



The impact of distance learning on the development of information and communication skills of students of higher education institutions

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■ **Abstract.** The aim of the article was to identify the impact of distance learning on the development of information and communication skills of students in higher education institutions. The article examined the impact of distance learning on the development of information and communication technology (ICT) skills of students in higher education institutions. It has been found that in the context of the pandemic, educational institutions were forced to switch to a distance learning format, which emphasised the importance of digital literacy and technical competence of students. It is determined that ICT is crucial for modern education and professional development of students. The study surveyed 100 students about their experience of using ICT in distance learning, which was conducted in three stages with students of different specialities to identify their views on changes in the level of ICT competencies. The results showed that students have significantly improved their skills in working with software, using online resources and interacting in the digital environment. At the same time, certain obstacles were identified in the context of distance learning, which are related to technical problems and lack of practical experience. However, the analysis showed positive changes in academic achievement for a significant number of students after using ICT. This made it possible to identify that distance learning has become quite effective for learning the material. The conclusions show that distance learning, despite its shortcomings, has a significant positive impact on the development of students' ICT skills. It is recommended to integrate elements of distance learning into the traditional educational system to ensure more effective formation of digital competences

■ **Keywords:** students; online learning resources; digital literacy; technological competence; educational platforms

■ Introduction

The rapid development of information and communication technologies (ICTs) is being witnessed, which are penetrating all spheres of life, including education. Distance learning is becoming more and more relevant and important every year due to the development of digital technologies, globalisation, and constant challenges, including the COVID-19 pandemic in the world. The relevance of distance learning is also growing in times of war, as it ensures the continuity of the educational process when physical attendance at educational institutions becomes impossible or

dangerous. In this case, distance learning allows children to continue to receive knowledge regardless of their location, reducing risks to their safety. It also helps to maintain the psycho-emotional state of children by giving them the opportunity to communicate with their peers and teachers. The use of modern technology makes education more flexible and accessible in challenging environments.

Due to such obstacles, the ability to use ICTs becomes especially relevant for students of higher education institutions (HEIs). It is critical to identify the

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impact of distance learning on the development of information and communication skills of higher education students. Despite the constant introduction of distance learning, there are numerous problems and challenges that require additional research and analysis. The main task is to determine the impact of distance learning on the development of students' information and communication skills. The study of this aspect is considered necessary to improve the educational process, adapt teaching methods and support higher education students in the new environment.

The relevance of the topic of the impact of distance education on the development of information and communication skills of university students is confirmed by a number of studies. In particular, I. Vasylykiv *et al.* (2024) emphasised that distance technologies have significantly expanded the capabilities of each participant in the educational process. In the modern world, education can be obtained from anywhere in the world. And although traditional forms of education are not losing ground, distance education technologies are becoming increasingly popular. The research results presented by A. Hibszer & M. Tracz (2023) point out the importance of using a variety of technologies in HEIs and their integration into the pedagogical practice of individual disciplines. The researchers focused on supporting individual learning of students, interaction between participants in the educational process and collaboration through digital technologies. D. Perbandt *et al.* (2021) studied the impact of online learning on the development of students' communication skills, finding that active participation in online discussions and group projects significantly improves these skills.

A. Kumi-Yeboah *et al.* (2023), Yu. Kuchyn & L. Lyman (2023) studied blended learning (a combination of distance and face-to-face learning) and its impact on the learning process. They emphasised that blended learning combines the advantages of both forms of learning, contributing to the development of various skills of students. N. Sharata *et al.* (2022) investigated the factors that influence higher education students' engagement in online learning, finding that active engagement depends on the quality of learning materials, feedback from teachers, and opportunities for social interaction. E.M. Weaver *et al.* (2022) identified key aspects of creating effective learning communities for online learning, highlighting the importance of maintaining a sense of community among students. D. Yan & Q. Fan (2022) studied adaptation to distance learning and the development of autonomy, showing that distance learning increases students' autonomy by developing self-organisation and self-control skills. At the same time, the study found that not all students adapt equally easily to new conditions, which can cause stress and reduce motivation.

A. Conti Gomes de Souza *et al.* (2023) noted that distance learning contributes to the improvement of technical skills of students who successfully master new learning platforms (Microsoft Teams, Zoom, Moodle). However, insufficient technical support and different levels of access to digital technologies can create discomfort for some students. Y. Peng *et al.* (2023) found that distance learning has a mixed effect on students' psychological state. Flexible scheduling reduces the stress associated with physical attendance, but the lack of face-to-face interaction can lead to isolation and reduced motivation. The study by A. Rosetta *et al.* (2021) showed that distance learning has a positive effect on the development of communication skills in virtual teams, promoting interpersonal communication in a digital environment. However, the lack of physical presence can lead to feelings of isolation and lack of personal contact, which negatively affects communication.

The analysed studies confirm that distance learning has a significant impact on the development of information and communication skills of higher education students. However, this impact is multifaceted and depends on many factors, including technical support, the level of support from teachers, and individual characteristics of students. In most cases, researchers have identified the positive and negative aspects of distance learning, determined the psychological factors of influence on students, but not enough attention has been paid to the impact of distance learning on the development of information and communication skills of higher education students.

The purpose of the article was to identify the impact of distance education on the development of information and communication skills of university students. In accordance with this goal, the objectives of the study were:

- conducting a theoretical analysis of the scientific literature on distance learning and ICT;
- carrying out a survey of students about their experience of using ICT in distance learning;
- performing a comparative analysis of students' performance in the context of distance learning.

■ Materials and Methods

The purpose of the survey was to investigate the experience of higher education students in using ICT in distance learning. In particular, the survey was aimed at identifying their level of satisfaction, the main challenges and benefits they faced, as well as the impact of distance learning on their ICT development.

The experiment was conducted from October 2022 to June 2023. The study involved 100 students of Ivan Franko National University of Lviv. The participants of the experiment were aged 17-19, of whom 68% were girls and 32% were boys. The survey was conducted among students of different specialities and courses of the university using an online questionnaire. The questionnaire consisted of 20 questions, including both

closed and open-ended questions, to obtain detailed information. The survey was conducted using an online questionnaire that included both closed and open-ended questions, which provided detailed information about students' experiences and attitudes towards ICT use. The survey was carried out in three stages, taking into account ethical standards, namely voluntary participation, confidentiality, honesty, and transparency. Adherence to these ethical standards contributes to scientifically sound and ethically correct research, increasing the trust of respondents and the quality of the data obtained:

Stage I. General information about the respondents. Students answered the following questions in the questionnaire:

1. Frequency of ICT use. Frequency of ICT use for learning (daily, several times a week, rarely, never);
2. Types of devices used. Types of devices used by respondents for studying (computer, laptop, tablet, smartphone);

3. Level of ICT proficiency. Level of ICT skills (beginner, intermediate, advanced);

4. The purpose of using ICT. Purpose of using ICT (searching for information, completing assignments, communicating with teachers, participating in online courses, working with learning platforms);

5. Problems in using ICTs. Difficulties in using ICT (technical problems, slow internet speed, lack of skills, lack of necessary equipment);

6. The impact of ICT on academic performance. Respondents' assessment of the impact of ICT on their academic performance (positive, neutral, negative).

This data helped to understand how students and teachers use ICT in the educational process, identify problem areas and improve technological support at the university. According to the information provided by the students, a group of 100 respondents was formed. Based on the first section of the survey, general information about the respondents, Table 1 is compiled according to the number of respondents.

Table 1. General information about the respondents

	Faculties					
	Pedagogical	Philological	Journalism	International relations	Legal	Historical
Age	18-19 years old	17-18 years old	17-18 years old	18-19 years old	17-18 years old	17-18 years old
Gender f/h, %	78/22%	57/43%	56/44%	35/65%	71/29%	48/52%
Course of study	2 nd year	1 st year	1 st year	2 nd year	1 st year	1 st year
Number of respondents	25	19	14	11	20	11

Source: compiled by the author

Experience in using ICT:

- frequency of ICT use before starting distance learning;
- types of ICTs used (computers, tablets, smartphones, software);
- level of ICT skills before starting distance learning.

Experience in distance learning:

- duration of distance learning;

- platforms and tools used for distance learning (Zoom, Google Classroom, Moodle);

- frequency of ICT use in distance learning.

Stage II. Components of the survey during the second stage:

1. Checking the average score of the test session before and after the use of ICTs according to the European Credit Transfer and Accumulation System (ECTS) scale (Table 2).

Table 2. Criteria for assessing the learning outcomes of higher education students according to the ECTS scale

ECTS scale	
A	90-100
B	82-89
C	75-81
D	67-74
E	60-66
FX	35-59
F	0-34

Source: compiled by the author based on N. Tjahjamoorniarsih et al. (2023)

At the second control stage, a comparative analysis of student performance before and after the introduction of distance learning was conducted to identify

changes in the academic performance of higher education students, assess the effectiveness of distance learning, and its impact on the overall level of knowledge and

success of university students. The analysis included several key stages:

1. Data collection and preparation – academic indicators of students were collected for two periods – before the introduction of distance learning and during its implementation. This included the average grade per semester, the number of exams and tests successfully passed, the percentage of students who received high grades (excellent students), and the percentage who failed exams (unsatisfactory grades).

2. Use of methods of academic performance assessment criteria – various methods of assessing student performance were used to conduct the analysis. The main criteria were the average grade per semester (ECTS scale), the number of exams and tests successfully passed (the total number per semester is 8), and the percentage of students who received high and low grades.

The impact of distance learning on ICT skills:

- assessment of changes in the level of ICT skills (improvement, no change, deterioration);
- skills that have improved the most (working with software, online communication, searching for information);
- the main difficulties and challenges faced by students (technical problems, Internet access, lack of necessary devices).
- Satisfaction with distance learning;
- overall level of satisfaction with distance learning;
- advantages of distance learning (flexibility, convenience, access to additional resources);
- disadvantages of distance learning (lack of practical classes, insufficient interaction with teachers and fellow students).

A comparative analysis of students' performance before and after the introduction of distance learning

has revealed both positive and negative aspects of the impact of distance learning on academic results. It is important to take into account the individual technical and socio-economic conditions of students to ensure equal opportunities and improve the efficiency of the learning process. Based on the results obtained, recommendations were developed to improve the quality of distance learning and its integration into the traditional educational system. The surveys and comparative analysis of students' academic performance made it possible to formulate recommendations for improving the impact of distance learning on the development of information and communication skills of university students. The findings became the basis for recommendations for improving the educational process and integrating ICTs into education. This survey helped to understand how distance learning affects the development of students' ICT skills and what changes need to be made to improve the efficiency of the educational process in the future.

Stage III. Providing suggestions for improving distance learning:

1. students' recommendations for improving the use of ICT in the educational process;
2. ideas for integrating ICT into traditional learning after returning to the classroom format.

■ Results

The primary objective of the survey was to determine the frequency of ICT use. This section of the questionnaire aimed to find out how often students used ICT before the introduction of distance learning. The question included the following answer options: "daily", "several times a week", "rarely", "never". The answers presented in Table 3 allowed analysing the frequency of ICT use and moving on to the next question.

Table 3. Results of the study of the frequency of ICT use before starting distance learning

	Number of respondents according to the answers received			
	Daily	Several times a week	Rarely	Never
Respondents from the Faculty of Education	10	8	7	-
Respondents of the Faculty of Philology	5	-	13	1
Respondents from the Faculty of Journalism	4	6	4	-
Respondents of the Faculty of International Relations	3	8	-	-
Respondents of the Law Faculty	6	7	7	-
Respondents of the Faculty of History	2	-	8	1

Source: compiled by the author

Given the results, it was found that 30% of students regularly and 29% several times a week used ICT to complete academic tasks such as searching for information on the Internet, preparing essays and doing homework. 39% of respondents rarely used ICT, and 2% never used it. Students of different faculties use different types of ICT to facilitate learning and research. In particular, the study selected respondents from six different faculties of humanities. Students studying in the hu-

manities use the following ICTs: text editors (Microsoft Word, Google Docs) for writing essays and research papers; data processing software (Excel, SPSS) for analysing sociological data; online libraries and archives for accessing historical documents and literature. The use of ICT helps students of various specialities to succeed in their studies and research. In this section of the survey, respondents indicated which devices and software they used. Answer options included "computers", "tab-

lets", "smartphones", "specialised software". Figure 1 shows the results of this stage of the survey among the

respondents, taking into account that the surveyed students had the opportunity to choose several answers.

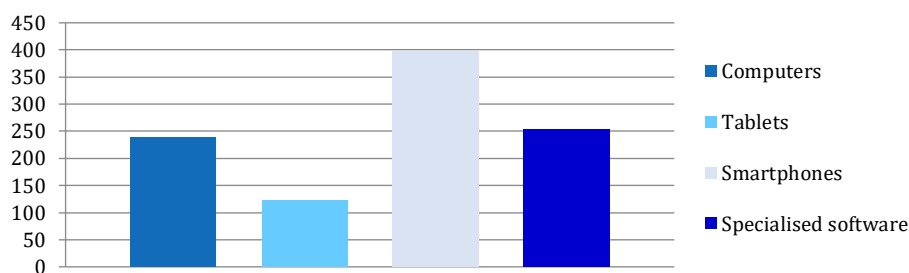


Figure 1. Results of the survey of respondents' use of ICT

Source: compiled by the author

According to the survey, it was found that almost all students use a smartphone in everyday life and during the educational process (99%). Specialised software is second among the tools used by higher education students, with 64% of students using it. Further, 60% of students use computers and 31% use tablets. The next stage of the survey was for students to assess their level of ICT skills before starting distance learning using the following scale: "very low", "low", "sufficient", "high", "very high". This question allowed identifying the initial

level of students' ICT skills. The questionnaire was designed to provide a complete and objective picture of ICT use among university students. The data obtained will help to identify the main problems and needs of students in the field of ICT, as well as to develop recommendations for improving the effectiveness of distance learning. An important aspect was to determine the level of ICT skills among the respondents before starting distance learning, which will form the basis for the control phase of the study (Fig. 2).

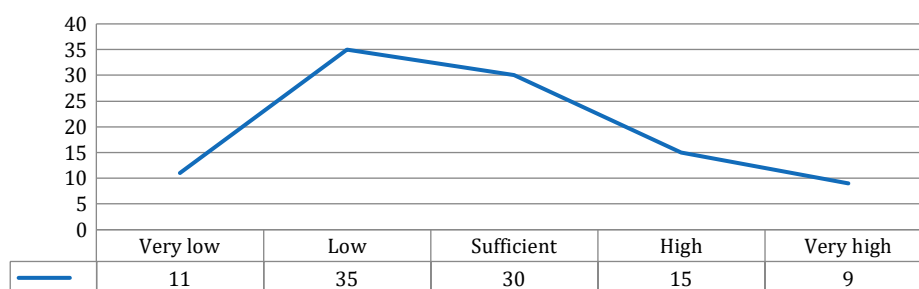


Figure 2. Results of the survey of ICT skills prior to the start of distance learning

Source: compiled by the author

The results of the respondents' self-assessment of their ICT skills showed that students in the first and second years of study consider their skills insufficient to use ICT in learning effectively. Only 9% of students rated their skills at a very high level, which indicates low confidence in using various technological tools and platforms for learning among the majority of respondents. This means that only a small proportion of students have sufficient skills to work effectively with ICT, which may affect their ability to adapt to distance learning and use modern technologies in the learning process. These students are likely to have previous experience of active use of ICT in their academic or personal activities. A high level of proficiency was rated by 15% of students. This group of students is also well-versed in basic tools and platforms, but may have some difficulty with more complex tasks or new technologies. The sufficient level is defined by 30% of higher education students as

having the basic knowledge and skills necessary to perform basic ICT tasks, but having problems with more complex or unusual tasks. The largest group of students (35%) rated their ICT skills as low. These students experience significant difficulties in using technology for learning and may need additional support and training to adapt to the demands of distance learning. 11% of respondents rated their skills as very low. This group of students has minimal knowledge and skills in ICT and may face serious obstacles in the learning process. These results emphasise that most students feel insecure about their ICT skills.

A variety of platforms and tools were used for distance learning to ensure an effective learning process (Fig. 3). The main platforms were Zoom, Google Classroom, Moodle, and Microsoft Teams. Zoom was used for synchronous lectures, online classes and seminars. Zoom enabled video conferencing, group discussions

and real-time collaboration. Moodle was used as a platform for course management and asynchronous classes. Moodle allowed teachers to create interactive courses, conduct tests and evaluate students' results. Google Classroom was used to organise the learning process, post materials, assignments, and feedback. This learning tool provided a user-friendly interface for student and teacher interaction and content management. Microsoft Teams helped to organise teamwork and was used for communication and online meetings. Teams provided the ability to collaboratively edit documents, chat and organise project work.

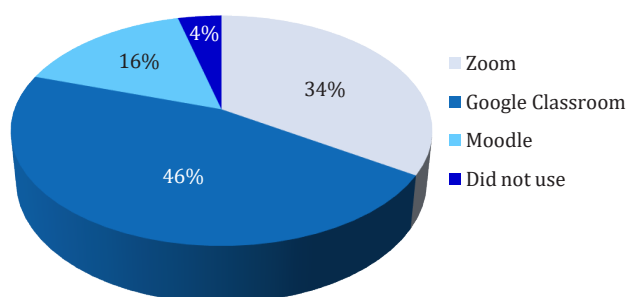


Figure 3. Results of the survey of respondents' use of distance learning platforms and tools

Source: compiled by the author

The frequency of ICT uses increased significantly in distance learning compared to traditional learning. Students used ICT on a daily basis for various purposes. Firstly, there were daily online classes. Students participated in synchronous online classes via Zoom or Microsoft Teams. On average, 3-4 hours of online classes were held daily. Next came the work with study materials. Students used Google Classroom and Moodle to access these materials, complete assignments and receive feedback from teachers. On average, 2 hours a day were spent working with the platforms. Students had time for independent study and research, using the Internet to find additional information, work with e-books and resources. This took about 1 hour a day. Finally, communication and group work were equally important in the study. Students used instant messengers, email, and Microsoft Teams to communicate with their classmates and teachers, as well as to complete group projects. This took an additional 1-2 hours per day. In accordance with the frequency of ICT use, students had intensive experience in this area during distance learning, which contributes to the development of their digital skills and adaptation to modern educational technologies. Having collected data on the learning outcomes of higher education students before and after the introduction of ICT, Table 4 compiles the results obtained.

Table 4. Checking the academic performance of higher education students before and after the use of ICTs according to the ECTS scale

Criteria for grades in accordance with the students' faculty		Academic performance according to the period of the study		
		Before the introduction of distance learning without ICT	After the introduction of ICT-enhanced distance learning	
			First semester (October 2022-January 2023)	Second semester (February 2023-June 2023)
Semester grade point average according to the ECTS scale (max. 100)	Students of the Faculty of Education	82 (B)	83 (B)	86 (B)
	Students of the Faculty of Philology	79 (C)	87 (B)	90 (A)
	Students of the Faculty of Journalism	90 (A)	91 (A)	92 (A)
	Students of the Faculty of International Relations	73 (D)	75 (C)	82 (B)
	Students of the Faculty of Law	89 (B)	90 (A)	90 (A)
	Students of the Faculty of History	81 (C)	87 (B)	91 (A)
Number of exams and tests successfully passed (credited)	Students of the Faculty of Education (max. 200)	154	163	178
	Students of the Faculty of Philology (max. 152)	108	146	147
	Students of the Faculty of Journalism (max. 112)	97	102	109
	Students of the Faculty of International Relations (max. 88)	46	52	57
	Law students (max. 160)	123	151	151
	Students of the Faculty of History (max. 88)	59	68	79
Percentage of students who received low/high grades	Students of the Faculty of Education	29/71%	14/86%	12/88%
	Students of the Faculty of Philology	41/59%	30/70%	21/79%
	Students of the Faculty of Journalism	23/77%	21/79%	9/91%
	Students of the Faculty of International Relations	54/46%	47/53%	41/59%
	Students of the Faculty of Law	28/72%	11/89%	11/89%
	Students of the Faculty of History	17/83%	15/85%	7/93%

Source: compiled by the author

Based on the analysis of the results, the following aspects of the study were identified:

1. There has been an increase in the average grade point average of students from different faculties after the introduction of distance learning using ICT. This may indicate that distance learning methods are more effective, or that students have adapted better to the new learning format, which has had a positive impact on their academic performance.

2. All students of the respective faculties have increased the number of exams and tests they pass. This is due to the fact that the use of ICT contributes to more effective learning and preparation for exams.

3. The distribution of academic performance has improved, as the percentage of students with high academic performance has increased significantly in most faculties after the introduction of ICT. At the same time, the percentage of students with low academic performance has decreased, which is also a positive indicator.

4. Adaptation to new teaching methods is observed, as students quickly adapted to the new ICTs, which is reflected in the improvement of academic performance in the first semester after the introduction of ICTs. The second semester showed even better results, which may indicate further improvement of the learning process and students' adaptation to the new conditions.

5. Positive changes have been identified at all faculties, regardless of their profile. This shows that ICTs are universal tools that can be effectively integrated into the educational process regardless of specialisation.

According to the results obtained, it can be noted that the use of ICTs provides students with better access to learning materials, additional resources and online lectures, which contributes to better preparation for classes and exams. And interactive teaching methods, which are possible thanks to ICT, can increase the involvement of higher education students in the learning process, increase their motivation and interest in the subject, which ultimately improves academic performance. The data shows an overall improvement in students' academic performance after the introduction of ICT, which indirectly indicates an increase in ICT skills. Students have demonstrated the ability to use technology effectively for learning, indicating an increase in their ICT skills.

Analysing the learning outcomes, it was found that students improved their ICT skills. The use of various learning platforms and software for distance learning, such as learning management systems, video conferencing software (Zoom, Microsoft Teams) and other learning resources, contributed to the improvement of skills in working with these tools. At the same time, higher education students have improved their online communication skills through the constant use of chats, forums, emails, and video meetings to discuss learning tasks, group projects, and interact with teachers. The transition to distance learning required students to

exercise more self-discipline and manage their time effectively to complete assignments and participate in online classes. Despite the positive results, university students faced certain difficulties and challenges, namely:

1. Technical problems (students may have encountered various technical problems, such as problems with computers, software or video connections, which sometimes prevented them from participating in online classes).

2. Access to the Internet (some students did not have a stable and fast Internet connection, which was a significant problem, especially for those living in areas with limited access to the network).

3. Lack of appropriate devices (not all students had access to appropriate devices such as computers, laptops or tablets, which could have made it difficult for them to participate in distance learning).

4. Learning environment (the home environment was not always conducive to effective learning, especially if students did not have a separate quiet place to study).

5. Psychological challenges (the lack of direct contact with fellow students and teachers, as well as isolation, could have a negative impact on the overall psychological state of students).

The introduction of distance learning has had a positive impact on the development of students' ICT skills, especially in terms of software, online communication and information retrieval. However, students faced various difficulties, such as technical problems, limited access to the Internet and necessary devices, which may require additional support and resources to overcome these challenges in the future.

The overall level of satisfaction with distance learning can vary depending on various factors, including individual student preferences, technical proficiency and personal circumstances. Given the positive academic performance after the introduction of ICT, it can be assumed that most students are satisfied with the new learning format. However, there is a possibility that some students faced challenges that could affect their satisfaction with the learning process. Higher education students have identified a number of advantages of distance learning:

- flexibility (the ability to plan one's own study schedule, combine studies with work or other commitments);

- convenience (the ability to study from anywhere, which saves time and money on transport);

- access to additional resources (access to numerous additional materials, video lectures, e-books and other resources that facilitate deeper learning);

- development of self-organisation and independence (distance learning contributes to the development of skills of independent time planning and organisation of the learning process);

- interactive teaching methods (the use of interactive platforms and tools can make the learning

process more interesting for the participants in the learning process).

Despite the significant advantages, university students also identified certain disadvantages of distance learning, namely the lack of practical classes, insufficient interaction with teachers and fellow students, certain technical problems and psychological challenges. Distance learning requires a high level of self-discipline and organisation from students, which can be a challenge for some of them. Thus, the survey and research helped to understand how distance learning affects the development of ICT skills among students and what changes need to be made to improve the efficiency of the educational process in the future. Distance learning has significantly increased the overall level of ICT skills among students. They were forced to learn new technologies and tools to participate in online classes, complete assignments and communicate with teachers and fellow students. Students developed their self-organisation and time management skills, as distance learning required them to plan and complete their learning tasks independently. They also became more familiar with online communication tools, using email, chats, forums and social networks to exchange information and work together.

Based on the data and results of the study, it is worth highlighting the changes that are necessary to improve efficiency in future educational processes. The first priority is to improve technical support, as students need to be provided with stable Internet access and appropriate equipment for successful learning, and technical support should be provided to solve problems related to software and hardware, as obstacles have been identified. Investing in the training and development of teachers in ICT and pedagogical technologies, as this will help to increase the effectiveness of distance learning methods. The development of hybrid learning models that combine elements of distance and face-to-face learning will also be valuable for modern students, as it can provide a more efficient and convenient educational process. There is always a need to improve the quality of online resources, and the development and implementation of high-quality online courses, interactive tasks, video lectures and other resources can help to improve the learning experience and increase student motivation. The changes also include interactivity and interaction, i.e. increasing the level of interactivity of classes through the use of video conferencing, virtual laboratories and other collaboration tools, which will help maintain a high level of interaction between participants in the educational process. Despite the advantages of distance learning, psychological support for students should not be forgotten, namely, providing access to counselling that can help them cope with stress and maintain high motivation during the learning process. Students should be encouraged to maintain a balance between studying and leisure to prevent burnout.

The main recommendations for the effective development of ICT skills of university students include the following aspects:

- introduction of interactive learning platforms, namely the use of LMS (Learning Management Systems), such as Moodle, Canvas or Blackboard, to organise the learning process and interactive resources, video lectures, interactive modules, online courses and simulations to increase the engagement of higher education students;
- development of digital literacy, in particular, it can be the organisation of courses or trainings on the basics of digital literacy and the use of software for students; constant updating of knowledge related to new technologies and software products used in their field of study;
- providing technical support to help students solve technical problems that arise during online learning and providing detailed instructions on the implementation of learning platforms and software;
- stimulating communication and cooperation, i.e. promoting group work through various online platforms that promote the development of communication skills and teamwork, and various forums and chats to discuss educational issues and exchange experiences between participants in the educational process;
- maintaining motivation and engagement – interactive teaching methods (game elements, surveys, quizzes to maintain interest in learning) and regular feedback on student performance and progress will help;
- evaluation and improvement of processes, as regular analysis of the effectiveness of ICT in the learning process and making the necessary adjustments helps to improve learning.

The recommendations provided will enable higher education institutions to effectively integrate ICTs into the educational process in order to provide students with modern and high-quality education in distance education. The survey has provided a rethinking of how distance learning affects the development of ICT skills of higher education students. Positive results indicate an improvement in software skills, online communication, and information retrieval. At the same time, to improve the efficiency of the educational process in the future, it is necessary to take measures to overcome technical problems, ensure flexibility of learning, improve the quality of online resources and provide psychological support. Investments in the professional development of teachers and the creation of a favourable learning environment are also key factors in the successful implementation of distance education.

■ Discussion

The results obtained show that new ICTs in education now occupy a proper place in the work of educational institutions at all levels. The need to use them in harmony with traditional teaching methods is recognised by

these authors. This opinion coincides with the study by T. Fursykova *et al.* (2022), who added that a modern educational institution should be primarily a system with modern methods of organising the educational process, monitoring results, and managing student learning outcomes. The main features of the higher education system are technologies for training not only students but also staff for effective work in higher education institutions. It has been found that the full and effective development of pedagogical innovations is possible only with a comprehensive theoretical and practical consideration of pedagogical innovations. Therefore, the purpose of this study was to analyse a systematic and effective methodology for the introduction of new forms of knowledge and the development of ICT for distance learning in educational institutions.

The results also show that the main direction of ICT development is determined by the choice of its components. It is determined by the choice of its components. These technical aspects have a significant impact on the formation of the main directions of ICT. Updating, expanding and continuously improving learning services. This can be called the adaptation of the quality of knowledge through modern educational technologies. The same results were obtained in the works of G. Green & T. Shorer (2022), S. Abdellatif *et al.* (2023), C. Yuan *et al.* (2024). These studies complement the results obtained and help to understand the mechanism of influence of distance learning on the development of information and communication skills in students, and what changes need to be made to improve the efficiency of the educational process in the future.

The article identified the significant impact of distance education on the development of information and communication skills of university students. In general, there are several indispensable aspects of this impact. These include: increasing technological literacy, independence and self-discipline, improving communication skills, expanding access to information. This study provides recommendations for improving the relevant skills of students in working with ICT in distance learning. In particular, students have to use different platforms and tools for distance learning, their technological literacy improves, and they become more confident in using ICT. The findings are in line with the work of L.M. Belfi *et al.* (2022), who noted that distance learning often requires students to be more independent, which contributes to the development of self-organisation and self-discipline skills. As a result, students are better able to manage their time and resources. Using the Internet as the main source of information and learning materials, students have access to the latest data and research in their field. Distance learning often involves the use of communication tools such as email, video conferencing and chat rooms, which can help students develop effective communication skills. Tools such as virtual labs, simulations, and other interactive

learning methods allow students to develop practical skills and apply theoretical knowledge in a virtual environment. Distance education provides an opportunity to communicate and share experiences with students and teachers from other countries.

An important condition for effective distance education is the availability of quality technical support and appropriate learning materials. The assumption that distance education has certain disadvantages, such as limited social contacts, difficulties in maintaining students' motivation and desire to learn, as well as problems with access to technology for some students, was confirmed by the results of the study and coincides with the findings of O. Prakash Gusai *et al.* (2023), M. Sablic & A. Miroslavljević (2024), R.T. Enakrire (2024). These scholars are actively researching the impact of online learning on the development of ICTs in students, namely, they note both positive and negative aspects of this process. They emphasise the need to combine online and offline learning methods to achieve optimal results. A hybrid learning model, which includes both traditional and digital methods, is considered to be the most effective for developing ICT and other skills in students.

Scientists K. Al-Tkhayneh *et al.* (2023), in correlation with the results of this study, actively investigate the development of ICTs and their impact on various spheres of life, including education. Based on the results, it was determined that ICTs greatly simplify access to educational materials and resources. Students can receive information from anywhere in the world, which expands their learning and research opportunities. The use of ICTs allows for the creation of interactive learning materials that can be adapted to the individual needs of students, increasing the effectiveness of the learning process. In addition, they improve communication between students and teachers, allowing for quick information exchange and feedback. The results of this study proved the opinions of leading scientists S. Grassini & L. Lombardo (2024) that not all students have equal access to ICT, which can create educational inequality. It is important to ensure that all students have access to the necessary resources, regardless of their socioeconomic status. A study by O. Churikova-Kushnir *et al.* (2021) complements the results of this study and shows that students may experience a decrease in motivation and engagement during distance learning, especially without proper support and incentives. And the introduction of new technologies can be accompanied by technical challenges, requiring additional support and training for students and teachers.

This study, as well as the work of P. Dlugosz *et al.* (2022), aimed to recommend an active process of integrating ICT into the curriculum so that students can develop the necessary skills and be competitive in the labour market. It is essential to organise trainings and courses to improve technical literacy for both students and teachers to ensure effective use of technology. The

introduction of ICTs should be accompanied by measures to support students' mental health, including social interaction and psychological support. The results of the study showed the need to integrate ICT into the curriculum to create a more dynamic and interactive learning environment, which was confirmed by A. Be-húnová *et al.* (2022) and O. Grytsiuk *et al.* (2022). Researchers have identified the social aspects of ICT use and, in the future, skills in education, emphasising that technology can both improve and exacerbate existing inequalities in access to education.

Summarising the main discussions and opinions of scholars and the results of this study, the development of ICTs is an important direction for modern education, as they open up new opportunities for learning and development. However, it is essential to take into account the challenges and problems associated with their implementation and work to create equal conditions for all distance learners. The development of ICTs is of great importance for modern society, as they affect all aspects of people's lives, increasing the efficiency, accessibility, and quality of services in various fields. However, it is also critical to take into account the challenges and risks associated with ICT development, such as cybersecurity, data privacy and unequal access to technology, and work to overcome them. ICT development has a huge impact on various areas of life, including the economy, education, healthcare, governance, and people's daily lives.

■ Conclusions

In the context of the pandemic, higher education institutions were forced to switch to a distance learning format, which emphasised the importance of digital literacy and technical competence of students. The analysis showed that ICTs are essential for modern education and professional development of higher education students, ensuring effective learning and preparation for the requirements of the modern labour market. A high level of digital literacy is becoming an integral part of the professional competence of a modern specialist, which is especially important in the context of rapid technological development.

The study was conducted in three stages: determining general information about the respondents, their experience of using ICT and distance learning; checking the average score of the test session before and after using ICT on the ECTS scale; determining the impact of distance learning on ICT skills and satisfaction with distance learning; and identifying suggestions for improving distance learning. Based on the results of the study, conclusions were drawn about the effectiveness of

distance learning. According to the analysis of the results, it was found that the average grade point average of higher education students changed after the introduction of distance learning. Trends in the majority of students' grade point averages were assessed. The analysis showed changes in the number of students who successfully passed exams and tests. This made it possible to identify that distance learning has become quite effective for learning the material. Analysing the percentage of students with high and low grades, it turned out that the number of excellent students increased by 23% and the percentage of students who failed exams decreased (14%). These results indicate the need for further introduction and improvement of ICT in the learning process to support and improve the academic performance of higher education students. It was assessed that distance learning had a positive impact on students' academic performance. Recommendations for improving distance learning methods and its implementation in the future were also developed. The comparative analysis provided a comprehensive picture of changes in student performance after the introduction of distance learning and an assessment of its effectiveness.

The overall level of satisfaction with distance learning among students was high, as they were able to study flexibly and conveniently, access additional resources and develop independence. However, disadvantages such as lack of practical classes, insufficient interaction with teachers and fellow students, technical problems and psychological challenges are also significant and may affect the satisfaction of individual students. The success of distance learning depends on the ability of the HEI to effectively address these issues and provide the necessary support to students. Despite some drawbacks, distance learning has a significant and positive impact on the development of ICT skills among university students. However, it is important to integrate elements of distance learning into the traditional educational system, which will ensure more effective development of digital competences.

The limitation of the study was that it was conducted among students of only one HEI and not all faculties, and may not fully reflect the situation in other HEIs or regions. Prospects for further research include conducting similar studies in different HEIs and regions to obtain even more qualitative and representative results.

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■ Conflict of Interest

None.

■ References

- [1] Abdellatif, S., Shomotova, A., Trabelsi, S., Husain, S., Alsalhi, N., & Eltahir, M. (2023). Transition to distance learning: Student experience and communication during the COVID-19 pandemic in the United Arab Emirates. *Sustainability*, 15(8), article number 6456. [doi: 10.3390/su15086456](https://doi.org/10.3390/su15086456).

- [2] Al-Tkhaiyeh, K., Altakhaine, A., & Nser, K. (2023). The impact of the physical environment on the quality of distance education. *Quality Assurance in Education*, 31(3), 504-519. doi: [10.1108/QAE-09-2022-0163](https://doi.org/10.1108/QAE-09-2022-0163).
- [3] Behúnová, A., Knapčíková, L., & Behún, M. (2022). Enhancing education process supported by virtual reality. In *Proceedings of the 20th international conference on emerging elearning technologies and applications* (pp. 40-45). Stary Smokovec: IEEE. doi: [10.1109/ICETA57911.2022.9974884](https://doi.org/10.1109/ICETA57911.2022.9974884).
- [4] Belfi, L.M., Dean, K.E., & Sailer, D.S. (2022). Virtual journal club beyond the pandemic: An enduring and fluid educational forum. *Current Problems in Diagnostic Radiology*, 51(4), 450-453. doi: [10.1067/j.cpradiol.2021.07.001](https://doi.org/10.1067/j.cpradiol.2021.07.001).
- [5] Churikova-Kushnir, O., Sofronii, Z., Lisovyi, V., Postevka, H., & Niemtsova, L. (2021). Moodle system as a way to monitor competence of future teachers of music art. *WSEAS Transactions on Environment and Development*, 16, 439-449. doi: [10.37394/23203.2021.16.39](https://doi.org/10.37394/23203.2021.16.39).
- [6] Conti Gomes de Souza, A., Mayara Erich, N., Silva Barata, M., & Melho de Aguiar, A. (2023). Systematic literature review on emergency remote teaching in the field of biosciences during the COVID-19 pandemic: Perceptions of teachers and students, use of digital information and communication technologies, lessons learned, and challenges. *Investigations in Science Education*, 28(2), 374-401. doi: [10.22600/1518-8795.ienci2023v28n2p374](https://doi.org/10.22600/1518-8795.ienci2023v28n2p374).
- [7] Dlugosz, P., Liszka, D., Bastrakova, A., & Yuzva, L. (2022). Health problems of students during distance learning in Central and Eastern Europe: A cross-sectional study of Poland and Ukraine. *International Journal of Environmental Research and Public Health*, 19(16), article number 10074. doi: [10.3390/ijerph191610074](https://doi.org/10.3390/ijerph191610074).
- [8] Enakrire, R.T. (2024). The usefulness of computer skills for enhanced teaching and learning among lecturers in an open distance e-learning (ODEL) environment. *Education and Information Technologies*, 29, 16597-16612. doi: [10.1007/s10639-024-12519-z](https://doi.org/10.1007/s10639-024-12519-z).
- [9] Fursykova, T., Habelko, O., & Chernii, V. (2022). The development of digital competence of future teachers in the process of distance learning. *International Journal of Emerging Technologies in Learning*, 17(10), 85-98. doi: [10.3991/ijet.v17i10.28973](https://doi.org/10.3991/ijet.v17i10.28973).
- [10] Grassini, S., & Lombardo, L. (2024). Education in I&M: New insights in remote teaching and learning of instrumentation and measurement: TheiHomeX Remote Lab Project. *IEEE Instrumentation & Measurement Magazine*, 27(1), 26-30. doi: [10.1109/MIM.2024.10423663](https://doi.org/10.1109/MIM.2024.10423663).
- [11] Green, G., & Shorer, T. (2022). Beliefs, emotions, and use of information and communication technologies in distance learning during the COVID-19 pandemic: Health sciences students' perspectives. *Digital Health*, 8. doi: [10.1177/20552076221131188](https://doi.org/10.1177/20552076221131188).
- [12] Grytsiuk, O., Herasymenko, L., Nabok, T., Bryl, T., & Maksimova, L. (2022). Assessment of learning outcomes in distance learning using the Moodle platform. In *Proceedings of the 4th international conference on modern electrical and energy system* (pp. 1-4). Kremenchuk: IEEE. doi: [10.1109/MEES58014.2022.10005777](https://doi.org/10.1109/MEES58014.2022.10005777).
- [13] Hibszar, A., & Tracz, M. (2023). An evaluation of the effectiveness of distance learning using ICT in geographical education. From the experiences of teachers in Poland. *Environmental & Socio-Economic Studies*, 11(4), 25-35. doi: [10.2478/enviro-2023-0021](https://doi.org/10.2478/enviro-2023-0021).
- [14] Kuchyn, Yu., & Lyamar, L. (2023). Distance learning of medical PHDS in Ukraine under COVID19 and war with Russia: A new reality. *Neonatology, Surgery and Perinatal Medicine*, 13(48), 5-11. doi: [10.24061/2413-4260.XIII.2.48.2023.1](https://doi.org/10.24061/2413-4260.XIII.2.48.2023.1).
- [15] Kumi-Yeboah, A., Kim, Y., & Armah, Y.E. (2023). Strategies for overcoming the digital divide during the COVID-19 pandemic in higher education institutions in Ghana. *British Journal of Educational Technology*, 54(6), 1441-1462. doi: [10.1111/bjet.13356](https://doi.org/10.1111/bjet.13356).
- [16] Peng, Y., Wang, Y., & Hu, J. (2023). Examining ICT attitudes, use and support in blended learning settings for students' reading performance: Approaches of artificial intelligence and multilevel model. *Computers & Education*, 203, article number 104846. doi: [10.1016/j.compedu.2023.104846](https://doi.org/10.1016/j.compedu.2023.104846).
- [17] Perbandt, D., Heinelt, M.S., Bacelar-Nicolau, P., Mapar, M., & Caeiro, S.S. (2021). Towards effective e-learning on sustainability: A case study-course on participatory processes in environmental policy. *International Journal of Sustainability in Higher Education*, 22(4), 801-832. doi: [10.1108/IJSHE-07-2020-0262](https://doi.org/10.1108/IJSHE-07-2020-0262).
- [18] Prakash Gusai, O., Rani, A., & Yadav, P. (2023). COVID-19: The era of shift from conventional education system to e-learning, virtual learning, and distance education. In *Global higher education and the COVID-19 pandemic* (pp. 119-137). London: Apple Academic Press. doi: [10.1201/9781003328582-8](https://doi.org/10.1201/9781003328582-8).
- [19] Rosetta, A., Agatha, M., Muslim, E., & Rafi, M. (2021). Evaluating the success of e-learning systems and strategy creation: The perspective of students in Universitas Indonesia. In *Proceedings of the 2020 4th international conference on education and e-learning* (pp. 11-17). New York: Association for Computing Machinery. doi: [10.1145/3439147.3439155](https://doi.org/10.1145/3439147.3439155).

- [20] Sablic, M., & Mirosavljević, A. (2024). Implementing flipped classroom in the digital learning environment. *Education and Self-Development*, 19(1), 38-49. doi: [10.26907/esd.19.1.04](https://doi.org/10.26907/esd.19.1.04).
- [21] Sharata, N., Berezovska, T., & Kravchenko, T. (2022). Efficiency of the method of student thematic online debates in the development of professional competences in future specialists. *WSEAS Transactions on Environment and Development*, 18, 191-203. doi: [10.37394/232015.2022.18.21](https://doi.org/10.37394/232015.2022.18.21).
- [22] Tjahjamoorniarsih, N., Putr, L., Kusumawardhani, E., Pramadita, S., & Gunawan, V. (2023). An android e-learning application to support academic learning: Design, development, and implementation of a case study. *International Journal of Electrical and Electronic Engineering & Telecommunications*, 12(5), 363-372. doi: [10.18178/ijeetc.12.5.363-372](https://doi.org/10.18178/ijeetc.12.5.363-372).
- [23] Vasylykiv, I., Zhyhaylo, O., Illiash, S., Kalyta, N., & Lutsiv, S. (2024). Modern information technologies in the professional education of future primary school teachers. *International Journal of Religion*, 5(6), 901-911. doi: [10.61707/rer49162](https://doi.org/10.61707/rer49162).
- [24] Weaver, E.M., Shaul, K.A., & Lower, B.H. (2022). Implementation of an online poster symposium for a large-enrollment, natural science, general education, asynchronous course. *Frontiers in Education*, 7, article number 906995. doi: [10.3389/feduc.2022.906995](https://doi.org/10.3389/feduc.2022.906995).
- [25] Yan, D., & Fan, Q. (2022). Online informal learning community for interpreter training amid COVID-19: A pilot evaluation. *PLoS ONE*, 17(11), article number e0277228. doi: [10.1371/journal.pone.0277228](https://doi.org/10.1371/journal.pone.0277228).
- [26] Yuan, C., Zhou, C., Peng, J., & Li, H. (2024). Mixture correntropy-based robust distance metric learning for classification. *Knowledge-Based Systems*, 295, article number 111791. doi: [10.1016/j.knosys.2024.111791](https://doi.org/10.1016/j.knosys.2024.111791).

Вплив дистанційного навчання на розвиток інформаційно-комунікаційних навичок студентів закладів вищої освіти

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■ **Анотація.** Метою статті було виявлення впливу дистанційного навчання на розвиток інформаційно-комунікаційних навичок студентів у закладах вищої освіти. У статті досліджено вплив дистанційного навчання на розвиток навичок інформаційно-комунікаційних технологій (ІКТ) у здобувачів освіти закладів вищої освіти. З'ясовано, що в умовах пандемії освітні заклади були змушені перейти на дистанційний формат навчання, що підкреслило важливість цифрової грамотності та технічної компетентності студентів. Визначено, що ІКТ мають вирішальне значення для сучасної освіти та професійного розвитку студентів. У дослідженні було проведено опитування 100 студентів щодо їх досвіду використання ІКТ у дистанційному навчанні, яке проводилось у три етапи із студентами різних спеціальностей для виявлення їхніх поглядів на зміни у рівні ІКТ-компетентностей. Результати показали, що студенти значно покращили свої навички роботи з програмним забезпеченням, використанням онлайн-ресурсів та взаємодії в цифровому середовищі. Водночас було виявлено в умовах дистанційного навчання певні перешкоди, які пов'язані з технічними проблемами та відсутністю практичного досвіду. Та аналіз показав позитивні зміни академічних досягнень у значної кількості студентів після застосування ІКТ. Це дало змогу виявити, що дистанційне навчання стало достатньо ефективним для засвоєння матеріалу. У висновках визначено, що дистанційне навчання, незважаючи на свої недоліки, має значний позитивний вплив на розвиток ІКТ-навичок у студентів. Рекомендовано інтегрувати елементи дистанційного навчання в традиційну освітню систему для забезпечення більш ефективного формування цифрових компетенцій

■ **Ключові слова:** здобувачі освіти; навчальні онлайн ресурси; цифрова грамотність; технологічна компетентність; освітні платформи