The use of modern technologies to enhance the quality of teaching at higher education institutions

Використання сучасних технологій підвищення якості освіти у вищій школі

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Abstract

Currently, state-of-the-art technologies contribute to the development of the educational process, which entails the search for new approaches to providing information. The purpose of the study is to identify the effectiveness of using modern technologies to enhance the learning performance in higher education institutions. Attaining the said goal became possible due to calculating the variation coefficient of, the obtained level of knowledge, the Student coefficient as well as the direct standardization method. It was found that the greatest advantage of using modern technologies is the possibility of combining distance and in-class learning. However, the disadvantage is the difficulty of identifying the relevant technologies according to the training program. The elaborated mechanisms for ensuring the learning process were implemented with the help of Blackboard, CourseCraft, Trello, EdApp,

Анотація

Сучасні технології сприяють розвитку навчального процесу, що пов'язано з пошуком нових підходів до подачі інформації. Мета роботи полягає у виявленні результативності від використання сучасних технологій для підвищення якості освіти у вищій школі. Досягнення мети стало можливим завдяки розрахунку коефіцієнтів варіації, отриманого рівня знань, Стьюдента та прямого методу стандартизації. Встановлено, що найбільшою перевагою від використання технологій є можливість комбінування дистанційного й аудиторного навчання. Недолік полягає у складності знаходження характерних технологій відповідно до програми навчання. Розроблені механізми для забезпечення процесу навчання були реалізовані за допомогою програм Blackboard, CourseCraft, Trello, EdApp, Scheduler Maker. Встановлено, що серед студентів, які вивчали педагогіку та

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Scheduler Maker software. It was established that among students who studied pedagogy and primary school methods (group 1), a high level of knowledge was attained with 71%. Students of group 2, who studied English, achieved a high level with 65% of students. The practical implications of the study lie in the improvement of the learning process at higher education institutions drawing on the use of modern technologies. Prospects for research may be related to comparing the effectiveness of programs used to provide learning with a traditional learning approach.

Keywords: digital technologies, comprehensive training, educational materials, level of knowledge.

методику початкової школи (група №1), високий рівень знань був досягнутий серед 71%. Студенти групи №2, які вивчали англійську мову, високого рівня досягли серед 65% студентів. Практичне значення роботи полягає у вдосконаленні процесу навчання у вищій школі в результаті застосування сучасних технологій. Перспективи дослідження можуть бути пов'язані з порівнянням ефективності використаних для забезпечення навчання програм з традиційним підходом навчання.

Ключові слова: цифрові технології, комплексна підготовка, навчальні матеріали, комплексна підготовка, рівень знань.

Introduction

The training of specialists in higher educational institutions draws on European and national standards and is aimed at identifying innovative approaches in teaching and learning. The implementation of new training programs can be attained entailing the state-of-the-art technologies (Lousã & Lousã, 2023). Modern technologies contribute not only to the educational process, but also to the development of students' creative skills, which substantiates the relevance of the chosen topic.

Enhancing the quality of education drawing on digital technologies can be realized as a result of studying and consolidating educational material, assessing the level of knowledge. Moeover, digital technologies can be used to organize the educational process, drafting the class schedule (Cho et al., 2020). Multimedia programs, software, access to electronic libraries can be presented in the educational process (offline and online). A variety of multimedia technologies contribute to the effectiveness of communicating the information, which may vary in content and form (Al-Rahmi et al., 2022a). Multimedia technologies (whiteboards, projectors, etc.) contribute to the visual perception of information, which facilitates the process of memorization. The software aims to use specialized applications that facilitate the learning of theoretical and practical material (Cheah et al., 2019). Access to electronic libraries facilitates the study of scientific information from various sources and helps solve problems based on world experience.

Ensuring a continuous learning process relying on digital technologies is aimed at a more

detailed study of materials and the enhancement of cognitive literacy. Beyond all doubt, the variety of modern technologies helps to find the most effective ones for displaying the educational process and its organization for various categories of students (Lyailya et al., 2021). Consequently, the educational material can be communicated in various electronic formats, which facilitates monitoring the stydying process. This contributes considerably to developing students' intellectual potential, which is reflected in the full assimilation of the material. Digital facilitate the seamless uptake of information drawing on the principles of interactivity, adaptability, individual learning, as well as group learning (Al-Ansi, 2022). For example, the LMS Moodle program is aimed at improving professional skills as a result of working with educational materials. Also, the application allows the instuctor to provide an electronic format for displaying the material. AICC (Aviation Industry Computer-Based Training Committee) facilitates the development of training courses that are relevant to the curriculum. The WorkWize application facilitates the display of educational data, which can be presented in a non-standard form (Suelves et al., 2022). Conducting an integral learning process can be ensured with the help of online platforms (Google Meet, Microsoft Teams), which enhances communication, creating a dynamic learning environment (Dahri et al., 2021). This facilitates the seamless presentation of information, improving the processes of remembering the information. Digital technologies give impetus to flexibility of the educational process, which allows the instructor

to diversify the methods of providing educational information.

In recent studies, the issue of using digital technologies to increase the comprehensive organization of the educational process is considered superficially. Emphasis is made on the benefits of identifying the digital technologies' overall effectiveness. The purpose of the study is to determine the effectiveness of using modern technologies to enhance the performance at higher education institutions.

The research objectives include as follows:

− to identify the advantages and disadvantages of using modern technologies in higher education;
− to elaborate mechanisms for improving the first-year university students' academic performance, with the special emphasing on using modern technologies;
− determine the effectiveness of the developed mechanisms for improving students' academic performance, taking into consideration the calculation of the direct standardization method;
− to determine the academic performance level on studying the courses of "Pedagogy and methods of primary education" and "English".

Literature review

Modern technologies contribute to the development of educational models, facilitating educational reforms. Digital technologies enable creating index systems for evaluating educational programs and student satisfaction. Moreover, digital technologies contribute to the development of pedagogical competences, which is manifested in enhancing the education quality and allows taking into account the students' individual capabilities (Diz-Otero et al., 2023). However, the introduction of digital technologies in the learning process has not only advantages, but also disadvantages that teachers face. When it comes to disadvantages, those may be related to the lack of teachers' expertise, which will not contribute to the use of modern technology potential. The development of teachers' digital skills can be achieved due to the proper use of interactive learning objects, contributing to the development of electronic courses. The creation of elective training courses with the help of Quality Matters allowed to obtain high indicators, thus contributing to the enhancement of professional knowledge (Alibraheim et al., 2022). In fact, modern digital technologies

facilitate the expansion of specialized knowledge and the broaden possibilities of their professional application. The TECW program promotes the learning of a second language, based on pedagogical training, students streaming, development of writing skills. That said, with the help of the program it is also possible to monitor the quality of tasks, receive constant feedback, and motivate students. The program enables to analyze submitted tasks, which affects the possibility of developing students' knowledge. Some issues in using TECW are related to students' reluctance to revise the tasks, to tackle the difficulties (Zhang et al., 2022).

The COVID-19 pandemic contributed to the increased use of digital technologies in the learning process. The use of thematic analysis made it possible to establish that modern technologies significantly facilitate the development of independence and continuous support. During training, teachers with a low level of digital literacy may encounter obstacles that affect the quality of teaching. However, the adaptation of digital technologies to the curriculum contributes to the expansion of opportunities for obtaining a high knowledge level (Meirovitz et al., 2022). The use of digital technologies in the educational process should be based on improving the quality of education, ensuring accessibility standards. Modern technologies contribute to the formation of innovative thinking and the expansion of access to education. 92.1% of respondents from Swinburne University of Technology (out of 136 people) came to the conclusion about the need to use Google Classroom for professional development. Google Classroom facilitates the sharing of learning materials between students and teachers (Adi Badiozaman et al., 2022). The implementation of the interactive course "Digital technologies in teaching foreign languages: theory, methodology, application" was implemented at Vinnytsia State Pedagogical University (Ukraine). The course dealt with the he formation of mixed learning, the possibility of using flexible electronic forms. In the course of the study, the potential of technologies grounded on a combination of quantitative and qualitative methods was elaborated (Ihnatova et al., 2022)

It should be noted that modern technologies in the educational process are a motivational component that promotes professional development, faculty interaction, and the desire to succeed. Furthermore, digital technologies contribute to the learning process organization and enhance the activation of educational and cognitive activities. The results of diagnostic

surveys showed a high level of students' academic performance (Fursykova et al., 2022). The development of digital technologies in the educational process should be connected with the elaborating teachers' didactic technological competences. The solution to this issue can be provided as a result of teacher training aimed at improving digital literacy. The process should be aimed at expanding the possibilities of working with various modern technological systems that contribute to learning (Záhorec et al., 2021). The involvement of modern technologies in the learning process should be based on an integrated approach and the involvement of various approaches. Training should be aimed at identifying dynamic connections, multidirectionality, which contributes to the development of thinking, contributes to the analysis of the presented information. The presented processes can be implemented as a result of applying relevant solutions to address the tasks (Howard et al., 2021).

The of literary sources revealed that most of the works highlight the digital technologies' impact on the learning process. Problems faced by teachers while using modern technologies in education were also identified. Gaps in research are related to the lack of analysis regarding various technologies for organizing the learning process within the conditions of a seperate higher educational institution.

Methods

Research procedure

According to the research procedure, 4 stages were planned. The first stage of the research consisted in identifying the advantages and disadvantages of digital technologies during education. This stage aimed at a more detailed study into the possibilities of modern technologies in students' training at higher educational institutions. The identification of the most important advantages and disadvantages became possible as a result of obtaining the data from the respondents. The submitted data became the basis for developing the mechanisms for modern technologies' application in the educational process at the high school.

The second stage of the research involved the elaboration of mechanisms that contribute to the organization of the educational process in higher education entailing the use of digital technologies. The mechanisms were aimed at ensuring the education of first-year students, since they still lack knowledge in the

professional field. The development of mechanisms involved studying the specifics of more than 250 modern interactive technologies. Following the elaboration of mechanisms for improving the educational process, the period of study of first-year students lasted 3 months (November 2022 - January 2022).

The third stage of the research was conducted during the training period and consisted in determining the most favorable mechanisms of training with the use of digital technologies. The results were obtained among two groups of students, which approach facilitated the comparison of results among students from different specialties. Students of group 1 were enrolled in the course "Pedagogy and methods of primary education", students of group 2 in "English" correspondingly.

The fourth stage of the study provided for obtaining information on the level of knowledge of students of groups 1 and 2. The distribution of results involved obtaining information on the level of knowledge before the beginning of the study (2 months of training) and after training (3 months of training). The level of knowledge was distributed into high, sufficient, medium, low.

Sample formation

The research embraced 148 students from various educational institutions: Yuriy Fedkovich Chernivtsi National University, Chernivtsi branch of the State Scientific Institution "Institute of Modernization of the Content of Education", Prykarpattia National University named after V. Stefanyk. First-year students majoring in "Pedagogy and methods of primary education" (94 students), "English" (54 students) were involved in the study. The limitation of the student sample was used to test the effectiveness of incorporating digital technologies for learning. This is because first-year students do not have professional knowledge, but only develop it during the training process. During the study, students were divided into two groups according to their specialization.

Method

To obtain information about the advantages and disadvantages that may arise when using digital technologies in education, traditional methods were used. A relevant method was to use a comparison between a traditional learning system and an interactive one. In accordance with the traditional education system, it was

envisaged to organize regular education without the use of modern technologies. The comparison of these education systems made it possible to form the advantages and disadvantages of including modern technologies for professional training of students. When it comes to the established data, the most characteristic advantages and disadvantages were identified according to the results of the students. The results from the students were obtained using the Thurstone scale, which enabled the calculation of the variation coefficient, which was developed by the authors:

$$k_v = \frac{s_в}{x} \qquad (1)$$

s – an indicator characterizing the deviation from the established norm;
x – sample value

The development of mechanisms to ensure digitalization of first-year students' education consisted in studying the advantages of digital technologies using the well-known comparison method. To provide comparative data, more than 250 available digital technologies were selected, the functionality of which contributed to the development of mechanisms for providing education in higher education. Implementation of training was ensured as a result of uninterrupted access to the Internet, as well as modern technologies Blackboard, CourseCraft, Trello, EdApp, Scheduler Maker. Additional programs were TalkEn. Cloud (learning the English language) and Mind42 (to provide training for students majoring in "Pedagogy and methods of primary education".

Obtaining data on the effectiveness of the learning mechanism according to the students' data of groups 1 and became possible as a result of using the Thurstone scale (Zhang et al., 2022). The collected data contributed to the calculations of the direct standardization method (Ihnatova et al., 2022).

$$S = \frac{n_f}{n_e} \times c_e, \qquad (2)$$

n_f – actual conditional value;
n_e – conditional expected value;
c_e – standard set value.

In fact, students' level of knowledge following 3 months of study was obtained by calculating the coefficient of the obtained knowledge level:

$$К_з = \frac{h_т + h_п - h_{дп}}{h_м} \qquad (3)$$

$h_т$ –grades received for theoretical material;
$h_п$ – grades received for practical skills;
$h_{дп}$ – indicator of mistakes made;
$h_м$ – maximum number of points allowed.

Data analysis

Further, to compare the obtained data on the effectiveness of the learning mechanism for students of different groups and the level of acquired knowledge, the calculation of the Student's coefficient was used. The performed calculation contributes to obtaining a statistical verification of the results, which contributes to a more thorough investigation. The comparison of data took place among students of both groups (group 1 and group 2), which made it possible to compare the obtained results (Suelves et al., 2022).

$$t = \frac{M_1 - M_2}{\sqrt{m_1^2 + m_2^2}} \qquad (4)$$

M_1, M_2 – average divergence of elements;
m_1, m_2 – mean square deviation of the elements.

Data collection

Data collection involved the use of the Thurstone scale, which contributed to obtaining data on the advantages and disadvantages of digital technologies in education. Moreover, the scale was used to identify the effectiveness of the developed mechanisms for organizing learning using digital technologies among students. The scale provided for marking 0 (no preference) and 1 (given preference), which corresponded to the preference chosen by the students. Students had to provide data within 5 hours via email. The elimination of data falsification became possible as a result of the use of pre-registration of electronic mailboxes of students who participated in the study.

Ethical criteria

Compliance with the ethical criteria during the research consisted in compliance with the provisions of the Guidelines for Research Ethics in Science and Technology (National Research Ethics Committee, 2016). In accordance with the ethical provisions used, the authors confirmed the novelty of the information and the absence of plagiarism. The work did not use published materials, the theoretical material applied in the introduction, literature review, and discussion sections was supported by relevant literature sources.

Results

The rapid transition to the use of digital technologies (fully or partially) is connected with social, economic, political aspects (COVID-19, war in Ukraine, etc.). Therefore, in the work among the respondents, it was determined which advantages and disadvantages of modern technologies are the most crucial in the learning process. These data are necessary to understand the expansion of the possibilities of use in the educational process. The calculated data were obtained using the coefficient of variation according to formula 1 (Figure 1).
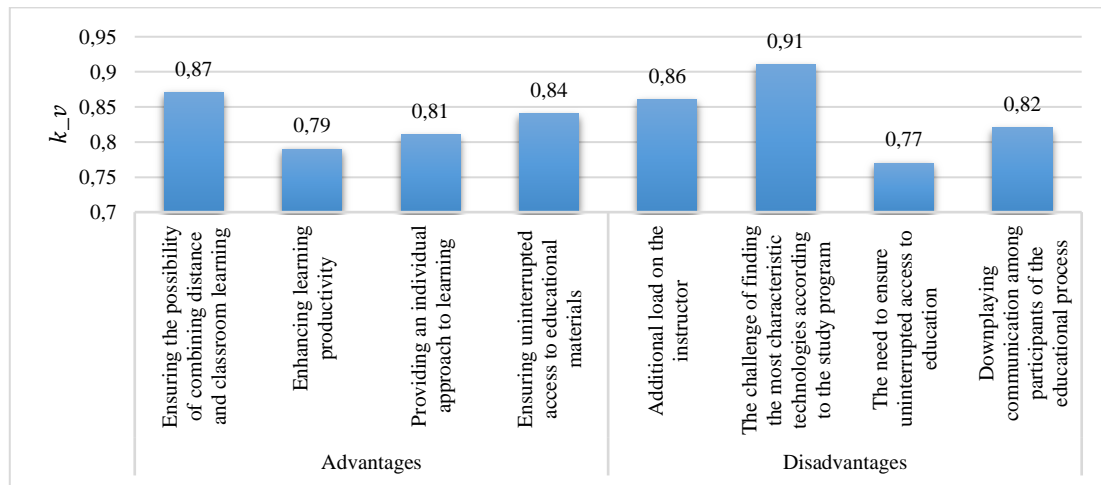

Figure 1. Advantages and disadvantages of introducing digital technologies into the educational process
Source: Developed by authors

In light of the results obtained from the respondents, the greatest advantage of using modern technologies is the possibility of combining distance and classroom learning. The process is related to the fact that during emergencies, training can be provided in an interrupted mode. Electronic systems contribute to uninterrupted learning, access to necessary materials, as they can be stored in network access. They also facilitate the organization of teamwork, providing access to digital materials that were displayed during lectures or practical work. This approach entails the actualization of the received information, which affects the quality of knowledge acquisition.

Ensuring the steady access to educational materials according to the results obtained is the second most important advantage. The results are related to the possibility of systematizing the educational materials that were used in the learning process and leaving them publicly available. The display of materials using digital technologies can be presented in the same way as it was presented during classes. This allows students to complete their homework using the material they have covered. Further, uninterrupted access consists in the possibility of obtaining access to materials from the world's libraries. Providing an individual approach to learning can be implemented as a result of selecting relevant applications that contribute to the development of individual skills. During training, digital technologies also contribute to the determination and monitoring of the learning progress of an individual student. Moreover, modern technologies contribute to the performance of individual assignments, the verification of which can be automated. Notably, an individual approach to learning contributes to increasing the level of knowledge in problematic aspects.

Although increasing the productivity of learning is not critical, it is important for the effectiveness of learning due to the formation of students' motivation. Learning productivity is associated with a non-standard approach, the possibility of easier perception of materials as a result of the exclusion of secondary information. That said, learning productivity can be increased as a result of non-standard submission of materials, use of rating approaches. The first disadvantage as a result of the use of digital technologies in education is the difficulty of finding the most characteristic technologies in accordance with the educational program. The process may be related to the limited functionality of the program, the lack of accurate sound transmission, and the complexity of implementation. This disadvantage may also be connected to problems in adjusting the existing

information or the complexity of its display. Also, the quality of the presented information may not correspond to the level of students' knowledge. An additional burden on the teacher is the need to understand the use of digital technologies in the educational process. To address it, teachers should study the features of using programs, applications, which require the use of additional time. When involving various innovative technologies in the educational process, additional training of teachers and students regarding their correct use should be provided.

Furthermore, a decrease in communication between the participants of the educational process may be related to the performance of tasks directly in the application. Therefore, the use of technologies should also involve teamwork, which affects the level of socialization. Completing tasks using the application may affect the need to increase the rating of an individual student, which excludes the possibility of discussion with other students. This is due to the fact that students will be focused on achieving the highest results. The need to provide uninterrupted access to education may be related to the lack of Internet access, problems when using specialized programs. In the learning process, there may be a need for additional program customization, which requires additional knowledge. It is also necessary to provide preliminary training on the correct use of the technologies proposed for training.

The identified advantages and disadvantages of the use of digital technologies contributed to the development of mechanisms for improving the quality of education in higher educational institutions. The mechanisms were aimed at improving the quality of education of first-year students:

– to provide comprehensive training of students as a result of combining theoretical and practical classes. The presented mechanism can be achieved as a result of using the Blackboard digital application. This is due to the fact that it facilitates the development of classes based on existing material or as a result of creating your own courses for training. Digital technologies during comprehensive training can contribute to the display of theoretical information during practical classes. It can also be manifested in conducting educational webinars to consolidate the learned material;

– to ensure the development of professional and cognitive activities of students, which contributes to their active participation in the educational process. The CourseCraft computer program promotes comprehensive perception as a result of preparing the lessons. With the help of CourseCraft, it is possible to ensure the development of classes by students, which is based on flexible functionality. This approach contributes to a more detailed study of a specific topic, the perception of information and is reflected in the development of communication culture. The development of classes by students contributes to the formation of a professional opinion in accordance with the questions posed, addressing existing issues;

– to ensure the possibility of using digital technologies for the organization of the educational process. The Trello application allows organizing the learning process as a result of entering data about lectures, practical classes, specifying additional tasks. Trello also helps to organize time for preparing homework and repeating the material studied;

– to ensure the development of students' creative thinking. To that end, creative thinking can be enhanced through setting some non-standard tasks. For instance, in the development of the specifics of the presentation of information as a result of studying a topic assigned to the student; during preparation for practical classes. Using the EdApp program can promote the development of creative thinking as a result of a variety of functionality that allows you to vary the tools during learning. The process may involve using existing templates or creating your own;

– digital technologies should also be used in curriculum designs, which contributes to the automation of the process. The Scheduler Maker program allows you to create a schedule of classes for different groups of students, as well as set reminders as a result of additional changes. Also, the functionality of the program includes data synchronization, which allows you to adjust data from various digital devices (laptop, smartphone, tablet);

– to expand access to global electronic libraries as a result of the use of digital technologies. Access to the Internet facilitates the search for scientific information to expand professional knowledge. Such an approach affects the possibility of studying various approaches to

solving tasks, which will contribute to professional activity;

− when mastering the material, not only programs that promote a non-standard format of information presentation should be used, but also those that allow to acquire specialized skills. For example, to learn English, it is possible to use the TalkEn.Cloud program, which facilitates access to interactive information. The program provides for the completion of tasks, as well as the use of automated knowledge testing, which allows you to obtain information about the students' knowledge level. To ensure the study of the subject "Pedagogy", the Mind42 program can be used, which facilitates the organization of teamwork, the format for presenting information, conducting brainstorming. Also, the program can contribute to the development of approaches to training the elementary school learners.

The developed mechanisms for improving the quality of education as a result of the use of digital technologies made it possible to determine which of the mechanisms has the greatest importance for students. To that end, the results were presented for different groups of students. Group 1 was represented by students majoring in "Pedagogy and methods of primary education", group 2 by the course in English. Obtaining the data became possible using direct standardization method calculations (Table 1).

Table 1.

The effectiveness of the developed learning mechanisms for different groups of students

Teaching mechanism	Students' performance according to answers of group 1	Students' performance according to answers of group 2	Student's coefficient (table value - 2.447)
students' comprehensive training resulting from combining theoretical and practical classes	1.43	1.42	0.815
enhancing students' professional and cognitive activity	1.5	1.44	1.027
use of digital technologies to organize the educational process	1.31	1.33	0.853
enhancing students' creative thinking	1.37	1.38	0.716
development the lesson plan	1.29	1.3	0.893
expanding access to global electronic libraries	1.41	1.48	1.284
development of specialized skills	1.32	1.49	1.317

Source: Developed by authors

It was found that for students of group 1, the development of professional and cognitive activity is one of the priority directions. This is due to the fact that it promotes the search for approaches to ensure the learning of primary school students. The mechanism consists in the active participation of students in the preparation of classes, which contributes to the expansion of professional skills. Comprehensive training as a result of combining theoretical and practical classes is also important for students of group 1. The results are related to the possibility of receiving information in a more simplified form as a result of using the Blackboard application.

The development of specialized skills for students of group 2 is of the greatest importance, as it is associated with the use of special programs (TalkEn.Cloud) that contribute to the study of the English language. This approach facilitates the elimination of knowledge gaps, a more detailed study of the topic and consolidation of knowledge immediately after studying the material. Expanding access to global electronic libraries is also important for students of group 2. This is due to the fact that the indicator promotes the search for various information, which affects the improvement of the level of the English language. The study of various world sources of information is reflected in the expansion of practical approaches to the study of the English language. For students of group 1, this mechanism ranks third, because teamwork is more important.

The development of creative thinking of students of group 1 ranks fouth (students of group 2 rank fifth). Hence, it allows forming an unconventional approach to learning and in further professional activity contributes to the innovative presentation of information. However. the development of creative thinking

first requires the presence of deeper knowledge, which will allow them to be transformed. The mechanisms of using digital technologies for the organization of the educational process and the development of the lesson plan are equally important for students of both groups. The presented mechanisms are more significant for teachers, which helps to organize the educational process.

The level of acquired knowledge among students of groups 1 and 2 was established by calculating the coefficient of the acquired level of knowledge (Formula 3). The results are presented in Table 2.

Table 2.

Determination of the knowledge level gained by students after completing the training

Group No.	Knowledge level							
	High		Sufficiant		Average		Low	
	before the study	after using digital technologies	before the study	after using digital technologies	before the study	after using digital technologies	before the study	after using digital technologies
Group 1	10.2	10.9	7.6	8.9	5.4	6.0	3.7	-
Group 2	10.1	11.0	7.4	8.7	5.8	6.3	3.0	-
Student's coefficient (table value – 2.447)	0.883	0.887	0.992	0.918	1.315	0.996	1.471	-

Source: Developed by authors

The resulting calculations made it possible to establish that the majority of students showed a high level of knowledge after 3 months of study as a result of using digital technologies. It was established that 71% of students of group 1 showed a high level of knowledge, which is connected with the systematic study and the use of an integrated approach. Before the beginning of the study, only 18% of students showed a high level of knowledge. A sufficient level of knowledge was obtained after training among 19% of students of group 1, a low level of knowledge is absent. Before the start of the study, 47% of the students in group 1 had an average level, and 2% had a low level.

Similar results are also obtained by students of group 2, most of whom received a high and sufficient level between 65% and 24%. There was no low level of knowledge among students. Before the beginning of the study, the level of knowledge among students of group 2 was at a sufficient level among 32%, average - 41%, low - 1% of students. The increase in results after three months of study is associated with the correct organization of the educational process, increased student motivation as a result of digitalization of the educational process.

Discussion

Addressing the shortcomings in the educational process can be achieved as a result of the use of gamification techniques. Gamification is related to the use of game technologies in education. Gamification in higher education can be implemented by accumulating points as a result of passing relevant levels in education. The process can be implemented with the help of special programs (Learning.online) that facilitate the completion of tasks according to the training program (Záhorec et al., 2022). Digital learning tools contribute to the creation of new perspectives for creating an artificial language environment and learning English. The use of digital technologies, which contribute to functional modeling, contributes to the graphic display of educational material. This approach contributes to the learning of new words, language structures, and also promotes communication between students, which is manifested in the expansion of the level of knowledge (Habelko et al., 2022). Digital technologies contribute to going beyond the existing boundaries of learning, which is based on improving coordination, stability. However, digital technologies should be directed to the development of students' cognitive processes, ensuring the connection of educational material with the capabilities of digital programs. The learning process should be based on the constant search for new approaches that contribute to the acquisition of more specialized knowledge (Adi Badiozaman et al., 2022a). In the current study, the identification of acquired cognitive skills by students is not presented, however, the effectiveness of learning mechanisms among groups of respondents is presented in the work.

In particular, students who took the course in pedagogy and methods of primary education, as well as students who study English.

The spread of COVID-19 affected the transformation of the educational process, which has contributed to the use of online technologies. The use of digital technologies should be based on their thematic direction, the ability to make changes to the presented material. Education should be aimed at the development of scientific and pedagogical activity (Chen et al., 2022). The use of Science Lab in the educational process promotes a virtual learning environment, which consists of a combination of pedagogical theory and inclusive learning strategies. When using a computer program in education, it is necessary to analyze its functionality and the possibility of using theoretical material during research. In that light, attention should also be paid to the possibility of processing student results, which contributes to the design of a unified educational system (Lyailya et al., 2022). Systematic analysis of existing publications in the field of application of modern technologies for providing training allowed to reveal their advantages. It was established that digital technologies contribute to prospective and individual learning, expand the possibilities of the educational process. With the help of digital technologies, it is also possible to develop critical thinking, which affects the learning of learning material (Cheah et al., 2023). The transformation of educational programs with the help of digital technologies contributed to the development of creative thinking among students and influenced the expansion of motivation. Positive changes are related to the application of a complex learning process, which is achieved during lectures, practical work, and seminars. For example, the Google Jamboard online service facilitates group learning, the use of educational materials in an accessible form (drawings, diagrams), and the creation of notes (Dilekçi and Karatay, 2023). Mechanisms aimed at improving the quality of the educational process as a result of the use of modern technologies were developed in the work presented. Thus, among the modern technologies used were Blackboard, CourseCraft, Trello, EdApp, Scheduler Maker.

Ensuring flexibility and individualization of education can be achieved as a result of the use of digital pedagogical technologies. An innovative learning strategy can be the use of video lessons, mobile applications, and virtual reality programs. This approach contributes to the highest quality assimilation of the studied material and promotes its further use in professional activities. Digital technologies make it possible to communicate material in a more accessible form (Dahri et al., 2022). Applications for mobile learning contribute to the enhancement of the information perception, which increases the value of learning and the motivation of students. The improvement of perception is associated with an accessible presentation of the material, which can be presented in the form of presentations, diagrams, graphs. It is also aimed at the automation of learning, which contributes to the saving of time spent on learning (Al-Rahmi et al., 2022).

The analysis of the scientific works made it possible to conclude that most of the studies are based on determining the effectiveness of the structuring the educational process, including their advantages. In the current paper, the advantages and disadvantages of using digital technologies in the educational process and their importance for the respondents were revealed. The study also developed mechanisms for improving the quality of education with the help of digital technologies (Blackboard, CourseCraft, Trello, EdApp, Scheduler Maker). Moreover, the level of students' knowledge after 3 months of study, was highlighted based on the mechanisms developed by the authors.

Conclusion

The research conducted by the authors yielded meaningful findings. The set goal was achieved, and the effectiveness of the technologies involved during training was confirmed. The findings were obtained as a result of identifying the level of students' knowledge before and after the study.

It was determined that the greatest advantages of using digital technologies in education are the possibility of combining distance and classroom learning (0.87). Ensuring uninterrupted access to educational materials is also important (0.84), as it contributes to uninterrupted learning. Notably, the biggest drawback is the difficulty of identifying the most characteristic technologies according to the program (0.91), since the indicator affects the quality of training. The additional load on the teacher (0.86) is also a disadvantage of digital technologies, as it implies the need to study the functionality of the applied programs.

Using the Blackboard program to design the educational process can affect the combination of theoretical and practical classes. The CourseCraft application can be directed to the development of professional and cognitive

activities of students; Trello in its turn helps to organize the educational process. Students' creative thinking can be developed as a result of using the EdApp program to prepare practical classes. The Scheduler Maker application facilitates the development of a lesson plan, and digital technologies can facilitate access to information from the world's electronic libraries. Digital technologies contribute to the development of knowledge in specialized disciplines (namely, TalkEn.Cloud contributes to the study of the English language, Mind42 - the expansion of knowledge in pedagogical disciplines). It was established that the mechanism of developing the professional and cognitive activity is the most effective for group 1 who studied pedagogy and primary school methods (1.5). The results are related to the possibility of creating unconventional approaches for teaching elementary school learners in the future. Students of group 2, who studied English, believe that the development of specialized skills (1.49), such as the TalkEn.Cloud program, is of paramount importance.

After three months of training, it was found that the high level of knowledge of students of groups No. 1, No. 2 was achieved among a larger number of respondents. Before the start of the study, a high level was achieved among 18% of students of group #1 and 26% of students of group #2.

The practical value of the study lies in the possibility of improving the educational process of higher school students entailing the use of modern technologies. Research perspectives may be related to the elaboration of learning using digital technologies for a different group of respondents. Participants of the study can be students of 1st year, 5th year, as well as those who are enrolled in their second higher education program.

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