

DOI: <https://doi.org/10.57125/FED.2023.06.25.12>

How to cite: Bieliaieva, N., Holiiad, I., Dynko, V., & Mogilat, A. (2023). Developing and implementing a distance learning model for training specialists of the future. *Futurity Education*, 3(2), 194–212. <https://doi.org/10.57125/FED.2023.06.25.12>

Developing and Implementing a Distance Learning Model for Training Specialists of the Future

Natalia Bieliaieva

The searcher Dragomanov ukrainian state university, Kyiv, Ukraine, <https://orcid.org/0009-0003-2987-8423>

Iryna Holiiad

PhD in Pedagogical Sciences, Associate Professor, Senior researcher, State scientific institution "Institute of education content modernization", Kyiv, Ukraine, <https://orcid.org/0000-0003-4979-828X>

Volodymyr Dynko

PhD in Pedagogical Sciences, "Boryspil Vocational Lyceum", Boryspil, Ukraine, volodimir_dinko@ukr.net, <https://orcid.org/0000-0001-6773-0540>

Anastasia Mogilat*

Postgraduate Dragomanov ukrainian state university, Kyiv, Ukraine, <https://orcid.org/0009-0002-6632-5708>

***Corresponding author:** 20a.a.nazarenko@std.npu.edu.ua.

Received: April 19, 2023 | **Accepted:** June 7, 2023 | **Published:** June 25, 2023

Abstract: Modern social development requires improvement of the existing educational system, including through the implementation of innovative distance education, which has become established after the introduction of global quarantine restrictions. The purpose of the article is to propose a practically proven model of distance learning that will be useful in training the specialists of the future. Appropriate methods were used to write the article. The most important among them were the content analysis of theoretical and empirical materials, the method of generalization, and comparison. As a result of referring to the theoretical framework, a total of 27 positions of modern and relevant scientific literature were analyzed, which made it possible to provide the necessary theoretical basis for the study. The results analyze the impact of the proposed distance learning model on the educational process. The strengths and vulnerabilities of the proposed model are also identified based on empirical material. The results obtained are compared with the general trends in the organization of distance learning in the world. The conclusions note that the findings confirmed several statements about the prospects for using distance education even after the COVID-19 pandemic: the overall effectiveness of distance learning and the positive impact on students' academic achievement. The use of this learning model has led to an increase in digital competence, stimulation of students' cognitive activity, desire for independent learning, and use of digital resources.

Keywords: distance education, digital technologies, model, interaction.

Introduction

The current state of the information society creates new requirements for the training of specialists of the future. This includes the integration of digital technologies into everyday life, the improvement of existing teaching practices based on the experience gained from the global COVID-19 pandemic and related quarantine restrictions, and the widespread introduction of distance learning. In particular, due to these restrictions, it was found that distance learning has its own significant advantages, which include not only significant budget and time savings but also the ability to encourage independent learning and integrate modern technologies into the educational process. This aspect proved to be optimal in the context of the crisis and the need to take extraordinary measures. At the same time, the World Health Organization has lifted the state of emergency due to the global pandemic, so educational institutions will be able to return to traditional forms of education. However, the popularity of distance education has not disappeared - many experts still prove the existence of tangible positive effects of its implementation (Perruzzo & Allan, 2022; Rajab, 2018). Therefore, the relevance of studying this innovative form of organizing the educational process is obvious.

Research Problem

Modern transformations in education associated with the widespread use of information and communication technologies have led to the formation of new open e-learning resources, an increase in social needs in the field of personalized and adaptive learning, and the need for the widespread use of innovative technologies in the educational sector. The active use of information and communication technologies as a method of providing educational services and creating a special environment for communication is described in modern models of distance learning.

A current trend is also the use of a combination of distance and blended learning. Many educational institutions are searching for the optimal model of organizing work with students, allocating resources accordingly, and preparing the institution's staff to organize training. The capabilities of

modern learning management systems and individual systems for managing educational content, open Internet resources (including cloud services, e-libraries, etc.) are effective if many factors are implemented. In particular, we are talking about the proper training of all participants in the educational process (managers, teachers, students, administrators, etc.), proper regulatory and legal support, availability of the necessary educational and methodological base, and material and technical support.

Research Focus

The main attention in preparing the proper use of distance education should also be directed to the relevant established models. Taking this aspect into account makes it possible to clearly define the sequence of actions to be taken, which in turn opens up opportunities for the effective use of all the possibilities of distance education. Despite the active development of distance education in general, not much attention has been paid to this aspect, as the use of distance learning has generally become a private matter for teachers. Educational institutions often only regulated the use of certain platforms or electronic resources.

Research Aim and Research Questions

The purpose of the article is to propose an effective model of distance learning for training future professionals, emphasizing its relevance through the use of an appropriate theoretical framework.

Accordingly, the main research questions are:

1.Characterization of the theoretical foundations of the use of distance education

2.Study of the main models of distance learning usage

3.Development and testing of a distance learning model based on the use of modern innovative and digital technologies

Research Methodology

General Background

This study is based on a content analysis of theoretical and empirical materials collected.

Accordingly, the study was implemented in several stages:

1.At the first stage, a model of distance learning was created, and all its components were theoretically substantiated.

2.At the second stage, the model was implemented (experimental verification).

3.At the third stage, the results of using this model are characterized, the key aspects of the use of innovative digital technologies in the system of training specialists of the future are investigated.

4.At the fourth stage, the results were compared with those of other researchers.

5.In the fifth stage, conclusions are drawn and prospects for further research are characterized.

Participants

The experimental testing of the distance education model involved 50 teachers from different educational institutions. The latter had different experience in using digital technologies and distance teaching methods. Before taking the survey, the respondents agreed to participate and to process their answers.

Instruments and Data collection

In order to experimentally test the effectiveness of the distance model, a special survey was conducted among teachers using Google-forms. Using the capabilities of the Excel program, we managed to process the information received. The research materials were collected and substantiated in stages from February 10, 2023, to May 20, 2023, i.e., almost throughout the entire second semester of the academic year. In order to determine the effectiveness of the distance education model as the main means of professional development of students, a special questionnaire was developed, which consisted of open and closed questions.

The first part. Open questions:

1.How often have you used modern innovative educational technologies in organizing distance learning? (Select one answer)

- a) Continuously
- b) Several times a week
- c) Several times a month
- d) Very rarely
- e) Not at all

2.Have digital technologies led to better student performance? (Select one answer)

- a) Yes, the average score has increased significantly
- b) No, the situation has worsened on the contrary
- c) The situation with grades has not changed

3.What do you think is missing for the effective use of distance education models?

- a) The required level of digital competence (Select one or more answers)
- b) Appropriate technical conditions
- c) Motivation to use
- d) Everything suits me

4.To what extent would you assess the effectiveness of the use of digital innovative technologies in the distance education model? (Choose one answer)

- a) High level of efficiency
- b) Medium level

c) M

5. What are the main advantages of a remote model based on innovative digital technologies? (Choose one or more answers)

- a) Attracting a large number of students
- b) Improved cooperation between students and teachers
- c) Increasing the level of motivation among students
- d) Providing access to professional learning materials
- e) Obtaining better results and level of mastery of educational material

6. Has your level of mastery of innovative educational technologies changed? (Select one answer)

- a) Yes, it has increased significantly.
- b) Yes, it has decreased
- c) No, it has not changed

The second part. Closed questions:

6. What are the main tools you used when organizing distance learning?

7. Have you encountered any difficulties with the proposed model of distance education?

8. Does the placement of e-learning materials affect the growth of interest in learning among students?

9. Do students prepare for their studies on their own based on the electronic educational materials provided?

10. Is it worth further developing distance education (based on innovative technologies and forms of education)?

Analysis of data

Based on the content analysis, it was possible to process the materials of modern researchers. At the same time, the phenomenon of using distance education in the system of training future specialists is characterized as a complex system that is constantly being improved using system analysis. The method of comparison was important for the study, based on which the obtained results were compared with the results of recent studies. Also important were the methods of generalization and typological method, which were used to qualitatively process and group the obtained materials. Also, the principles of comparativism were used to compare the strengths and weaknesses of the distance learning model and identify opportunities for improvement. It should be noted that the survey was conducted based on the following ethical criteria: anonymity, voluntary participation, absence of any discriminatory elements based on gender or age.

Theoretical Framework

A model is a system of important elements that reproduce certain aspects, relationships, and functions of the object of study. In the framework of this study, a model that is somewhat generalized and takes into account the most important factors of the learning process itself will play an important role. Modern models of distance education are based on the principle of using a variety of tools and instruments based on new information technologies and digital platforms and resources.

Since the beginning of the COVID-19 pandemic, the phenomenon of distance learning has been actively researched and implemented in practice. At the same time, in 2013, the Regulation on Distance Learning was adopted, which created the basis for the regulatory and legal aspects of the introduction of distance learning in Ukraine.

Distance education is a form of learning based on the use of modern digital and information and communication technologies that facilitate interactive communication between students and teachers, and promote the development of independent work among students.

The distance learning system includes the following components:

Tools for providing educational materials to students Tools for monitoring progress

Tools for consultation and cooperation between teachers and students Opportunities for quick communication and interaction

Tools for quickly adding new materials to courses. The structure of distance learning involves 4 subjects:

Students - those who receive educational services. Teachers - those who teach.

Administrators - those who plan educational work, create educational programs, divide students into groups and assign workloads to teachers, i.e., deal with various organizational issues.

An IT administrator is someone who facilitates the normal functioning of the learning system, solves various technical problems, and monitors the statistical work of the system itself.

The main conditions for the systematic implementation of distance learning are the formation of an educational institution's IT policy and the maintenance and updating of relevant information and educational environments. The latter should ensure the readiness of all participants in the educational process for innovative solutions, the formation of an appropriate level of digital qualifications of teachers and students, the creation of an appropriate IT infrastructure of the educational institution (we are talking about logistics, software, etc.) the creation of regulatory and legal support for distance learning, etc.

Research Results

Models of Distance Education: Types, Features of Use

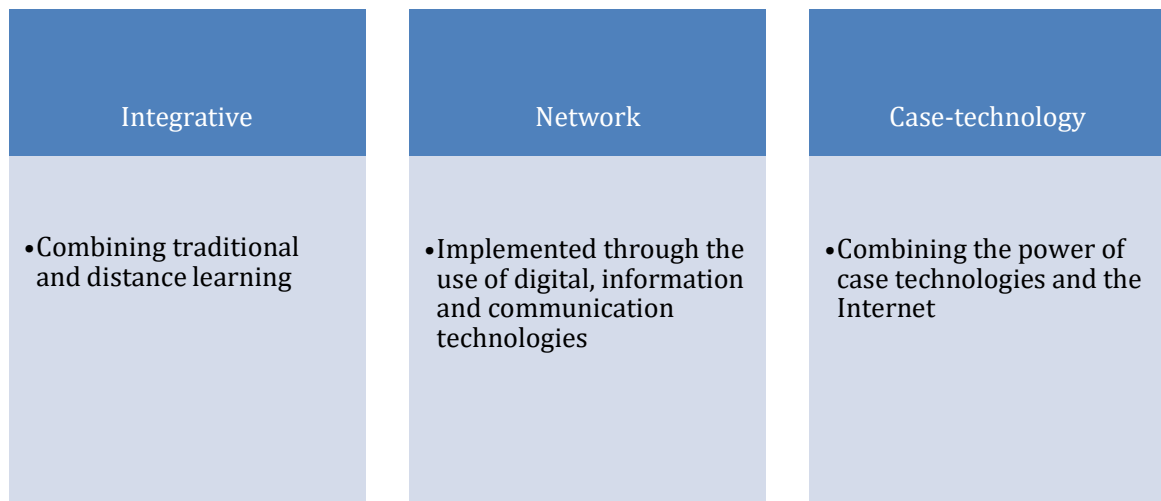
In Europe and North America, individual projects on the use of distance learning have been developed since the 2000s (Clennell et al., 2020). As a result, by the beginning of the COVID-19 pandemic, a certain methodology for working with online resources had already been formed, and ways to optimize them and general rules of use had been proposed (Rumble, 2019). Such attention to distance

education (which was then seen as exclusively auxiliary or to be used in the absence of other opportunities) made it possible to quickly integrate the latest technological solutions into learning, to use the experience gained in relation to the problems that have arisen (Santoveña-Casal & Fernández Pérez, 2020). At the same time, an appropriate regulatory framework was formed for the widespread use and implementation of distance learning in those educational institutions that, at first glance, were poorly adapted to it. For a long time, the mechanisms for its implementation remained an urgent problem (for example, taking into account the norms of teachers' teaching load, funding, and, above all, the choice of the most optimal digital platforms for creating and delivering distance learning) (Wong et al., 2021).

Contemporary researchers identify several accepted models of distance education, which are being further improved: integrative, network, case-technology, and integrative television models. While the latter is used mainly at school, integrative and network models are used in higher education institutions. The integrative model involves a synthesis of traditional and distance learning. Thus, it becomes possible to reconstruct the entire educational process: classroom lessons, seminars, and practical work are conducted in the traditional form, while those that require autonomous cognitive work and independent research are implemented in a virtual format. The network model implies that a student does not need to attend an educational institution in person. It is realized through the use of various digital and electronic technologies and forms of education. At the same time, the case-based model combines the capabilities of the Internet and case-based technologies. Cases are sent to students. The course website should indicate the time of group discussions and the form of these classes (seminar, lecture-conversation), and also provide for work in smaller teams to develop educational projects, essays, etc. (See Figure 1).

Figure 1

The Main Models of Distance Education



Source: article authors' development.

However, due to the development of digital technologies, these models have been synthesized around person-centered approaches using various digital technologies. Accordingly, using the fundamentals of these forms of distance learning, they can be implemented in different ways, introducing new models.

A Model of Distance Learning Based on the Use of Innovative Digital Technologies

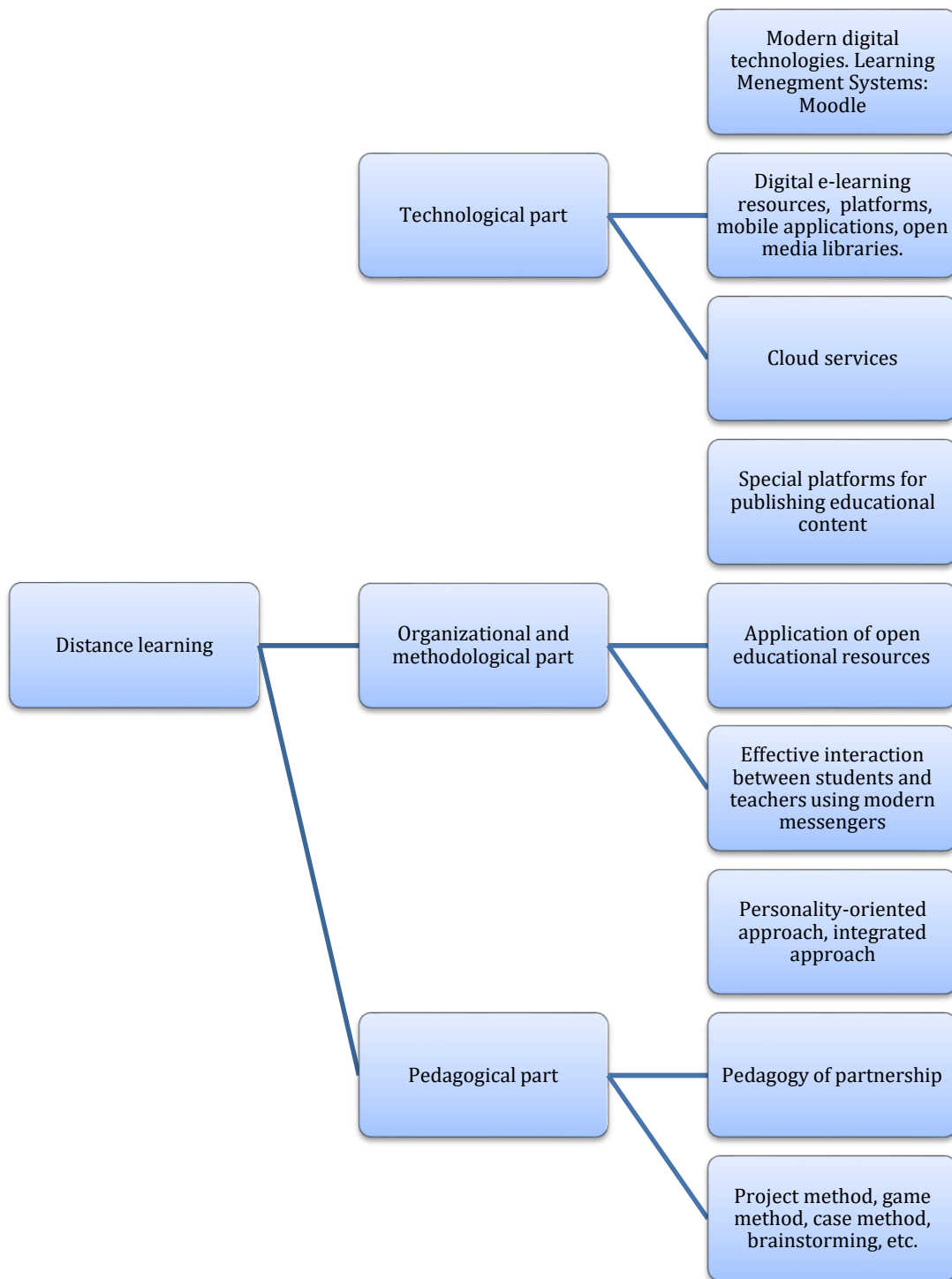
The modern model of distance learning should reflect a systematic set of synchronous and asynchronous individual and direct interactions between students and teachers, learning content, and interface. Accordingly, modern innovative and digital technologies should become the basis for training. The choice of information technologies should be based on the individual capabilities of students.

In distance learning, the content is formed in such a way that allows to maximize the use of a wide range of information and telecommunication technologies, taking into account the peculiarity of perceiving educational content in its various forms: text, sound or graphic (Williams et al., 2023). The psychophysiological and psychological-pedagogical aspects of the perception of educational information also have characteristic features: secondary to the traditional learning environment (secondary to traditional technologies of educational activities), autonomy, independence, and interactivity (Almås et al., 2021).

Given the open access of digital learning resources, they should become an additional part of the organization of classes, quality control, etc. (Spillere et al., 2018). At the same time, it is also important to use special learning relationships that will contribute to the development of practical skills in students (Hart-Davis, 2018; Reid, 2020).

Accordingly, the distance learning model should include the following parts: technological, organizational, methodological, and pedagogical. In the technological part, the use of digital electronic resources, web 3 technologies, open media libraries or digital libraries, etc. is of primary importance. At the same time, the organizational and methodological system will be responsible for the effective interaction between the participants of the educational process and educational content. The entire set of tasks defined by educational standards should be designed in the educational digital space. At the same

Figure 2

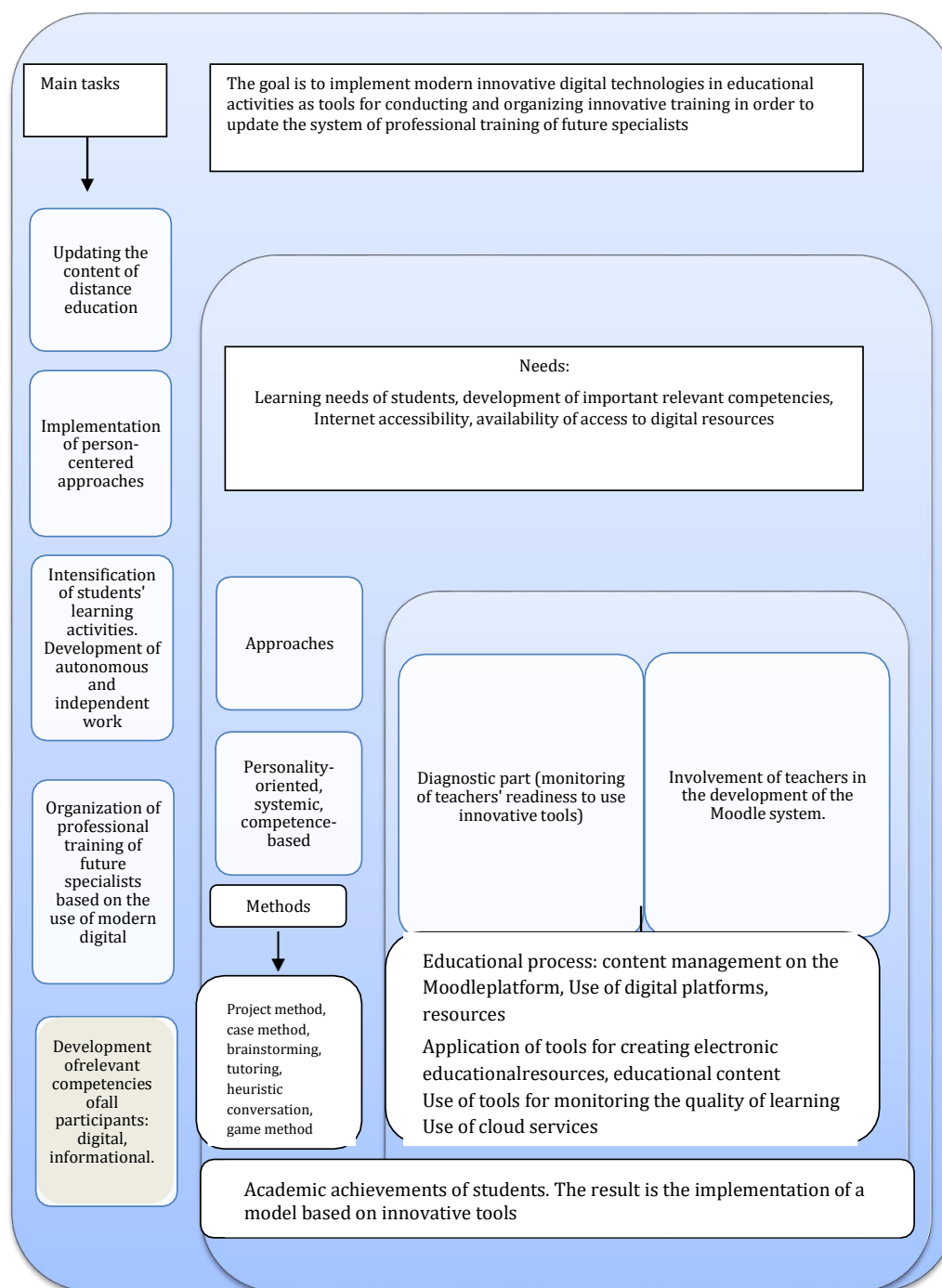


Source: article authors' development.

The purpose of this model of distance education will be to implement modern innovative digital technologies in educational activities as tools for conducting and organizing innovative training in order to update the system of professional training of future specialists (See Figure 3).

Figure 3

The Structure of Using the Distance Learning Model



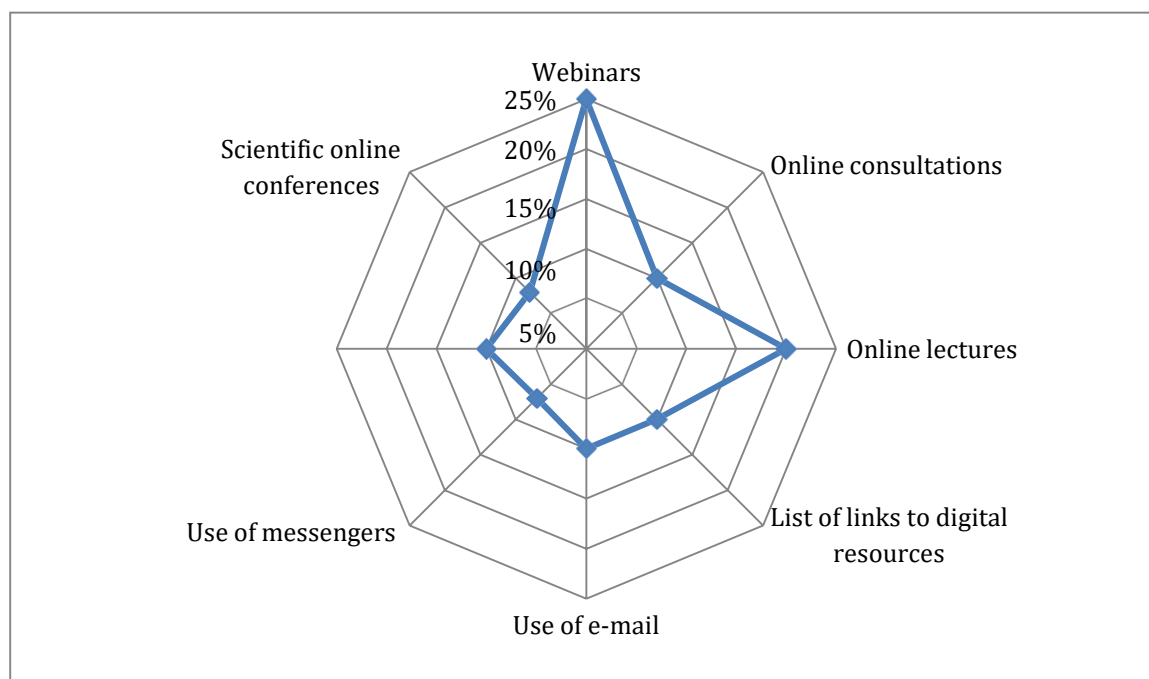
Source: article authors' development.

To implement the model described above, an educational institution needs to choose a special distance platform for conducting educational and research activities, learning how to form and create e- resources (e-courses, e-portfolios, e-digests, etc.), training on how to work with the platform (registration of all participants, effective use of all platform features).

This model can also be implemented with the involvement of the resources of the administration of the educational institution to establish sustainable distance learning, the availability of at least several specialists who are able to take on the organization, advisory activities, and control functions in the educational process with the use of learning management systems and content management systems. The main emphasis is on the use of digital tools in the pedagogical, organizational, and methodological part. (See Figure 4).

Figure 4

Structure of the Use of Digital Tools in Distance Learning (Based on the Distance Learning Model)



Source: article authors' development.

As a result of the COVID-19 pandemic, many administrators have turned to existing cloud environments and digital platforms in times of crisis and uncertainty (Nichols, 2020). It is worth highlighting the capabilities of the Moodle platform. As a result of its practical use, tangible advantages have been identified:

- opportunities for teachers to quickly master digital tools;
- variability in the introduction of distance learning tools (from tests and surveys to consultations and full-fledged courses);
- protection of resources from possible digital and cyber threats, the confidentiality of private information;
- ease of use for students.

The technology for implementing distance learning was tested, and it was found that all resources should be openly available. In particular, the openness of an educational institution's website should become a tangible mechanism for organizing cooperation between teachers and students, coordinating

their joint actions, and exercising control over the organization of the educational process. Possible ways of communication may include messengers, e-mail, online platforms, webinars, etc. The best method of communication with students should be selected based on individual experience and specific circumstances of application (Baber, 2020). The results of using the distance learning model, according to the digital toolkit, are shown in the table (See Table 1).

Table 1

Channels of Cooperation with Students (According to a Survey of Teachers).

Digital tool	Number of votes	Popularity (in %)
Messengers	7	14
Email	7	14
Online platforms	30	60
Webinars or online lectures	5	10
Other	1	2

Source: authors' development.

Table 2

How Often Have You Used Modern Innovative Educational Technologies in Organizing Distance Learning?

Answer	Number of votes	Popularity (in %)
Continuously	20	40
Several times a week	15	30
Several times a month	9	18
Very rarely	6	12
Not at all	0	0

Source: authors' development.

Table 3

Have Digital Technologies Led to Better Student Results?

Answer	Number of votes	Popularity (in %)
Yes, the average score has increased significantly	30	60
No, the situation has worsened on the contrary	5	10
The situation with grades has not changed	15	30

Source: authors' development.

Table 4

What do You Think is Missing for the Effective Use of Distance Education Models?

Answer	Number of votes	Popularity (in %)
The required level of digital competence	12	24
Relevant technical conditions	23	46
Motivation to use	11	22
I am satisfied with everything	4	8

Source: author' development.

Table 5

How Would You Assess the Effectiveness of Using Digital Innovative Technologies in the Distance Education Model?

Answer	Number of votes	Popularity (in %)
High level of efficiency	31	62
Medium level	15	30
Low level	4	8

Source: authors' development.

Table 6

What Are the Main Advantages of a Remote Model Based on Innovative Digital Technologies?

Answer	Number of votes	Popularity (in %)
Attracting a large number of students	13	26
Improved cooperation between students and teachers	12	24
Increasing the level of motivation among students	10	20
Providing access to professional learning materials	9	18
Obtaining better results and the level of mastering the educational material	6	12

Source: authors' development.

Table 7

Has Your Level of Mastery of Innovative Educational Technologies Changed?

Answer	Number of votes	Popularity (in %)
Yes, it has increased significantly	40	80
Yes, it has decreased	5	10
No, it has not changed	5	10

Source: authors' development.

Table 8

Have You Encountered Any Difficulties with the Proposed Model of Distance Education?

Answer	Number of votes	Popularity (in %)
Yes	21	42
No	29	58

Source: authors' development.

Table 9

Does the Placement of e-Learning Materials Affect the Growth of Interest in Learning Among Students?

Answer	Number of votes	Popularity (in %)
Yes	30	60
No	20	40

Source: authors' development.

Table 10

Do Students Prepare for Their Studies on Their own Based on the Electronical Materials Education Provided?

Answer	Number of votes	Popularity (in %)
Yes	33	66
No	17	34

Source: authors' development.

Table 11

Is it Worth Further Developing Distance Education (Based on Innovative Technologies and Forms of Education)?

Answer	Number of votes	Popularity (in %)
Yes	45	90
No	5	10

Source: authors' development.

Thus, based on the survey, it is possible to reflect the results of applying the proposed model of distance learning in practice. In particular, teachers most often use separate online platforms to organize distance learning (60%). The tested model focuses on the Moodle service and its capabilities. At the same time, the survey did not elaborate on this - it did not establish whether teachers actually use this resource or any other resource they are used to. The popularity of distance technologies, in general, has led to the fact that even after the introduction of the blended learning system, most teachers turn to the practice of using distance technologies (40% of respondents use them constantly and another 30% use them quite often). This interest in distance technologies probably indicates that even after the COVID-19 pandemic, this innovative system will not disappear from use in pedagogy.

Among the respondents, 60% noted an increase in the level of grades among students. for this reason, 62% of respondents highly appreciated the effectiveness of distance learning. However, there is no consensus on the specific advantages of distance education. We also note that the availability of e-learning materials influences the growth of interest in learning among students (60%).

For the further successful implementation of the distance learning model, the surveyed teachers lacked technical conditions (46%), which is a tribute to the Ukrainian educational realities. On the other hand, the majority of respondents did not experience any serious problems while working with the model (58%). This can be partly explained by the development of teachers' digital competencies (80% of respondents noted this) and the desire of students to learn based on digital materials (60% and another 66% noted that students are actively studying on their own). The overall result of the study shows that 90% of the surveyed teachers are ready to continue using the distance education model and are generally interested in further improving distance education based on innovative (integrative) teaching tools and technologies.

Discussion

An important part of the distance is the direct support of educational institutions. Those educational institutions that have longer administrative support are more likely to develop a well-managed and sustainable distance learning program (Cobo & Rivas, 2023). In the current literature, there are various business forms of implementing distance learning based on distance courses. Such practices are especially common in Europe and America. They serve as an important experience for the Ukrainian distance education system. In particular, Standiford (2015, p. 558) noted that at the University of Oregon, 80% of OSU's online learning is returned to the department offering the program. This figure is much higher than the income from typical lecture and laboratory courses (Parsons et al., 2022). It is important that the money is returned to the teacher, which encourages him or her to teach online.

When implementing a distance education model, it is clear that there is an important need for faculty to have the freedom to be creative in developing innovative courses. At the same time, excessive planning and certain bureaucratic mechanisms can be serious obstacles for modern teachers (Conte et al., 2019). Nichols (2020) noted that a well-established digital model of distance education that includes the systematic application of data analysis may even give distance learning an advantage over traditional.

To implement a successful distance education model, it is important to maintain proper digital communication between students and teachers (Nimante et al., 2022; Zhao, 2022). Thus, the teaching staff can establish personal relationships with students taking e-learning courses, allowing students to ask clarifying questions at any time of the day (Cavalcanti et al., 2021). This practice is actively used in Finland and Sweden, which are leading countries in terms of education quality (Andersone, 2020; Khan & Vuopala, 2019). Although it may not be feasible for teachers to respond at any time of the day, it is important that learners receive regular feedback to personalize their e-learning experience (Pinheiro & Santos, 2022).

Nimante et al. (2022, p. 213) note that learning environments with the help of innovative educational technologies are designed to engage students with diverse backgrounds and learning needs in quality learning, creating a high level of engagement. Wong et al. (2021, p. 221) believe that current globalization challenges have influenced educational institutions to adopt a variety of innovative technologies that relate to both teaching and certain organizational processes. These statements

correlate with the obtained indicators, which show that modern teachers use a wide range of digital technologies, which in turn affect the formation of a specific digital learning environment. As demonstrated in the results, the most common tools for distance education are digital platforms, resources, cloud services, etc. At the same time, modern research emphasizes the effectiveness of digital platforms as a means of developing professionals of the future (Hart-Davis, 2018; Senthilvinayagam et al., 2020).

Researchers emphasize the growing interest of students in independent learning after the introduction of global quarantine restrictions (Prullage, 2019; White et al., 2023). As demonstrated in the study results, this trend is also noted by teachers. The widespread use of digital technologies has led to an overall increase in digital competencies, which is also in line with general European and global practice. However, there is no consensus on the specific advantages of distance education. All of the above circumstances were noted, which suggests that the proposed model of distance education is quite comprehensive and includes many positive aspects emphasized by other researchers (Alizade, 2019). Obviously, the results of the study also confirm the thesis that even in post-covid times, teachers will not abandon the use of distance education or its elements (Lazinski et al., 2021). The problematic elements of the study were the lack of specifics, in particular regarding the most popular platforms for distance education. The model emphasizes the use of Moodle, but it was not possible to track the use of other platforms.

Conclusions

Thus, modern information technologies contribute to the formation of real opportunities for differentiating learning, focusing on the personal abilities of each participant in the learning process. Accordingly, distance education and its individual elements are actively used and improved all over the world.

The article proposes a model for organizing distance learning, which has been tested in practical use. The content of the training is structured in such a way as to maximize the use of information and digital technologies, taking into account the specifics of the perception of educational material in its various manifestations. The data obtained confirmed a number of statements about the continued use of distance education even after the COVID-19 pandemic, the overall effectiveness of distance education, and the increase in students' grades. The use of the distance learning model has led to an overall increase in digital competence, intensified students' cognitive activity, desire for self-education, and use of digital resources. Due to this, teachers highly appreciated the effectiveness of the proposed distance learning model.

Suggestions for Future Research

In general, it is noted that teachers use a wide range of online tools to organize the educational process, but the problem of using digital platforms for distance learning in the proposed model requires further research. At the same time, further research is needed to study the key opportunities for the use of blended learning in educational institutions with the specification of tools that implement it in practice and the design of a nationwide information and educational digital space. It could qualitatively integrate the information and learning environments of educational institutions with experience and digital educational resources. Obviously, the turn to distance education involves mastering new technologies, which requires new levels of digital competence. Further improvement of the developed model would involve the development and optimization of new digital practical skills and abilities, their harmonization with modern advanced educational technologies.

A separate important problem for further research is the development and implementation of distance education models based on other remote educational platforms (particularly, based on Zoom, Microsoft Teams, Google Classroom, etc). Accordingly, the issue of comparing the effectiveness of the developed models will become relevant and important for further pedagogical researches. These studies will enrich the modern pedagogical science as a whole.

References

- Alizade, T. (2019). Basic models and methods of distance learning. *Azerbaijan Journal of Educational Studies*, (3), 123–132. https://ia803202.us.archive.org/22/items/turkan-alizade/Turkan_Alizade.pdf
- Almås, A. G., Bueie, A. A., & Aagaard, T. (2021). From digital competence to professional digital competence. *Nordic Journal of Comparative and International Education (NJCIE)*, 5(4), 70–85. <https://doi.org/10.7577/njcie.4233>
- Andersone, R. (2020). Innovations in the improved curriculum content of the competence approach: A case study in Latvia. *Rural Environment. Education. Personality (REEP)*, 13, 213–218. <https://doi.org/10.22616/reep.2020.025>
- Baber, H. (2020). Determinants of students' perceived learning outcome and satisfaction in online learning during the pandemic of COVID19. *Journal of Education and E-Learning Research*, 7(3), 285–292. <https://doi.org/10.20448/journal.509.2020.73.285.292>
- Cavalcanti, A. P., Barbosa, A., Carvalho, R., Freitas, F., Tsai, Y.-S., Gašević, D., & Mello, R. F. (2021). Automatic feedback in online learning environments: A systematic literature review. *Computers and Education: Artificial Intelligence*, 2, Article 100027. <https://doi.org/10.1016/j.caeai.2021.100027>
- Clennell, S., Peters, J., & Sewart, D. (2020). Teaching for the Open University (Extracts). In D. Sewart, D. Keegan, & B. Holmberg (Eds.), *Distance education: International perspectives* (p. 327–338). Routledge. <https://doi.org/10.4324/9781003033950-33>
- Cobo, C., & Rivas, A. (2023). *The new digital education policy landscape: From education systems to platforms*. Taylor & Francis.
- Conte, E., Habowski, A. C., & Rios, M. B. (2019). Ressonâncias das tecnologias digitais na educação. *Revista Ibero-Americana de Estudos em Educação*, 14(1), 31–45. <https://doi.org/10.21723/riaee.v14i1.11110>
- Hart-Davis, G. (2018). Using Google Classroom. In *Deploying Chromebook in the classroom* (p. 485–560). Apress. https://doi.org/10.1007/978-1-4842-3766-3_8
- Khan, F., & Vuopala, E. (2019). Digital competence assessment across generations. *International Journal of Digital Literacy and Digital Competence*, 10(2), 15–28. <https://doi.org/10.4018/ijdlc.2019040102>
- Lazinski, M., Ross, L., Wolf, S., Finck, M., & Cherry, L. (2021). Interprofessional education at a distance: The hybrid interprofessional education model. *Internet Journal of Allied Health Sciences and Practice*, 19(3), Article 15. <https://doi.org/10.46743/1540-580x/2021.2011>

- Nichols, M. (2020). Operating models and organisational change. In *Transforming universities with digital distance education* (p. 143–167). Routledge. <https://doi.org/10.4324/9780429463952-8>
- Nĩmante, D., Kalniņa, D., & Baranova, S. (2022). Towards an inclusive digital learning environment in higher education: Opportunities and limitations gleaned from working students' remote learning experiences during COVID-19. In L. Daniela (Ed.), *Inclusive digital education* (pp. 213–226). Springer International Publishing. https://doi.org/10.1007/978-3-031-14775-3_14
- Parsons, D., Gander, T., Baker, K., & Vo, D. (2022). The post-COVID-19 impact on distance learning for New Zealand teachers. *International Journal of Online Pedagogy and Course Design*, 12(1), 1–16. <https://doi.org/10.4018/ijopcd.295955>
- Peruzzo, F. & Allan, J. (2022). Rethinking inclusive (digital) education: Lessons from the pandemic to reconceptualise inclusion through convivial technologies. *Learning, Media and Technology*, 1–15. <https://doi.org/10.1080/17439884.2022.2131817>
- Pinheiro, M. M., & Santos, V. (2022). Building the future of distance and online learning: The case of a Portuguese University. In A. Lopes & F. Soares (Eds.), *Online distance learning course design and multimedia in e-Learning* (pp. 114–141). IGI Global. <https://doi.org/10.4018/978-1-7998-9706-4.ch005>
- Prullage, G. S. (2019). Competency-based education and continued competency. In C. Kenner, L. B. Altimier, & M. V. Boykova (Eds.), *Comprehensive neonatal nursing care* (6th Edition) (pp. 887–896). Springer Publishing Company. <https://doi.org/10.1891/9780826139146.0044>
- Rajab, K. D. (2018). The effectiveness and potential of e-learning in war zones: An empirical comparison of face-to-face and online education in Saudi Arabia. *IEEE Access*, 6, 6783–6794. <https://doi.org/10.1109/access.2018.2800164>
- Reid, E. A. (2020). New pedagogical directions. In *Changing Australian education* (pp. 254–270). Routledge. <https://doi.org/10.4324/9781003115144-15>
- Rumble, G. (2019). Educational models and distance education. In *The planning and management of distance education* (pp. 24–39). Routledge. <https://doi.org/10.4324/9780429288661-2>
- Santoveña-Casal, S. & Fernández Pérez, M. D. (2020). Sustainable distance education: Comparison of digital pedagogical models. *Sustainability*, 12(21), Article 9067. <https://doi.org/10.3390/su12219067>
- Senthilvinayagam, S., Murthy, G. R. K., Akhila, K., & Yashavanth, B. S. (2020). Comparative analysis of learning models in distance education. *The International Journal of E-Learning and Educational Technologies in the Digital Media*, 6(1), 9–21. <https://doi.org/10.17781/p002645>
- Spillere, A. M. N., Medeiros, A. A., & Cordioli, J. A. (2018). An improved impedance education technique based on impedance models and the mode matching method. *Applied Acoustics*, 129, 322–334. <https://doi.org/10.1016/j.apacoust.2017.08.014>
- Standiford, R. B. (2015). Distance education and new models for forestry education. *Journal of Forestry*, 113(6), 557–560. <https://doi.org/10.5849/jof.15-020>

- Williams, T. L., Walker, E., Ludlum, M., Edwards, M., & Gregory, K. (2023). Online learning during the Covid crisis: Student views. *Journal of Higher Education Theory and Practice*, 23(2). <https://doi.org/10.33423/jhetp.v23i2.5818>
- White, J. R., Yang, T., Muñoz, A. S., & Gao, M. (2023). Digital competence and teaching practices of language teachers in Sweden in a COVID-19 world. In K. Sadeghi & M. Thomas (Eds.), *Second language teacher professional development. Digital education and learning* (pp. 125–146). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-12070-1_7
- Wong, C., Fink, E., & Bhati, A. (2021). Future of learning and teaching in higher education post-covid-19. In A. T. H. Kuah & R. Dillon (Eds.), *Digital transformation in a post-covid world* (pp. 221–244). CRC Press. <https://doi.org/10.1201/9781003148715-12>
- Zhao, L. (2022). A study on data-driven teaching decision optimization of distance education platforms. *International Journal of Emerging Technologies in Learning (ijET)*, 17(21), 75–88. <https://doi.org/10.3991/ijet.v17i21.35113>