Initiatives of the Ministry of Digital Transformation and the Ministry of Education and Science of Ukraine

According to scientists (A.O.Lazarieva and others), the education system must confirm its ability to adapt and continuously develop, modernizing both the structure and resources [2]. Scientists justify the need to develop a national strategy, highlighting the following priorities: involving the educational ecosystem in the formation of a unified state policy; developing digital learning, which contributes to the formation of digital competencies; providing the educational community with digital solutions; updating the principles of information systems. These areas outline the construction of a flexible and effective education system capable of meeting the challenges of modern society. That is why the introduction of a digital educational environment is not only an objective necessity, but also a strategic direction for the modernization of education. This, in turn, necessitates a comprehensive analysis of the essence of the digital educational environment, the study of its structure, functional characteristics, potential, etc.

Problem statement

The relevance of the outlined study is confirmed by the results of search analytics on the key concepts of “digital transformation”, “digital technologies”, “digital learning”, obtained using the Google Trends service (<https://trends.google.com/trends/>) (Fig. 2).

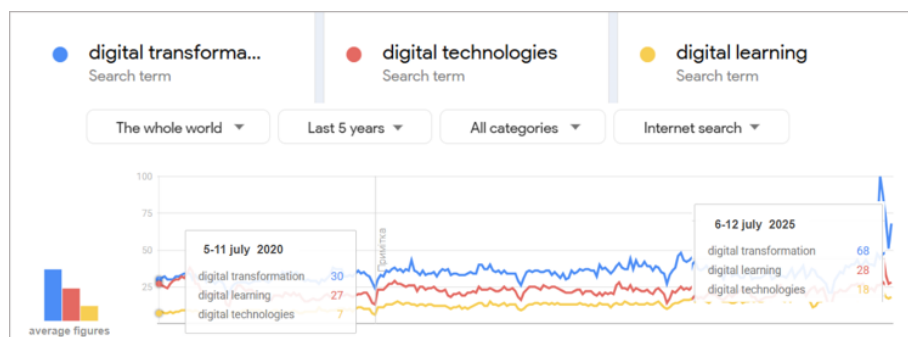


Fig. 2. Google Trends: search analytics results by concepts

This indicates digital changes in education and the need for their theoretical understanding and effective integration into the process of professional training of future specialists. The implementation of the above-mentioned innovations, as noted in the work [3] is an ambiguous process, since it involves the use of digital technologies by scientific and pedagogical workers, students as applications of activity and communication, means of achieving learning goals and results, tools for developing critical thinking and creativity. Ukraine has significant potential for improving digitalization and innovation, especially in the field of human capital and infrastructure (Fig. 3).



Fig. 3. Ukraine's position in the search query popularity ranking among 75 countries

Ukrainian scientists, analyzing the experience of using digital educational resources, came to the conclusion that a modern teacher should focus on the best European teaching practices, monitor the implementation of educational innovations, and also constantly improve the level of their digital competence, and promote the development of digital citizenship [4]. O.I. Kravchuk substantiates the idea that investments in the development of human capital, which is a key resource in a digital society, in particular through digital educational platforms and professional development programs, are becoming the main strategic directions [5]. Scientists study the digital educational environment as a multi-component, purposefully designed system of educational and

information resources and digital tools. Authors state that such approaches do not sufficiently fundamentally reveal the human factor, primarily the social and psychological aspects of participants' interaction in the educational process, individual trajectories and other characteristics. Following the above considerations, the study focuses on the subjective component of the digital educational environment.

The purpose of the paper is to study the digital educational environment of teachers' professional training based on the subjective component as a resource of individuals who participate in the functioning of this environment in a higher education institution in various aspects. A description of the functional characteristics, participants' activities in the educational environment through the prism of the digital educational environment will help develop innovative education, integrate it into the digital space.

Analysis of recent research and publications

Authors consider the concept of "digital educational environment", despite the fact that its content has not yet received a sufficiently fundamental interpretation. In the scientific literature, there are various interpretations of this concept, where the attention is focused on digital technologies, infrastructure, cloud services, educational resources. In support of this opinion, the paper presents the following definitions of the digital educational environment:

- a set of resources aimed at organizing and ensuring the educational process, implementing scientific, technical and international activities, creating conditions for the provision of educational services and education management [6];
- a set of technological tools, platforms and resources covering various aspects of the educational process, including virtual learning platforms, learning management systems, massive open online courses, educational applications and tools, virtual classrooms and webinars, digital textbooks and libraries, environments for collaboration and communication, adaptive learning systems, virtual and augmented reality [7, p. 64];
- the context or "place" where conditions are created for the use of technologies and digital devices, which are often transmitted via the Internet and other digital means, for example, via the mobile telephone network [8, p. 71].

Thus, from the standpoint of a systems approach, the authors consider the digital educational environment as an artificially designed, multi-component system that combines technical, information and communication resources for the purpose of organizing, implementing and developing the educational process in the context of education digitalization. Despite the fact that the interpretations of the concept do not emphasize the inclusion of a person in it, the environment cannot exist independently of it. Such an environment should be flexible, independent of spatial and temporal limitations and focused on the needs of its participants, forming the trajectories of their activities. The study emphasizes that the analysis of scientific sources revealed an objective need to standardize the definition of "digital educational environment" for the purpose of its unified interpretation and effective implementation in the educational process.

In this context, a logical continuation of the research is to address the components that form the content of this concept. The digital educational environment is considered as a system that integrates subject and object resources into a single whole. Subjects are students, scientific and pedagogical workers, stakeholders, employers and other participants in the educational process. Each of them is characterized by needs (cognitive, communication, information ones, etc.), functional purpose, level of involvement in education and other characteristics that define them as a subject resource of the digital educational environment. The objects of the system are components that provide digital interaction between subjects of the educational process and support work with digital content, in particular creation, storage, processing, transmission, application, for example: digital educational resources, communication tools, technical means, learning management systems. Despite the crucial role of technology in solving modern challenges, the key factor in digital transformation, as noted by O. P. Pinchuk and other scientists, remains a person who has the ability to quickly adapt, master data work, effective communication, and is also distinguished by flexibility of thinking, the ability to analyze, formulate conclusions, and create their own information product [9]. Valuable for this study is V. Yu. Bykov and O. Yu. Burov's work, which reveals the process of increasing the effectiveness of learning in a digital environment "not from the point of view of the education system, but from the point of view of the optimal use of human capabilities as a learner of knowledge" [10].

Scientists justify the need to change educational technologies, focusing on a human-centric approach, a continuous learning process and the acquisition of synthetic experience as an "exoskeleton of thinking". In the study [11] within the structure of the cloud educational environment, a community of stakeholders is defined, which includes subjects of educational, scientific and managerial activities directly involved in the educational process. Scientists (O. V. Ovcharuk and others) reveal such features of the information and digital environment of an educational institution as the organization of interaction between subjects of the educational process and stakeholders, adherence to the principles of non-discrimination, taking into account human needs and capabilities, based on the use of digital technologies [12]. In addition, scientists introduce the concept of "target groups", which include students, teaching staff, administrative staff, parents, and public representatives who participate in the support and development of an educational institution.

Thus, despite the diversity of learning technologies, it is important to study and take into account the ergonomic features of human activity in the conditions of a designed educational environment. Thus, the report [13] describes not only the achievements and gaps of Digital Europe, but also offers specific practical recommendations for achieving strategic goals for the period until 2030 and pays special attention to the need to actively involve citizens and their communities in working with digital content. The digital environment created by the latest technologies includes a person in the process of perception completely and immediately, influencing his actions, determining their activity. Supporting this opinion, the authors consider in more detail the subject resource of the digital educational environment as a significant element of its effective functioning and development.

Research methodology

To determine the content of the definition for “digital educational environment”, such research methods as analysis and synthesis have been used. Revealing the role of subjects of the digital environment and their interaction with the use of digital technologies, it has been used a set of empirical methods, in particular, questionnaires, observations, and an analysis of the obtained results was conducted. All methods have been chosen to ensure the objectivity and reliability of the research results. This publication has been carried out within the framework of the scientific research paper “Preparation of teachers for professional activity in conditions of blended learning” (state registration number 0121U110506), which is being carried out at Rivne State University for the Humanities.

The authors state that the subjects of the digital educational environment form a digital community that is an association of individuals who have common goals, values, and interests in the field of education. Such a community differs from the traditional pedagogical and scientific community in the flexibility of communication, access to digital technologies and digital content, the association of specialists from different fields, as well as their ability to cooperate regardless of space and time restrictions. First of all, this community carries out and develops innovative activities, that is, organizes, regulates, supports, and stimulates them. The main criterion for determining participants in the educational process as subjects of a group is the content and nature of their work, the dominance of digital technologies in their activities. It has been supported O. V. Ovcharuk’s opinion that subjects of the educational environment as representatives of “digital citizenship” must demonstrate the ability to “positively, critically and competently participate in the digital environment, relying on the skills of effective communication and creation, to practice forms of social participation that respect human rights and dignity through the responsible use of technology” [14]. Thanks to digital technologies, community participants not only receive information, but also influence the formation of the educational environment. The paper substantiates this opinion by considering the functional characteristics of the subject resource of the digital educational environment.

Students occupy a central place among the subjects of the digital educational environment, since it is their educational needs, professional interests, and readiness to work with digital technologies that determine the purpose of designing such an environment and the conditions for its functioning. Individuals who are currently obtaining the qualification of “teacher” are characterized by the ability to quickly adapt to changes, the willingness to interact in an online environment, preferring a blended learning format using mobile devices. Despite the increased activity of students, their professional development in the digital environment is accompanied by a number of problematic aspects, including: insufficient level of digital competence formation combined with low readiness to improve it; reduced motivation to independently master knowledge in distance and blended learning formats; excessive dependence on digital communication, which is due to the use of mobile devices and activity in social networks; limited knowledge of the principles of safe use of digital resources, information security rules.

It should be emphasized that in the context of professional training, students not only process educational content, but also act as its co-authors. Therefore, it can be argued that digital technologies transform the role of the user from a consumer of information to an active participant, and in some situations to a developer of the educational environment. Thus, the development of a digital educational environment is impossible without the functioning of feedback from students, which, despite the fact that it differs from communication in the conditions of “traditional” learning, affects the effectiveness and innovativeness of this environment.

In the digital educational environment, scientific and pedagogical workers perform functions that go beyond the traditional role of a teacher, since they are not the only carriers of knowledge, but act as consultants, curators of study groups, developers of distance courses, authors of digital content. So, the role of teachers is undergoing changes, which requires them to professionally adapt to modern working conditions. Thus, in the study [15] it is substantiated that the introduction of digital technologies contributes to the activation of teachers’ innovative activity, the formation of readiness for the use of digital platforms, and the clarification of the need to increase digital competence. I. P. Vorotnykova claims that teachers demonstrate high motivation to use digital technologies in their own professional development, which, in turn, allows them to adapt to dynamic changes in the labor market [16].

F. Veyis, F. M. Cigerci emphasize on technologically supported educational processes [17]. In their opinion, this contributes to the formation of technological pedagogical knowledge, which scientists consider not only as technical awareness, but as a conceptual basis for the development of digital competence. Therefore, among the main challenges facing scientific and pedagogical workers as subjects of the digital educational environment, the study highlights the following: integration of digital technologies into the content, methods and forms of learning; development of didactic and methodological content in digital form and taking into account the principles of adaptive learning; ensuring effective interaction with students in online and blended learning; increasing the level of digital competence, developing a culture of academic integrity in the digital environment; lack of a unified educational environment that is a platform with information resources, cloud services and other innovative tools; orientation towards continuous professional growth in accordance with the challenges in the subject (by specialty) and digital fields.

Another category of subjects of the digital educational environment is the administrative and managerial staff of higher education institutions, including the rector, vice-rectors, deans and their deputies. The institution’s administration, responsible for the quality and innovation of the educational process, is the initiator and coordinator of digital changes. Heads of faculties coordinate the educational process taking into account various organizational forms of learning, provide electronic support for students, and support academic integrity and inclusiveness in the digital environment at the level of structural units. Among the challenges facing this category of subjects are: creation, functioning of digital infrastructure and its improvement; adaptation of management processes to the conditions of the digital environment; mastering digital competence, strategic thinking, flexibility in management actions; ability to implement innovations, readiness for professional self-development.

Authors find stakeholders and employers highly important among the subjects of the digital educational environment, since it is they who form the demand for the quality of professional training of specialists in accordance with the current needs of the labor market. Studying the “education—labor market” system, scientists (T. A. Vasylieva and others) emphasize the different interests, obligations and goals of stakeholders’ activities [18]. The nature of interaction is determined by the functions and at what stage of the educational process they are involved in it. It is advisable to consider them as external partners of higher education institutions, who participate in the formation of the content of educational programs, provide expert assessment of learning outcomes, and contribute to the organization of practice and internships. At the same time, there are obstacles that complicate full-fledged interaction with this category of participants in the educational process. For example: the lack of a holistic system of cooperation between higher education institutions and external partners; fragmented involvement of the experience of stakeholders and employers in the digital educational process; inconsistency between the needs of the labor market and the results of training under the EPP; limited level of digital competence of external partners.

System administrators as technical specialists play a special role in the digital educational environment. Their activities are critically important both for ensuring the smooth operation of learning management systems and data protection, and for the practical implementation of the digital transformation of the educational process in general. Despite the importance of the professional activities of system administrators, it is accompanied by a number of problematic aspects, including: insufficient staffing; low level of updating of technical equipment (computers, servers, network equipment, etc.); increased level of control over the use of licensed software; limited integration of technical issues into management decisions; high requirements for possession of technical competencies, digital literacy. The presence of a goal for using digital technologies on the part of the user contributes to bringing the digital educational environment closer to the individual needs of a particular person and the formation of a personalized trajectory of its use (Table 1).

The digital educational environment not only affects the formation and development of each participant, but also undergoes changes under the influence of their actions and requests. A feature of the digital educational environment in the professional training of future teachers is that the tools listed in Table 1, on the one hand, should be the subject of study, and on the other hand, they should be teaching aids, focusing on interactive learning. It is fair to note that such a situation requires proper training of scientific and pedagogical workers. The insufficient readiness of the teaching staff to use the educational information (digital, author’s solution) environment is indicated by N. I. Hrechanyk and other scientists [19]. Within the digital environment, system-forming relationships are built between all participants, which are different in nature. They ensure the functioning and development of the environment from defining its goals to the final assessment of the results of training specialists. All participants in the digital educational environment are united into a holistic system, in which each interaction characterizes the quality, accessibility, openness of the learning process and is the key to the effective functioning of this environment (Fig. 4). Domestic scientists (A. P. Rybalko and others) using

Table 1. Subjects of the digital educational environment and tools for their interaction

Subjects	Directions of digital interaction and technological tools for its implementation
scientific and pedagogical workers	• educational platforms: <i>Moodle, Microsoft Teams, Google Classroom, Edmodo etc.</i>; • communication: <i>Zoom, Meet, Google Chat, Discord, Telegram, Outlook, Gmail etc.</i>; • creating visual, interactive content: <i>Canva, Genially, Prezi, Visme, Google Slides, Power Point, LearningApps etc.</i>; • surveys, questionnaires and testing: <i>Google Forms, Microsoft Forms, Mentimeter, Quizizz etc.</i>; • interactive whiteboards: <i>Padlet, Jamboard etc.</i>; • gamification: <i>Kahoot, Wordwall, Gimkit, Blooket, Flippity etc.</i>; • knowledge resources: <i>YouTube, Ted-Ed, Khan Academy etc.</i>; • encyclopedic resources: <i>Wikipedia, Britannica, Google Scholar etc.</i>;
students	• online courses and professional development platforms: <i>Prometheus, EdEra, Coursera, Udemy etc.</i>; • reflection and digital portfolio tools: <i>Google Sites, Notion, Padlet, Miro, Canva Whiteboard, Book Creator etc.</i>; • professional communities, webinars, EdTech-hubs: <i>Osvita.ua, EdCamp Ukraine, Facebook, Telegram groups (Osvitoria, Insights of an active teacher), etc.</i>
administrative and managerial staff of a higher education institution (administration, representatives of the dean's office)	• educational process management: <i>Moodle, Microsoft Teams (for Education), Google Classroom, Trello etc.</i>; • electronic document management and archive: <i>Google Workspace, OneDrive, Dysk, Vchasno.EDO etc.</i>; • communication: <i>Zoom, Meet, Google Chat, Discord, Telegram, Outlook, Gmail etc.</i>; • survey: <i>Google Forms, Microsoft Forms, Mentimeter, Slido etc.</i> • analytics, reporting: <i>Google Sheets, Excel etc.</i>; • data visualization and monitoring: <i>Google Slides, PowerPoint etc.</i>; • planning: <i>Google Calendar etc.</i>;
stakeholders, employers	• communication: <i>Zoom, Meet, Google Chat, Discord, Telegram, Email etc.</i>; • collaboration in : <i>Moodle, Teams, Google Classroom etc.</i>; • evaluation, survey, feedback: <i>Google Forms, Microsoft Forms etc.</i>; • electronic document management: <i>Google Docs, Google Drive, OneDrive etc.</i>; • career counseling and employment: <i>LinkedIn, Work.ua etc.</i>; • analytics of the specialists' training quality: <i>Excel, Google Sheets etc.</i>;
system administrators	• network and infrastructure management: <i>pfsense, Wireshark etc.</i>; • information security and access control: <i>Active Directory, Group Policy etc.</i>; • equipment maintenance and technical support for users: <i>GLPI, AnyDesk, HelpDesk etc.</i>; • cloud services and educational software: <i>Google Workspace, Microsoft 365, Nextcloud etc.</i>

the example of distance learning emphasize that effective communication between all participants in the educational process, as well as the development of mechanisms to support education seekers are extremely important [20].

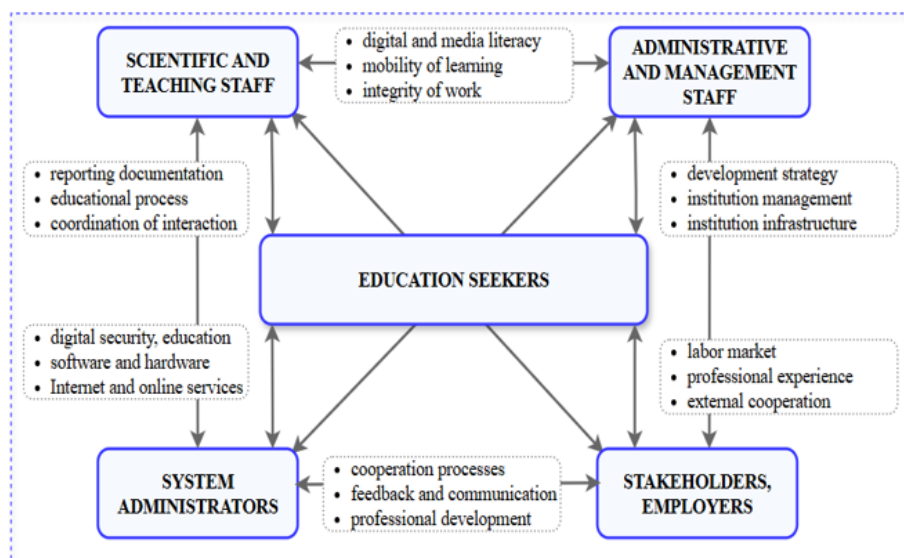


Fig. 4. Interrelationships between actors in the digital educational environment

Research results

Analysis of regulatory documents, scientific research and methodological publications in the field of education allowed us to identify the subjective component as the core of the digital educational environment. Each of the subjects of this environment plays an important role in its functioning. Effective participation involves comprehending the purpose, stages and principles of design and development of the digital environment within a particular educational institution. According to the results of the survey, in which 119 scientific and pedagogical employees of the university participated this sample approximately evenly includes all faculties, which allows us to extend the results to the entire university (Fig. 5).

After that, the authors have decided to find out which of the three forms of learning (face-to-face, distance or blended) is appropriate in the current conditions in the region (Fig. 6). Given that 75.5% chose a blended form of learning, the relevance of the topic of this publication is even greater. After all, only if a higher education institution has a digital educational environment it is possible to implement various models of blended learning [21]. At the same time, we agree that it is difficult to talk about a complete replacement of traditional forms and methods of teaching [22]. It is more expedient to distribute online classes and modern digital tools as a supplement to established traditional methods and means of teaching, rather than using them as the only form of organizing the educational process.

When determining the platform for creating a digital educational environment took into account what environments are on the market, how to deploy

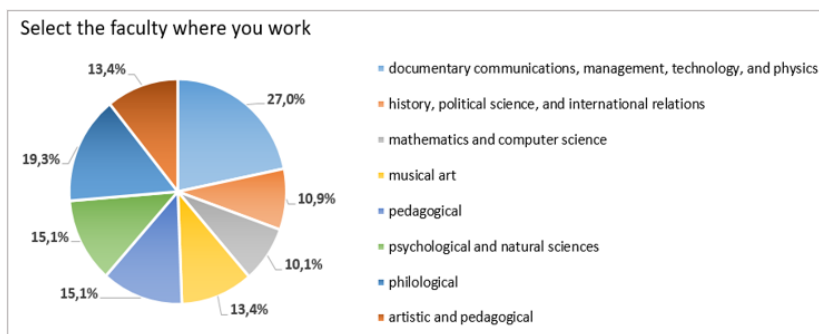


Fig. 5 a) Percentage diagram of the sample by faculty

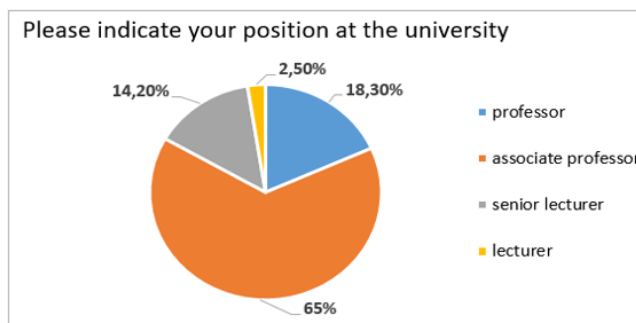


Fig. 5 b) Characteristics of the sample by position held

them on university servers, and what applications teachers already know how to use. As revealed during the surveys (Fig. 7), the most popular were Google Classroom and Moodle.

As the experience of previous years of implementing elements of distance learning at this university has shown, it is possible to use other services for this purpose. In particular:

- virtual disks, which were created for each department in the edu.ua domain back in 2014 and are still used by many to organize individual and independent work of students; additional services should be used to communicate with students so that they can submit their work and teachers can check it;

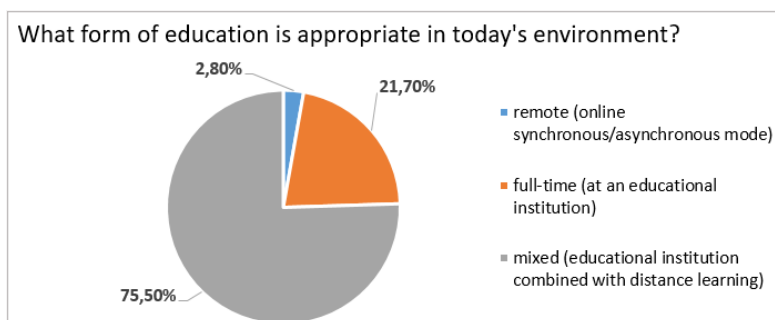


Fig. 6. Results of choosing the form of training

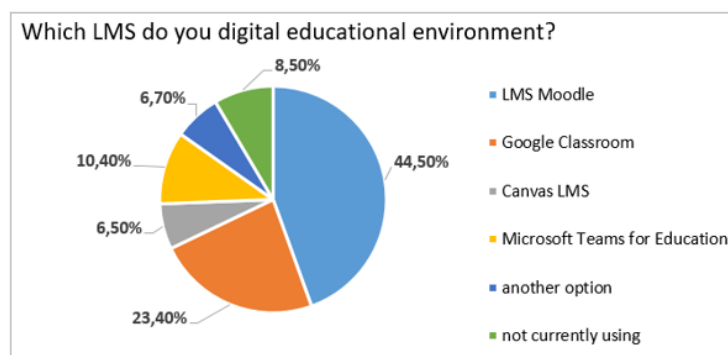


Fig. 7. Results of choosing the platform for creating a digital educational environment

- distance learning platforms that are already filled with educational content, and all that remains is to gain access to them. So, in quarantine conditions, most of them are open for registration and learning. In particular, the authors have gained access to Coursera, Prometheus, and others. In this case, it has been seen that students have registered for a particular course, but their results are visible only when they successfully pass the final test for the course;
- open educational resources that do not require any registration and mostly do not contain elements of control over their assimilation, which, however, contain quite useful materials;
- platforms learning, which provide the teachers with the opportunity to fill their educational content, supplementing it, if necessary, with links to open educational resources, links to materials posted on their personal or departmental virtual disk (this is convenient from the point of view of its editing and protection on the one hand and reducing the load on the server where the platform itself is deployed). The main advantage of such platforms is the ability to group or individual student enrollment in the course, communication with them on the platform itself (you can write a message and send it immediately to all course participants and they will read it when they enter the course or open their mail), monitoring of students' activities and their self-reflection, automated or manual (depending on the type of tasks and needs) assessment with posting grades in an electronic journal.

However, today, a distance learning platform alone is not enough to build a digital university. It is necessary to integrate all existing services in combination with a convenient interface and functionality. For this, automated university management systems are used. As it turned out, most teachers demonstrate readiness to implement at least some of the services that support the functioning of a digital educational environment (Fig. 8, Fig. 9).

Although the survey results indicate that teachers use digital technologies in various ways, they mainly prefer to use them for communication support (90.3%), content creation (68.7%), and knowledge resource processing (79.4%). while the use of gamification (18.7%), the development of electronic portfolios (29.3%), and working with interactive whiteboards (29.3%) remain outside the

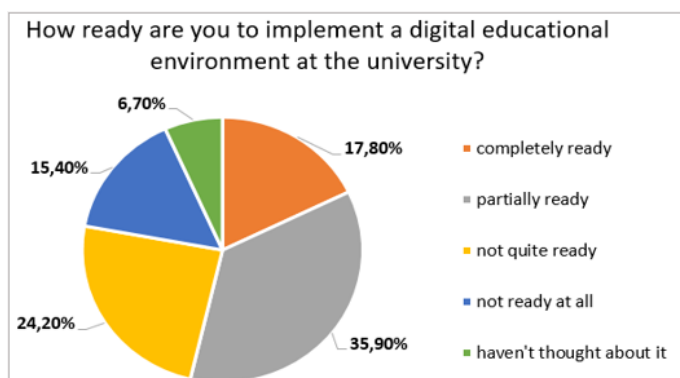


Fig. 8. Results of a survey on the transition to an automated university management system

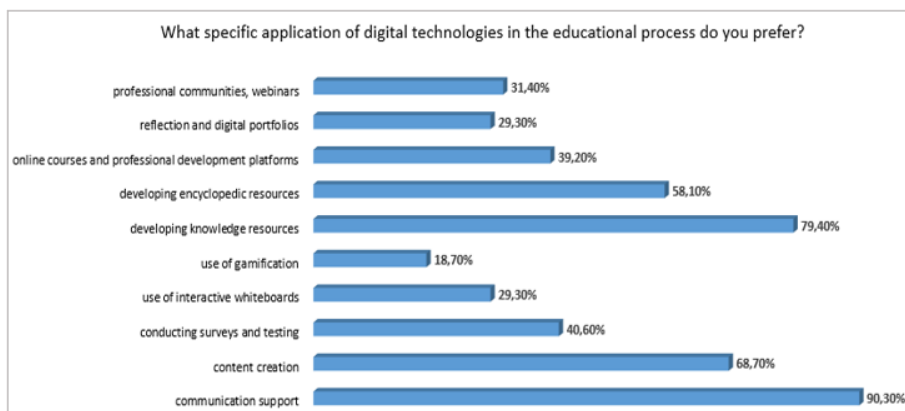


Fig. 9. Results of a survey on the use of digital technologies in the educational process

practical implementation of the educational process. At this stage, cooperation with system administrators is particularly important, but only 31.5% of teachers gave it a positive assessment (Fig. 10). In the process of creating a digital university, it is important to constantly study the labor market, and therefore we are establishing communication with stakeholders and employers — both when selecting the content of education and when choosing the means of educational activities. More than half of respondents (34,3%, 26,2%) said that representatives of this category of entities are properly involved in the educational process (Fig. 11).

Thus, it has been developed the prerequisites for the digitalization of the university, provided methodological and technological support for scientific and pedagogical workers in their professional activities in a digital educational environment.

Conclusions and prospects for further research

In the context of digitalization of education, higher education institutions are actively improving approaches to organizing the process of professional training of future teachers. One of the key areas of this process is the implementation of a digital educational environment, which is considered as

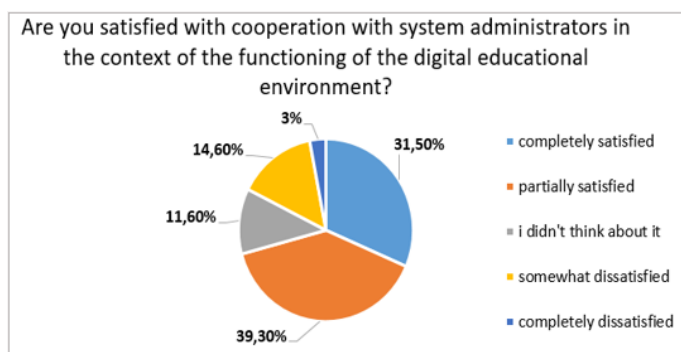


Fig. 10. Results of a survey on cooperation with university system administrators

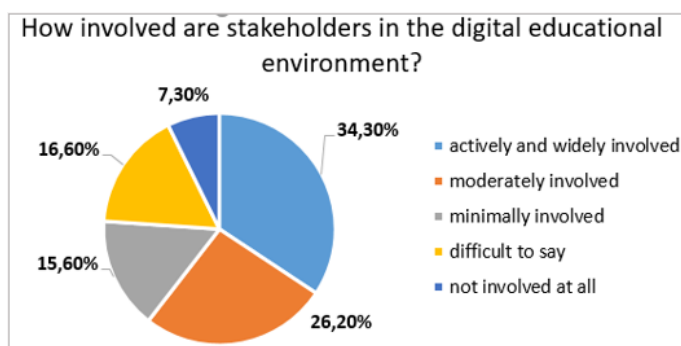


Fig. 11. Results of the survey on cooperation with stakeholders

an artificially designed, multi-component system that combines technical, information and communication resources for the purpose of organizing, implementing and developing the educational process in the context of digitalization of education. Such an environment integrates subject and object resources into a holistic space.

The subjects of the environment are students, scientific and pedagogical workers, stakeholders, employers and other participants in the educational process, each of whom has their own needs, functional roles, level of involvement in educational activities and other individual characteristics. Together they form a digital community that is an association of individuals who have common goals, values and interests in the field of education. Thanks to digital technologies, community participants not only receive information, but also actively influence the formation of the digital educational environment and contribute to its integration into the process of professional training of future teachers.

Within the digital environment, system-forming relationships are built between all participants, which are different in nature. Educational needs, professional interests and readiness to work with students' digital technologies determine the purpose of designing the environment, the conditions of its functioning. Within the environment, scientific and pedagogical workers are not the only carriers of knowledge, but act as consultants, developers of distance courses, authors of digital content. Administrative and managerial staff plays the role of initiator and coordinator of digital changes in higher education institutions. System administrators are responsible for technical support of digital

innovations, ensuring the stability and accessibility of the use of digital services and platforms. Stakeholders and employers, as external participants in the educational process, form a demand for the quality of professional training of specialists, and focus on the current needs of the labor market.

Further research should focus on improving the digital literacy of various categories of participants in the educational process and developing training programs for the practical implementation of digital university concepts.

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