

MODERN TOOLS TO ENHANCE THE EFFECTIVENESS OF DISTANCE LEARNING IN CONDITIONS OF DIGITALIZATION

^aVIRA KUROK, ^bIRYNA KASHUBIAK, ^cLIUDMYLA MAKSYMENKO, ^dIRYNA PUSHCHYNA, ^eTETYANA CHUMAK

^aNational Academy of Pedagogical Sciences of Ukraine, Oleksandr Dovzhenko Hlukhiv National Pedagogical University, 24, Kyivska Str., 41400, Hlukhiv, Ukraine

^bLesya Ukrainka Volyn National University, 13, Voli Ave., 43025 Lutsk, Ukraine

^cSumy State Pedagogical University named after A. S. Makarenko, 87, Romenska Str., 40002, Sumy, Ukraine

^dNational University Zaporizhzhia Polytechnic, Zaporizhzhia, Ukraine

^eNational University of Bioresources and Nature Management, 15, Heroes of Defense Str., 03041, Kyiv, Ukraine

email: ^avirakurok@gmail.com, ^biryna.kashubiak@gmail.com, ^clyshher@gmail.com, ^dpushchyna@zp.edu.ua, ^etchumak27@ukr.net

Abstract: At the stage of reorganization of the external and internal policies of educational process in Ukraine, there is an active search for the country's rightful place among the international community, the construction, and strengthening of new relations in Europe which leads to the need to address issues and create conditions for the quality preparation of future educators capable of utilizing digital technologies in distance education. The aim of the research is to analyze and practically implement the methodological component to enhance the levels of digital competence of specialists in the conditions of distance education, prepared to carry out future professional activity. The research utilized methods such as analysis, comparison, systematization, classification, generalization, and experimentation, as well as methods of mathematical statistics. The concept of "digital competence" has been defined, its structural components have been identified, and a methodology for forming the digital competence of future professionals in the pedagogical sphere has been developed and implemented. During the research at the Oleksandr Dovzhenko Hlukhiv National Pedagogical University, at the Faculty of Technological and Vocational Education, a methodological toolkit has been developed for forming digital competence, namely: the implementation of its components with selected methodologies for their formation, allowing the improvement of the educational process in Ukrainian higher education institutions. Following the research, prospective directions for improving the methodology of forming digital competence by developing its components have been formulated. The prospects for further research involve studying the possibilities of applying digital technologies in the preparation of specialists, starting from preschool educational institutions and ending with higher education institutions.

Keywords: higher education; future educators; distance education; digitalization; digital technologies; digital competence.

1 Introduction

The rapid pace of technological innovation has led to the widespread adoption of digital technologies worldwide. Global digital trends are forming how modern education is reformed. The globalization of higher education necessitates the active integration of digital technologies into the educational process for preparing future specialists. The peculiarities of the development of the modern digital generation is its integration into the global space. The development of digital competence is a crucial direction today, influencing the quality preparation of highly skilled specialists. In the context of today's digital society, there is a daily utilization of a vast amount of information, including "big data," artificial intelligence (AI), virtual and augmented reality technologies (VR, AR), quantum technologies, and "distributed ledger systems" [1; 18].

The digitalization of higher education holds a significant place on the path to the effective development of the digital society and digital economy in Ukraine and worldwide. The relevance of this issue is substantiated by legislative documents at the national level, namely, "Ukraine 2030E – a country with a developed digital economy" and others. The Ministry of Education and Science of Ukraine has presented the project "Concept of Digital Transformation of Education and Science for the Period until 2026" for public discussion, which serves as a comprehensive strategic vision for the digital transformation of the education and science sectors in the future [20; 27; 12].

Today, an increasing number of professions requires high levels of digital competence from specialists and proficiency in cutting-

edge technologies. Therefore, the issue of qualitatively updating the content of higher education becomes highly relevant. Higher education should take a proactive stance and explore new ways of preparing future specialists by incorporating digital technologies [4].

As distance education has actively developed worldwide, there has been a significant acceleration in the growth of the EdTech sector, which constitutes a part of the educational system that evolves in the direction of a symbiosis between traditional online education and the utilization of simulation methodology. The use of electronic tools and distance learning platforms impacts the quality of the educational process and requires higher education institutions and academic staff to possess relevant competencies in employing digital technologies for remote learning of highly qualified specialists [21; 25; 16].

The aim of the article is to explore the relevance and prospects of implementing modern tools to enhance the effectiveness of distance education based on digitalization principles in today's context.

The tasks that need to be solved in the process of conducting the research are substantiated:

1. Conduct an analysis of the current state of the methodology for organizing distance education in higher education institutions in Ukraine in the context of digitalization.
2. Develop a methodology for improving distance education in the conditions of digitalization.
3. Identify the components of forming the digital competence of professionals.
4. Implement the methodology for enhancing the effectiveness of distance education in the conditions of digitalization.

Solving these tasks in the research process will enable the construction of the educational process in Ukrainian higher education institutions in a distance format more effectively, taking into account the requirements for specialists in the pedagogical field in the labor market.

2 Method

In the process of experimental research, the following methods have been used: analysis, synthesis, comparison, systematization, classification - to conduct a theoretical analysis of problems aimed at researching the use of modern digital technologies in the conditions of distance education, as well as philosophical, psychological, pedagogical and methodical literature based on state general conditions binding standards of higher education, educational programs for training future specialists in the field of pedagogy; working curricula, educational and methodological complex of professional disciplines for various specialties; summarizing the experience of using digital technologies in institutions of higher education; experiment: ascertaining, formative and control to check the proposed methodological system aimed at increasing the levels of formation of digital competence in the conditions of distance education in institutions of higher education.

The experimental research has been conducted at the Glukhiv National Pedagogical University named after Oleksandr Dovzhenko during the academic years 2022-2023. The sample size consisted of 86 prospective educators. The control group included 42 respondents, while the experimental group involved 44 participants, comprising 46 females and 40 males. The results of the experimental research have been evaluated based on high, medium, and low levels.

At the declarative stage of the experiment, a cohort of respondents was identified, all of whom were in similar

conditions (course of study, educational program, etc.). A survey was conducted to diagnose the awareness of future educators regarding digital technologies and their utilization. An analysis of literature sources on the research problem was carried out, and a methodological toolkit was selected to support the idea of incorporating digital technologies into the educational process, the best practices in the methodology of applying digital technologies were examined.

A comparative analysis of the scientific foundation related to the research problem was conducted, involving the systematization, classification, and synthesis of theoretical data. A methodology for fostering the digital competence of future specialists in the context of distance education at higher education institutions was developed. Its components were identified as motivational, cognitive-operational, informational, and reflexive.

At the formative stage of the experiment, specialized methods of forming digital competence components were implemented in the experimental group in conditions of distance education in institutions of higher education at all stages of the experiment. Based on the analysis of experimental data, it can be concluded that during the formative stage of the experiment, the levels of digital competence among future specialists in the context of distance education at higher education institutions increased, which allows us to assert the effectiveness of the outlined methodology.

At the control stage, an analysis of the obtained results was carried out, and qualitative and quantitative indicators of the pedagogical experiment were processed using the Wilcoxon-Mann-Whitney criterion, results were generalized, conclusions were drawn, and prospects for further research were outlined.

3 Results and Discussion

The implementation of Industry 4.0 principles in Ukraine contributes to the active digitalization of education. The necessity of digitalizing education is driven by the formation of the digital economy, as its active development depends on having specialists prepared to operate within contemporary ideologies and technologies. The digitalization of education aims to ensure its continuity and individualization (Framework of digital competences for citizens of Ukraine, 2023).

In accordance with the demands of the modern labor market, employers put forward new requirements for the content and process of professional training of future specialists, who must possess deep professional knowledge and skills, be capable of creatively solving tasks, strive for self-improvement, and be ready to find ways to solve problems regardless of individual circumstances, to work with various forms of labor organization and production in tough conditions of competition, the ability to develop a special strategy of professional thinking, behavior and activity [20].

The concept of "digital competence" encompasses the ability to navigate the information space, conduct searches for necessary information, and utilize it according to personal needs and the requirements of the modern high-tech information society [14].

Digital competence is essential for individuals not only in their professional activities but also in everyday life, as demanded by both digital society and the economy.

The preparation of future specialists with a high level of digital competence is a necessary component of professional training, enabling them to perform their professional duties more effectively by aligning with the demands of the labor market and the digital society [23].

Ensuring the development of digital skills in future specialists in the field of education is a primary requirement for the advancement of Ukraine's digital market. Digital skills serve as the foundational prerequisite for the development of all other priorities in harmonizing digital markets between EU countries

and Eastern Partnership, as outlined during the ministerial meeting on the topic of the "Digital Community."

The framework for digital competence, established in 2013 and updated since then, encompasses 21 learning outcomes across 5 domains: information literacy, including content management; communication and collaboration, as well as societal participation; creation of digital content, incorporating ethical principles; security; and problem-solving [5].

To determine the levels of development of digital competence in future educators, the project "Description of the Digital Competence of a Pedagogical Worker" serves as the foundation. This method for assessing the levels of digital competence for pedagogical specialists has been developed in accordance with the Concept of Development of Pedagogical Education, European framework documents on digital competence – DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use, Digital Competence Framework for Educators (DigCompEdu); Report developed by participants of the Erasmus+ project "Modernization of Pedagogical Higher Education by Innovative Teaching Instruments" (MoPED). It is based on the assessment of indicators of information, computer, communicative literacy, media literacy, and attitudes towards technology.

The digital competence of an educational professional is described across five directions:

1. Educator in the Digital Society.
2. Professional Development.
3. Utilization of Digital Resources.
4. Teaching and Assessment.
5. Formation of Digital Competencies in Education Seekers. [3; 28; 13].

By utilizing digital technologies in the context of distance education, higher education learners have the opportunity to acquire 21st-century soft skills necessary for their future professional activity. These skills include critical thinking, communication skills, leadership qualities, emotional intelligence, positive thinking, teamwork, and self-organization.

To ensure the competitiveness of specialists in the labor market, it is essential to cultivate technical, soft, and social skills that can adapt to the evolving demands of the workforce. Investments in skill development are a critically important factor for a country's economic growth and competitiveness. At the same time, a persistent challenge for governments in many countries is striking a balance between specific and foundational skills tailored to particular professions. Qualified and mobile workforce stands as a key element in the competitiveness of any company and plays a crucial role in the economic growth of a country [8].

The OECD 2030 Educational Compass distinguishes between three types of skills (OECD, 2018) [27]:

- Cognitive and metacognitive skills, encompassing critical and creative thinking, as well as self-regulation.
- Social and emotional skills, covering empathy, self-efficacy, responsibility, and collaboration.
- Practical and physical skills, involving the application of new information.

Among the key skills that a modern specialist in the field of education should possess are: comprehensive problem-solving, critical thinking, mobility, creativity, leadership qualities, time management, coordination with others, emotional intelligence, judgment and decision-making, service orientation, negotiation skills, and cognitive flexibility.

The most effective system of the 21st century aimed at training and continuous support of highly qualified specialists is distance learning. It is a global telecommunications infrastructure designed to create systems for mass continuous self-learning and

universal information exchange (Geng; Law; Niu, 2019; Hermann; Pentek; Otto, 2019).

Distance learning models include: externship-based learning, autonomous educational institutions, autonomous learning systems, informal and integrated distance learning.

Elements that ensure the quality functioning of distance learning include: distance courses; websites and web pages; email; forums and blogs; chat and ICQ; tele- and videoconferences; virtual classrooms, and more [16].

Since distance learning in the era of digital technologies is gaining popularity, in the future it can take a separate place as a form of education among full-time, extramural, evening and externships.

Today, distance education built on digital technologies has several advantages, namely: accessibility, low cost, convenience, democratic "teacher-student" communication, use of comprehensive software and leading educational technologies, individualized learning process, and the ability to choose one's own pace of learning [10; 2].

In Ukraine, the organization of distance learning is regulated by the Order of the Ministry of Education and Science of Ukraine dated April 25, 2013, No. 466, "On the Approval of the Regulation on Distance Learning." Distance learning should be understood as a learning process based on an individualized approach to acquiring professional competence. It relies on the interaction of participants in the educational process who are located remotely from each other in a specialized environment. The functioning of this environment is carried out through the use of modern digital technologies.

The concept of "distance learning" encompasses a system of technologies through which students can acquire the necessary professional, specialized, and digital competencies. It is aimed at ensuring interactive interaction between higher education learners and educators, as well as fostering independence in the learning process. Distance learning technologies in education contribute to cost reduction for conducting training; simultaneous education of a large number of higher education learners; improvement of the quality of education through the use of modern tools, extensive electronic libraries, and the creation of a unified educational environment [15; 25].

With the help of distance learning, higher education learners have the opportunity to utilize unconventional sources of information, enhance the effectiveness of independent work, create new conditions for creativity, and acquire professional skills, and educators can implement fundamentally new forms and methods of teaching.

The study proposes to include the following aspects in the concept of "digital competence of the future professional":

- Understanding the essence and impact of digital technologies on the development of the educational process in the university;
- Mastery of modern software tools;
- Knowledge of algorithms and mechanisms for the application of digital technologies;
- Ability to carry out and evaluate one's activities using digital technologies [24; 17].

Based on the theoretical analysis of literary sources, it has been established that the digital competence of future professionals consists of the following components:

- Motivational;
- Cognitive-activity;
- Informational;
- Reflexive.

The motivational component includes interests, needs, understanding of the purpose of digital technologies in the

educational space, motives for the professional activity of the future specialist in the pedagogical field, which is oriented towards the goal, process, result of improvement and self-development in the field of digital technologies, interest in current trends.

The cognitive-activity component provides for the completeness, depth, and systematicity of the future specialist's special knowledge of digital technologies, which make it possible to ensure the organization of the educational process with the use of digital learning tools; the possibility of applying skills and abilities regarding the use of digital technologies in professional activities; it is a means of knowledge, development of digital competence, self-improvement, as well as an opportunity to establish communication between all participants of the educational process in the institution of higher education and beyond.

Informational component involves fostering the development of information culture in future educators, the ability to navigate in the information space, and utilizing digital technologies in the process of searching and processing information.

Reflexive component involves the ability to self-regulate and self-assess one's own activity.

In order to determine the levels of formation of components of digital competence among future specialists in the conditions of distance education, an experimental study was conducted during the academic years 2022–2023 at Hlukhiv National Pedagogical University named after Oleksandr Dovzhenko on the Faculty of Technological and Professional Education.

During the ascertainment stage of the experiment, a set of methodological tools was designed, aimed at increasing the levels of formation of digital competence of specialists in the pedagogical field at different stages of the experiment. The author's methods were implemented in the experimental group by creating artificial conditions for conducting the experiment.

A comparative analysis of the scientific base on the research problem, systematization, classification and generalization of theoretical data has been carried out; modeling the methodology of training specialists in the pedagogical field according to the outlined components, namely: motivational, cognitive-activity, informational and reflective.

The sample size was 86 future teachers. 42 respondents were involved in the control group, 44 respondents in the experimental group, including 46 women and 40 men. At the ascertaining stage of the experiment, an analysis of literary sources on the research problem was carried out, best practices in the application of digital technologies were studied, and object-oriented software was selected to support the idea of using digital technologies in the educational process.

During the exploratory experiment, a group of respondents in similar conditions (course of study, educational program, etc.) was identified. Surveying was conducted, based on which the awareness of future educators regarding digital technologies and methods of their use was diagnosed. The results of the conducted research allowed obtaining objective data on the levels of formation of digital competence among future educators. The level of formation of digital competence is understood as an indicator describing the ability of future educators to actively apply digital technologies in the educational process.

The study proposes to correlate competencies at three levels of experience in accordance with the scored points, namely:

- High (67-100 points - 3rd level) - characterized by the ability to apply digital technologies in full scope (including creating a digital product);
- Medium (34-66 points - 2nd level) - possesses knowledge of digital technologies but applies them only partially;

- Low (0-33 points - 1st level) - has knowledge of digital technologies but cannot correlate knowledge components with professional tasks.

We conducted a survey to check the awareness and use of digital technologies in the educational process by students and future teachers. The processed results have the following indicators: adaptive learning (12%), virtual classroom (9%), MOOCs (8%), synchronous and asynchronous learning (7%), blended learning (6%), flipped classroom (flipped learning) (5%), self-directed learning (8%), learning management system (4%), "Cloud" learning (5%), mobile learning (5%), course management system (CMS) (9%), e-Learning (7%), 1:1 technology (4%), gamification (9%).

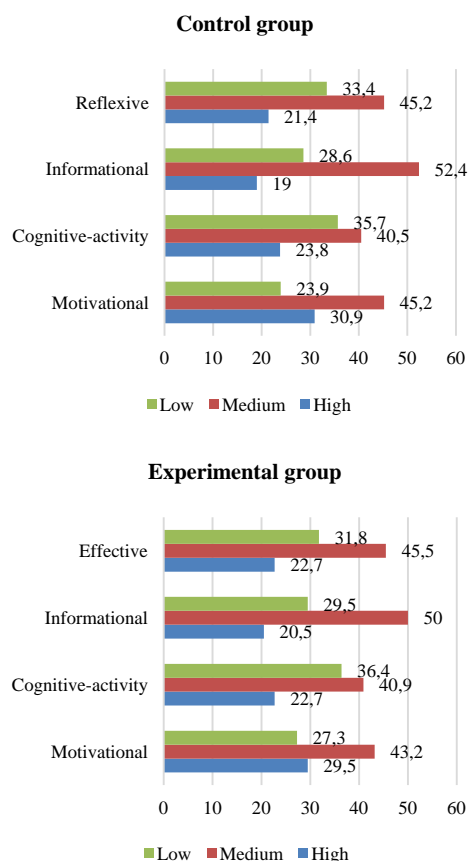
The obtained results of the study demonstrated the need for the development of students' digital competence. Synchronous and asynchronous learning, mobile learning, "cloud" learning" and blended learning are very convenient tools for organizing the educational process.

An important role in the study of the disciplines of the professional cycle is played by project activities, which make it possible to develop a set of skills for using digital technologies: information search, communication, synchronous and asynchronous communication, organizing joint activities, exchanging information and materials, conducting online surveys, creating a web portfolio and multimedia presentation of project results, creation of an electronic educational resource as a product of project activity.

To determine the levels of formation of the components of digital competence, a survey was conducted according to the author's questionnaire, which included four blocks of questions according to the outlined components, namely: motivational; cognitive-activity; informative reflexive.

In general, the data of the conducted survey show that students positively evaluate the possibilities of using digital technologies in education.

The results of the research at the ascertainment stage of the experiment are presented in Figure 1.



"Source: compiled by the author"

Figure 1. Results of diagnostics of the levels of formation of digital competence of future specialists in the field of pedagogy in the conditions of distance education in institutions of higher education at the ascertainment stage of the experiment in the control and experimental groups.

According to the results of the survey, it can be concluded that the respondents who belong to the first level - low, scored the lowest number of points. They realize that digital technologies have a high potential and want to learn them for further application in their future teaching practice, and they also occasionally use digital technologies in classes. Respondents belonging to the 2nd group (medium level) possess digital technologies at an average level. Students of the 3rd group showed a high level of mastery of digital technologies. They have a whole set of digital strategies and know how to choose the best of them for a particular situation, and they are always up to date with innovations.

At the formative stage of the experiment, specialized methods were implemented in the experimental group for the formation of digital competence components at all stages of the experiment. To determine the features of the formation and development of the motivational component of the digital competence of future specialists in the field of pedagogy in the conditions of distance education in higher education institutions, the degree of motivation, the desire for self-development and self-improvement, the author's questionnaires and clarifying interviews were used.

It is proposed to activate the potential of using digital technologies by specialists in the pedagogical field, namely by introducing: integration trainings (reflective, with elements of digital innovation); the use of doping methods aimed at forming the ability to maintain confidence during the use of innovations in the educational process (lecture, open class, etc.); the use of methods and techniques for the development of pedagogical self-

presentation skills (development of pedagogical portfolios, improvement of one's own pedagogical skill based on the use of digital technologies, etc.) [22].

The formation of the cognitive-activity component of the digital competence of future specialists in the field of pedagogy in the conditions of distance education is proposed to be carried out according to the method of posing problematic questions, by developing the author's special course "Digital technologies in education", which includes interactive methods; digital and multimedia technologies; hypertext and Internet technologies; technologies of virtual information space; cloud technologies; Web technologies; telecommunication technologies; SMART technologies. The definition of the content of the tasks took place taking into account the principle of complex differentiation for groups of students and was based on the implementation of indicators of the formation of digital competence of future specialists in the field of pedagogy in the conditions of distance education in higher education institutions.

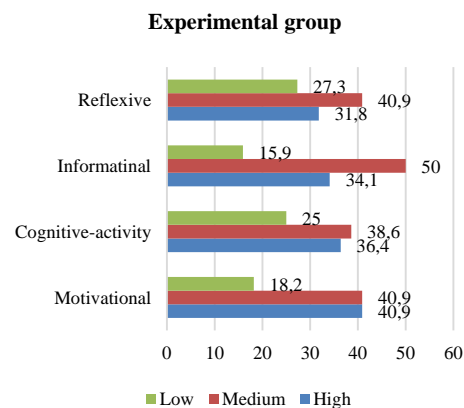
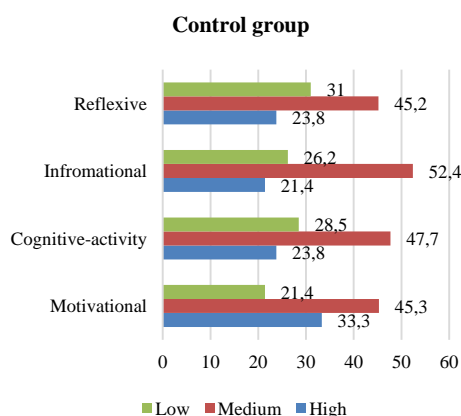
In order to exclude randomness in the assessment of the levels of the studied definition in conflict issues, there was a need to conduct an interview, during which students of education must answer questions and perform tasks, based on the results of which conclusions can be drawn about the level of development of each component.

The informational component of the formation of digital competence of future specialists in the field of pedagogy in the conditions of distance education in higher education institutions is proposed to be implemented through the development by future specialists in the field of pedagogy of a package of methodical materials for the chosen discipline of professional direction using digital technologies (lectures, practical work, tasks for independent work, etc.).

The implementation of the reflexive component is envisaged through the active development of students' ability to self-analyze, control, and evaluate the levels of their own professional culture, which ensures self-regulation of the educational activity of pedagogical specialists.

It is proposed to use the method of writing self-reviews, training activities, development of lateral (non-standard) thinking; use of strategic self-improvement techniques; method of problem-reflective dialogue and polylogue, reflexive-business games, as well as the method of positional discussion.

The obtained data results at the formative stage of the experiment are presented in Figure 2.



"Source: compiled by the author"

Figure 2. Results of diagnostics of the levels of formation of digital competence of future specialists in the field of pedagogy in the conditions of distance education in institutions of higher education at the formative stage of the experiment in the control and experimental groups

As we can see from Figure 2, after providing a formative influence in the experimental group, the group of 3rd level learners experimenting with digital technologies in different contexts and with different goals, integrating them into everyday life, purposefully selecting digital technologies and materials for specific situations, and trying to understand has significantly increased in the experimental group with the advantages and disadvantages of different digital strategies.

Therefore, in the course of researching the levels of formation of digital competence of future specialists in the field of pedagogy in the conditions of distance education in higher education institutions, we can state that the majority of respondents have formed its average level. This level of digital competence of future teachers characterizes the adequacy of the use of digital technologies in the educational process and contributes to its effectiveness. However, the research revealed certain problems that hinder the effective use of digital technologies by teachers in the educational process. First of all, these problems are related to the low level of material and technical equipment of classrooms (computers, tablets, interactive whiteboards, stable access to the Internet, specialized software) and the lack of systematic provision of the educational process with modern methodical materials.

According to the results of the analysis of experimental data, it can be concluded that at the formative stage of the experiment, the level of formation of the components of digital competence of future specialists in the field of pedagogy increased under the conditions of distance education, which allows us to speak about the effectiveness of the outlined methodology.

Thus, the use of blended and distance learning allows the educational process to be carried out at a modern level, taking into account the requirements of today.

4 Conclusion

In the course of the study, it was concluded that the qualitative formation of digital competence of future specialists in the field of pedagogy in the conditions of distance education in higher education institutions should be based on the principles of using digitalization tools.

The concepts of "digital technologies" and "digital competence" were defined. Prospective directions for improving the process of raising the levels of digital competence of future specialists in the field of pedagogy in the conditions of distance education in higher education institutions have been formed.

In the process of conducting the experiment, it was established that the level of formation of digital competence in the conditions of distance education in higher education institutions is mainly at medium and low levels.

Such a tendency requires the creation of the necessary methodological toolkit, which will serve to increase the effectiveness of training specialists in the pedagogical field, as a result of which they will develop digital competence.

The components of digital competence in the conditions of distance education are determined, namely: motivational, cognitive-active, informational and reflexive.

In the process of research, the organizational and methodical models of distance education were singled out, namely: externship-type education; autonomous educational institutions; autonomous educational systems; non-formal, integrated and distance learning.

The generalized data of the results of the experiment after the application of the proposed methodology allow us to draw conclusions about the effectiveness of the implemented methodological tools. In this regard, the policy of educational institutions of Ukraine should be aimed at updating the methodology of training specialists in the pedagogical field on the basis of digitalization of higher education.

We see the direction of further research in the development of modern educational programs of an international level for specialists in the field of pedagogy, which provide for the possibility of improving qualifications abroad and implementing the results of own research. Scientific research, as well as the conclusions formulated on its basis, can be used as an effective basis for improving the training of specialists in the pedagogical field in higher education institutions on the basis of digitalization, finding ways to increase the level of their digital competence, using the experience of foreign countries, introducing digital resources for the organization of scientific - research projects in the context of higher education, conducting professional activities at a high level, taking into account the requirements of the labor market; deepening the study of the structure of digital competence of educators in professional training.

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