

Scientific Herald of Uzhhorod University

Series "Physics"

Journal homepage: <https://physics.uz.ua/en>

Issue 55, 345–354

Received: 11.10.2023. Revised: 21.12.2023. Accepted: 27.02.2024



DOI: 10.54919/physics/55.2024.34hc5

The use of modern information and communication technologies in the educational process

Kumissay Avezova*

Doctoral Student

Abai Kazakh National Pedagogical University

050010, 13 Dostyk Ave., Almaty, Republic of Kazakhstan

Anarbek Kozibay

Full Doctor in Pedagogy, Professor

Abai Kazakh National Pedagogical University

050010, 13 Dostyk Ave., Almaty, Republic of Kazakhstan

Yelena Bayzakova

PhD in Pedagogy, Associate Professor

Abai Kazakh National Pedagogical University

050010, 13 Dostyk Ave., Almaty, Republic of Kazakhstan

Zhanar Zhumagalieva

PhD in Technical Sciences, Senior Lecturer

Abai Kazakh National Pedagogical University

050010, 13 Dostyk Ave., Almaty, Republic of Kazakhstan

Madina Tuken

Master of Science, Lecturer

Abai Kazakh National Pedagogical University

050010, 13 Dostyk Ave., Almaty, Republic of Kazakhstan

Abstract

Relevance. Contemporary social conditions in the field of education bring about the modernization of the educational process, which is characterized by the use of a wide range of information and communication technologies (ICT) in it. The school is implementing a reform by solving tactical, methodological, and organisational tasks. This is due to the fact that the implementation of the above-mentioned tools allows rational organization of educational activities, in particular, speeding up the process of delivering information by the teacher, which definitely contributes to the development of the entire educational environment. Accordingly, teachers are inspired to search for modern methods of teaching, the level of their professional development and the competence of parents increases, it relieves them of unproductive routine work.

Purpose. The purpose of the study is to analyze and investigate the ways of using ICT in educational activities and to determine the most effective of them.

Methodology. To achieve the research goal, various methods of scientific research were applied, namely: analysis and synthesis, comparison and typologisation, which allowed fully fulfilling all the objectives of this study.

Suggested Citation:

Avezova K, Kozibay A, Bayzakova Y, Zhumagalieva Z, Tuken M. The use of modern information and communication technologies in the educational process. *Sci Herald Uzhhorod Univ Ser Phys.* 2024;(55):345-354. DOI: 10.54919/physics/55.2024.34hc5

*Corresponding author



Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (<https://creativecommons.org/licenses/by/4.0/>)

Results. Established approaches to the use of modern teaching aids in educational activities were also studied, depending on the age and level of personal computer (PC) proficiency of students. It was established that a modern educational institution and its teaching staff should be prepared to use ICT both technically (providing classrooms with all necessary equipment) and intellectually (the teacher must know and be able to use information and communication technologies during professional activities and help others acquire this skill).

Conclusions. It is necessary to state the fact that most educational institutions do not meet the above two criteria for the use of ICT. The practical value of the research comes from the possibility of using the article test in pedagogical practice. Also, the article can help in the preparation of teaching aids in relevant subjects.

Keywords: electronic learning tools; multimedia; personal computer; education; student.

Introduction

The implementation of information and communication technologies (ICT) occupies a prominent place in all social spheres at the current stage of world development. The educational environment is no exception, as the use of ICT in it contributes to the absolute reformation of approaches to education. Thus, this educational tool appears at the moment in the context of a modified form of educational activity, as it forms fundamentally new principles of the process of learning and development of children. The use of this approach helps to increase the interest among students in learning, as well as independent work, for example, in the form of searching for material and its processing. However, there is a problem related to correctly conveying the purpose of using computer technologies to the child, otherwise, the child may use them for games rather than for learning [1; 2].

As for the teacher's professional activity, ICT will only have a positive effect on it. It is expressed in increasing the level of motivation to work and, as a result, allows improving the professional knowledge and competence of the educational worker. However, study of opinions and positions of scientists, on the organisation of the evaluation of the quality of education use of the researched tool during educational activities discloses an obvious contradiction [3-6]. A teacher with a theoretical in the course of professional activity is not prepared for its implementation to insufficient preparation of the content and organisational aspects. In this context, there is a problem of inefficient the use of digital tools for the development and modernization of the educational environment [6-8]. Possible classifications ICT can vary greatly. Their existence indicates uncertainty and the lack of a unified position on the role of ICT in education in general. The basis of any given classification directly depends on the purposes and objectives of its use. Based on various classifications, the most widely used modern electronic technologies are the Internet, text documents, graphic documents, video files, tables, presentations, websites, complex documents. Notably, the effectiveness of teaching by means of ICTs largely depends on the correct choice of methods of their use. Even with the most advanced software product, the student will work with interest if there is an element of originality [9-11].

Educational technologies, translated from Greek *techno* and *logo* (plan, learning), is a process in which intellectual data and materials are interpreted into the language of practical approaches. Educational technologies are a type of educational activity and a way of human participation during training. ICT contributes to a person's acquisition of the skills to implement activities in integrated digital

conditions, which are aimed at the future improvement of the positions of the associatively connected method. Thus, the approach, which is based on the processing and presentation of educational material in various positions, with mandatory consideration of the psychological and pedagogical principles of the implementation of ICT tools in educational activities [12; 13].

The implementation of digital tools during training enables teachers to increase success in the educational environment, increase promotion and a wide range of students taking part in Olympiads, educational, scientific and creative competitions, which accordingly increases develops the level of preparation. Therefore, the use of modern tools in the lesson allows improving the cognitive abilities of individuals, their creativity, as well as the ability to process information qualitatively. Notably, involvement of digital tools in educational activities considerably affects the forms and methods of presentation of educational material, the interaction between students and teachers and, accordingly, the teaching methodology in general. Therewith, information and communication technologies do not replace conventional approaches to learning but considerably increase their effectiveness. The main task for a teacher is to find an adequate place for ICT during training, i.e., to solve the educational task using information technologies where they are more effective than conventional educational technologies. The use of a laptop during the educational process (involving digital mechanisms) is one of the approaches to the intensification of learning, that is, its modernization, which contributes to the development of motivation and encouragement among students to master the subject, implementing ideas, developing education, increasing the pace of learning, and increasing self-employment. A laptop and computer have a positive effect on the improvement of mental work, the ability to work independently, as well as on the motivation of subjects during the educational process [14; 15].

The purpose of this study is to analyse and evaluate the ways of using ICT in the educational process and identify the most effective of them.

Materials and Methods

The scientific method is any strategy that is controlled and applied during research to achieve a certain result. In other words, it is a systematic way (which must follow rules and standards) to come to a conclusion that will satisfy the purpose of the study. Scientific methodology is a set of academic work processes. From the methodology, the study acquires credibility, reliability, and scientific value, it is a set of procedures in the research process. Research processes are mechanisms for data collection and analysis.

The description of the scientific methodology is the establishment of what procedures will be used for data collection and analysis.

To conduct the research, it is necessary to choose the scientific approach by which this research will be conducted. The research approach is a method of analysing the collected data. This is a way to understand the object of research, it can have quantitative, qualitative or a combination of both characteristics. In this study, a qualitative approach was used. Qualitative research seeks to understand phenomena. This methodological tool is aimed at understanding phenomena based on their explanations and motives. Interpretation and analysis of data ascribe meanings to phenomena. Data analysis considers subjectivity and nuances that cannot be quantified. It is more common in research in the humanities, which is why this approach was used in this study. Furthermore, it is necessary to determine the type of study, which is related to the contribution of the results of this study to science. In terms of the type, research can be basic or applied. Basic research is aimed at obtaining new knowledge for the development of science, but it does not concern the practical application of this knowledge. This means that the contribution of research to science is not immediate. Basic research usually involves universal truths and values. Applied research is also aimed at obtaining new knowledge, but it is focused on applying this knowledge to solve specific problems. Therefore, there is a need for practical application of research. This research is more basic than practical, but it also has its own practical value.

From the standpoint of the purpose, the study can be exploratory, descriptive, or explanatory. This refers to the level of familiarity with the subject being studied and how much this knowledge will deepen during research. This study is descriptive, characterised by a description of a phenomenon or object of study and an analysis of the relationships between its variables. In general terms, such a study is a review and registration of the characteristics of the phenomenon.

Regarding the methods used, there are analysis and synthesis, analysis decomposes the studied object into parts and studies its individual characteristics, and the reverse process – synthesis, collects parts of the studied object into a single whole and studies its characteristics in a united form; comparative analysis, in which several objects or groups of objects are considered separately, and then a certain number of selected qualities of these objects are compared with each other and a certain conclusion is drawn (depending on the set purpose of comparison); typologisation was also used, which contributed to the classification of ICT tools based on the study of classifications of other researchers and their opinions.

Results and Discussion

The term “ICT” is interpreted in different ways. ICT are in the broadest sense a generalised term that describes various approaches and methods of obtaining, storing, processing, displaying and broadcasting data. This definition has a narrow meaning and connects ICT with the improvement of the general cultural and professional level. ICT play the role of an “engine and coordinator in the environment of modern education”. The position of the

driving force is explained by the role and greater importance of digital technologies and resources in improving the quality of education compared to outdated technologies. Information and communication technologies are also considered “a large number of modern tools that perform tasks related to the creation, storage and transmission of data, provision of services (computer devices, software, cellular communication lines, e-mail)”. The starting points on which the process of ICT implementation is based are the improvement of students' motivation and encouragement to complete educational tasks, as well as self-management with the aim of qualitative integration of educational disciplines into a modernized educational environment [16; 17].

Modern ICTs offer additional opportunities for learning and developing information literacy. Their implementation is proportional to the level of development of skills and competence in the use of modern digital technologies, which allows integrating the latter into educational activities. In addition, an important role is played by the level of competence of the teacher, who is responsible for the formation of appropriate educational conditions, namely motivation and physical and psychological comfort, which contribute to the development of a wide range of skills in students. A person's current capabilities are not expressed by their place of residence, but by the type of training received. Not only schools, but also universities should be Internet-oriented. The effectiveness and dynamics of their use of modernized digital tools is influenced by the level of their professional competence and competitiveness [18; 19].

The formation and development of ICT is due to a number of discoveries in the information environment. Therefore, this process can be compared with the development of digital devices for storing information; development of the abilities of automated processing of materials and data using a computer. Thus, ICT has combined all these processes and allows increasing the volume of opportunities for teachers during their professional pedagogical activities. When studying all disciplines using ICT, the student is given the opportunity to reflect and participate in the development of educational elements, which undoubtedly increases students' interest in each subject.

With the spread of digital learning tools and technologies, electronic learning tools (ELT) – teaching aids that are created with computer information technologies began to develop intensively. According to the methodological purpose, electronic educational materials can be divided into the following types:

1. Educational software tools, the methodological purpose of which is to transfer the level of knowledge, skills, and abilities of educational or practical activities and to create the necessary level of assimilation, determined by feedback, embodied by means of the programme.
2. Software tools (systems) – exercises for practising skills, learning skills, self-learning. They are usually used when repeating or consolidating previously learned material.
3. Programmes for the control (self-control) of the assimilation of educational material – control programmes.
4. Information retrieval, information, and reference software, which provides the ability to select and display

the information needed by the user. Its methodological purpose is the development of information systematisation skills.

5. Software modelling tools (systems) that provide a certain aspect of reality for studying its basic structural or functional properties using a certain limited number of parameters.

6. Software for modelling any composition which teaches the basic elements and types of functions for modelling a specific reality. It is designed to create a model of an object, phenomenon, process, or situation (both real and virtual) for the purpose of their research and study.

7. Demonstration software that provides a visual representation of educational material, visualisation of phenomena, processes, and relationships between the studied objects.

8. Learning software and games for learning from situations (for example, to develop the ability to make an optimal decision or develop an optimal strategy of actions).

9. Leisure programme for the organisation of classes for students in extracurricular activities to increase attention, reaction, memory, etc.

Electronic textbooks are currently characterised by many forms of implementation, which can be traced from the specific features of academic subjects and from the capabilities of modern computer technologies. Modern ELTs are provided in the form of:

- virtual laboratories, laboratory workshops;
- computer simulators;
- testing and monitoring programmes;
- game training programmes;
- software and methodological complexes;
- electronic textbooks, text, graphic, and multimedia materials equipped with a hyperlink system;
- thematic environments (microcosms, simulation programmes);
- sets of multimedia resources;
- reference books and encyclopedias;
- information search systems, educational databases;
- intelligent training systems.

The above list is not exhaustive since new types of ELTs and forms of their implementation appear with the development of with the spread of computer devices and software. ELTs used in the educational process must meet the general didactic requirements:

- scientificity;
- accessibility;
- problematicity;
- clarity;
- consistency;
- step-by-step presentation of the material;
- the conscientiousness of teaching;
- independence and intensiveness of activity;
- the power of assimilation of knowledge;
- unity of educational, developmental, and educational functions.

Among the ergonomic requirements for ELT, based on considering the age characteristics of students, it is advisable to highlight the requirement associated with a humane attitude to students, an intuitive user interface, and simple navigation in ELT. Free workflow and pace of work

(except for work with tests, where the duration is strictly regulated) [6; 10].

Targeted and systematic use of CRT in the course of training in combination with traditional methods significantly increases the level of its effectiveness. Therefore, a number of key aspects of the use of CRT in the educational process can be identified: the motivational aspect is the creation of prerequisites for a maximum consideration of individual educational opportunities and needs of students, a large selection of content, forms, pace, and level of learning, a satisfaction of educational needs, disclosure of the creative potential of a student; the content aspect is the addition to a conventional textbook with elements that it cannot implement (ELTs allow one to quickly find the necessary information, work with it, work with visual models of processes that are difficult to explain); the pedagogical and methodological aspect is pedagogical and methodological support of the subject. ELT can be used in preparation for classes, directly in the classroom (when explaining new materials, to consolidate acquired knowledge, in knowledge evaluation), to organise independent study of additional material, etc.; organisational aspect – use in the classroom, project groups, individual learning models, in extracurricular work; aspect of control and evaluation is the implementation of various types of control using ELT [13; 15].

Characteristics of learning using ICT: adaptability – the “adaptation” of the computer to the individual characteristics of the student; controllability – the teacher can adjust the learning process at any time; interactivity and dialogicity of learning – electronic learning tools (ELT) have the ability to “react” to the actions of students and teachers, enter into a dialogue with them, which is the main characteristic of the computer learning methodology; an optimal combination of individual and group forms of work; support of student's psychological comfort when communicating with the computer. If ICT are included in the learning activity, it will increase the efficiency of knowledge transfer from teacher to student, free teachers from routine work, increase the attractiveness of the presentation of the material, and diversify feedback forms.

The main stages of learning using ICT:

1. Stage of preparation for the lesson: analysis of electronic information resources, selection of the necessary material on the topic, structuring and registration of the collected material in electronic or paper form. The teacher should think about how to organise the communication between students and the computer, compare the functions of computer tools and the actions of the student, a way to submit the educational material presented in an electronic publication on the topic. In such a lesson, it is necessary to use a special approach to setting tasks, during the processing of which students turn to ELT.

2. The course of the lesson: the teacher is prepared to present new concepts and determine the readiness of students to work independently with ELT; if necessary, the teacher demonstrates the features of working with software products, students are given individual tasks; students begin to work synchronously with ELT under the guidance of the teacher, and then begin to work independently; at this stage, the teacher becomes a mentor, organiser of research, search, information processing, adviser; students

work with various didactic materials (without a computer); the teacher can offer students a problem situation or a task, the solution of which will help achieve learning purposes.

3. Summing up the lesson.

Educational activity in an educational environment should ensure the preservation of students' health, maintain their academic performance during the school day, week, year, and the necessary physical activity. When conducting computer classes, it is necessary to alternate theoretical and practical work with a personal computer (PC) and a video display terminal (VDT) during the lesson. The duration of the training courses with PC and VDT depends on the age of the trainees, the technical data of the PC and VDT, the type and complexity of the work performed. According to the latest recommendations, the useful service of the computer should not exceed:

– in the development of play activity: for children from 6 years – 10 minutes; for elementary school students – 15 minutes; for students of grades 5-7 with PC knowledge – 20 minutes;

– in the training courses on the basics of computer science and computer technology: for students of 8 (9) grades – 25 minutes; for students of 9 (10) grade – 40 minutes; students of 10-11 grades are not allowed to use a PC for more than two hours of training per day: 30 minutes in the first lesson and 30 minutes in the second lesson with a break of at least 20 minutes for PC processing, including a break, explanation of educational material, a survey of students, etc.

To avoid overwork when learning with a PC and VDT, it is necessary to take a number of preventive measures:

- after each lesson, take a break for at least 10 minutes, regardless of the training process;

- organise constant ventilation of the computer classroom during breaks with the mandatory absence of students;

- connect a timer to a PC or disable the display of information centrally to ensure normalised working time on a PC; perform eye exercises with a PC or VDT every 20-25 working minutes;

- if there is visual discomfort, such as the rapid development of eye fatigue, cramps, floaters and flashes in the eyes, etc., then the exercises for the eyes are performed individually, independently, and before the specified time; reduce static tension for 1-2 minutes to carry out physical training individually or in an organised manner when the first signs of fatigue appear;

- to relieve general fatigue, improve the functional state of the nervous, cardiovascular, and respiratory systems, the muscles of the shoulder girdle, arms, back, neck, and legs breaks in exercises should be for 3-4 minutes.

Classes using a PC should be held a maximum of 2 times a week. The duration of direct work on the PC should not exceed:

– in grades 1-4: in game classes at a certain pace – 10 minutes; in mixed classes with distractions from working at the computer, in free mode – 30 minutes;

– in grades 5 (6): in game lessons at a certain pace – 30 minutes; in mixed classes – 60 minutes.

Compliance with the operating mode on the PC and the implementation of preventive measures is mandatory. It is unacceptable to devote all the study time to computer

games in a given rhythm. At the end of the lesson, games can be involved for up to 10 minutes for students of grades 2-5 and 15 minutes for students of grades 6-11. Clubs and elective classes on the PC should take place no earlier than an hour after the last lesson. This time should be used for rest and food [7; 11; 18].

The importance of implementation ICT to design the information culture of children should be emphasised since students acquire the skills and abilities necessary for life in an information society, which implies the acquisition of information that can be cultivated only by working with ICT tools. From a didactic standpoint, the most important methodological purposes of teaching schoolchildren information and communication technologies are:

1. Personality development, the formation of skills for the implementation of individual work and in the information environment due to the improvement of critical, logical thinking based on the principles of interaction with a computer.

2. Realization of social interests through the computerization of modern society: training students for independent cognitive activity with ICT.

3. Encouraging educational activities: increasing the level of rationality and success of the educational process through the use of ICT in class and outside of class; the use of ICT in the course of modernization of the educational environment, which definitely affects the spread of quality education.

The use of multimedia in the educational process in all disciplines is an attempt to increase the intensity of the educational process, optimise it, motivate students to study each subject, contribute to the spread of the principles of educational development of the pace of education. Information and communication technologies contribute to the improvement of critical thinking skills, mental work abilities, develop the ability of students to work individually, occupy an important place in the process of motivational encouragement and the motivational sphere during educational activities.

Society at the present stage of development is considered informative. This property requires the full use of ICT. For example, in the textbook "Informatisation of education" by S.G. Grigoriev and V.V. Grinshkun states that one of the main areas of application of these technologies is the educational process [20]. According to him, modern education is unimaginable without the use of ICT in all possible forms. Therewith, the means of informatisation are used: for the purpose of studying information technologies themselves and studying other fields of knowledge.

Based on computerisation, the emergence of "electronic schools" is discussed, the main requirement of which will be equipping all classes with the necessary technical means. It should be noted that informatization also requires the creation of a modern form of educational environment, due to the introduction of digital tools, namely ICT. It is necessary to consider the general purposes of using ICT in education. Kh.Ya. Denilkhanova & P.R. Muradova [21] describe them in the study "The purposes of the introduction of ICT in education", namely: improvement of all levels of the educational process; personal development of a student (preparation for different life circumstances); fulfilment of social order.

Currently, there are many classifications of all types of electronic technologies. E. Stoyanova *et al.* [22] present one of them in the paper “Typology of e-learning technologies for foreign languages”. This classification is the basis for the consideration of this subject. Based on this classification, information and communication technologies are divided into the following three groups, depending on their main purpose: demonstration technologies; technologies based on Internet resources; multimedia technologies.

E. Stoyanova *et al.* [22] define presentations and an interactive whiteboard as demonstration technologies. Regardless, these are technologies that are used to present information. From this position, the Professor emphasises the considerable advantage of an interactive whiteboard over a conventional one and discusses the opportunities provided by an interactive whiteboard. The multimedia content of the blackboard and the presence of certain programmes allow “creating a lively interaction of students with educational resources in the classroom, introducing additional materials into the classroom, improving the presentation of educational material”. Among the most important opportunities: effective use of time in the classroom, improvement of cognitive activity of students by creating a problematic situation in the classroom, better implementation of the principles of visibility and accessibility in the classroom.

To the second group, E. Stoyanova *et al.* [22] attribute technologies based on the use of the Internet, which today can be considered as “an analogue or alternative to conventional printed textbooks and teaching aids”. Today, the Internet is an indispensable element in all spheres of life. It confidently took a leading position, raised many controversial issues and, thus, appeared in many studies as an independent subject. Studies have shown that more than 90% of young people use the Internet daily. The use of the Internet in the course of education today is an important and to some extent mandatory tool of educational activity, the result of which is the creation of an information base of education and science. Finally, according to E. Stoyanova *et al.* [22], the third group includes “computer tools that simultaneously present information in various forms (text, audio, graphics, video information) using sound, animated computer graphics, video, and make it accessible to humans for interaction with it”.

The definition of “multimedia” should be considered in more detail. In G.Zh. Abylova's [23] study, multimedia is presented as “a combination of statistical and dynamic forms of information presentation that can be interactively controlled and simultaneously presented in an application”. It can be a combination of animation and sound, or video and text. Moreover, the level of training of students can reach 75% due to the use of a wide range of multimedia applications.

For comparison, another classification can be considered. Unlike E. Stoyanova *et al.* [22], G.M. Kiselev [24] give a number of criteria for distinguishing different groups of ICT, including forms of use of data processing technologies; use of communication tools in distance learning; to what extent computers are used in information technologies since computer and information technologies are not identical concepts. One of the distinctive elements of this classification is learning as a technology. Professor

G.M. Kiselev [24] divides information and communication technologies into interactive and mixed lessons depending on the type of use. That is, information and communication technologies in this case are considered not just as a kind of electronic resource for presenting or collecting information, but as general instructions for using these resources. Depending on the second criterion, this division is divided into “specialised, auxiliary, and functional ITs”. Depending on the use of IT in distance learning, local and network information technologies are distinguished [24-26].

The last criterion, assuming the use of computers, allows filtering out non-computer or computer technologies. Therewith, computer ICTs are divided into technologies with digital educational resources; multimedia technologies; distance learning technologies [27; 28].

Therefore, it should be noted that the introduction of ICT into the educational environment opens up additional didactic opportunities for the teacher, namely:

- instant feedback between the user and ICT tools, allowing for an interactive dialogue;

- computer visualisation of educational information using the capabilities of modern visualisation tools of objects, processes, phenomena (real and virtual) and their models, their representation in the dynamics of development, in temporal and spatial movement with the preservation of the possibility of dialogue with the programme [29-32];

- computer modelling of the studied objects, their interrelations, phenomena, processes occurring realistically and virtually;

- automation of computing and information activities, processing of the results of an educational experiment, both actually conducted and presented virtually on the screen, with the possibility of multiple repetitions of a fragment or the experiment itself, which allows indicating the results of experiments, appropriately adjusting the values of parameters (for example, physical quantities) to the conditions of the experiment, formulating the hypothesis of the experiment, testing it, changing the studied situation according to the data obtained during the experiment [33-36];

- automation of organisational management of educational activities and control of the results of educational material assimilation: creation and distribution of organisational and methodological materials, downloading and broadcasting over the network, etc. [37-39];

- automation of information activity and information interaction in educational institutions and in the educational system [40];

- creation of a unified educational environment.

A computer network connected to the Internet provides the subject of the educational process with the opportunity to receive an answer to any of the information resources, thus, it should be noted that in the educational process, ICT provides a large number of undeniable advantages over established approaches to education, namely:

- the dynamics and rationality of educational activity increases;

- the amount and quality of educational information that the teacher can provide students with increases;

- a completely new form of students' educational activity is formed, in which the teacher acts as an active organizer of the educational environment;
- individual training of each student, if each one performs the number of tasks that are available to them specifically;
- objectivity of evaluation, because students are evaluated by a teacher without subjective views and interests, and computer programs;
- more supervision during educational activities, because on the computer the teacher can create special conditions that are not demonstrated or do not exist in reality;
- the involvement of ICT made it possible to reproduce educational material without restrictions and at very low costs, to quickly and concretely convey it to each student (that is, in fact, to download various educational programs or data from the Internet and use it in the course of educational activities) [41-44].

After analysing the obtained results, it is worth concluding that due to the involvement of ICT, the educational environment becomes digital and modernized, independent work becomes a priority. The use of digital resources and tools in the educational process not only significantly contributes to the development of its quality, but is also reflected in the improvement of a wide range of methods and views on learning, while increasing the motivation for in-depth mastering of the basics of the educational discipline.

Conclusions

The introduction of ICT is not a determined social challenge, but a full-fledged need that is necessary for the successful future development of education. The use of Internet resources enables teachers introduce students to a unique set of materials for learning about the surrounding world, conducting excursions in geography and literature lessons, making virtual trips to museums of writers and artists, learning more about their biographies and creativity, and providing the opportunity to get acquainted with works that are not always available in printed illustrative materials. The introduction of ICT in the educational activities provides the necessary conditions for the development and provision of completely new

References

- [1] Rao JDP, Dewangan P, Sahu KM. Effectiveness of information and communication technologies in the educational process. *J Crit Rev.* 2020;7(19):848–852.
- [2] Bersirova A, Khakunova F, Khakunov N, Shkhakhutova Z, Grebennikova V. The influence of information and communication technologies in the educational process of the university. *Web Conf.* 2021;258:07070. DOI: 10.1051/e3sconf/202125807070
- [3] Okoye K, Nganji JT, Hosseini S. Learning analytics: The role of information technology for educational process innovation. *Adv Intell Syst Comput.* 2021;1180:272–284. DOI: 10.1007/978-3-030-96299-9_46
- [4] Sánchez-Otero M, García-Guilianny J, Steffens-Sanabria E, Hernández-Palma H. Pedagogical strategies in teaching and learning processes in higher education including information and communication technologies. *Informacion Tecnologica.* 2019;30(3):277–286. DOI: 10.4067/S0718-07642019000300277
- [5] Vargas Chagna LV, Vargas Chagna ME, Navarro Chacua RM, Guzmán Terán AJ, Ayala Bastidas JA. Diagnosis of the use of information and communication technologies in dual training. case study: Textile confection career at “Instituto superior tecnológico cotacachi”. *Adv Intell Syst Comput.* 2020;1110:72–84.
- [6] Granados Maguiño MA, Romero Vela SL, Rengifo Lozano RA, Garcia Mendocilla GF. Technology in the educational process: New scenario. *Rev Venez Gerencia.* 2020;25(92):1809–1823.

foundations of the educational environment of professional development for teachers and students. Information and computer technologies are becoming an integral part of public life, they facilitate human activity and contribute to the timely processing, transmission, storage, and presentation of information to the user. These technologies are being implemented in various fields of human activity and are very common in modern education.

Information technology is an extremely priority sphere of social life, as it affects the organization and regulation of all relations in the world of today. They to provide the necessary conditions for high-quality economic development and social well-being for the individual and society in general, although many teachers are not ready for change, ICTs must be accepted as a given of the modern world. However, knowledge in the field of ICTs and motivation to use them in work activity remain at a low level. In modern society, in which the leading place is occupied by information and the process of digitalization, it is the informational culture of the individual that is its characteristic feature, especially in the context of professional activity. Based on this, there is a change in the tasks of the educational process and its importance in the process of state development. The computerisation of the education sphere should be ahead of the computerisation of other spheres of human activity, since abilities acquired in the educational activities underlie all types of activities, determine their area, speed of development, and usefulness.

To summarise, it can be stated that the work of a teacher today cannot do without implementation of ICT. It is clear that in the future, with the expansion of computer capabilities to process information, the development of artificial intelligence and new software, the computer will become not only a multifunctional tool but also an active participant in preschool education, so people need to be prepared to introduce ICT into their workflow.

Acknowledgements

None.

Conflict of Interest

None.

- [7] Cvetković BN, Gligorijević M, Petković D, Jović S, Milovančević M, Nikolić V. Evaluation of information and communication technology sector in the teaching process and strategic collaboration between universities and industry. *Comput Appl Eng Educ.* 2019;27(3):653–662. DOI: 10.1002/cae.22105
- [8] De-la-Hoz-Franco E, Martínez-Palmera O, Combata-Niño H, Hernández-Palma H. Information and communication technologies and their influence on the transformation of higher education in Colombia to boost the global economy. *Informacion Tecnologica.* 2019;30(1):255–262.
- [9] Eftekhari Z, Ziaei S. New educational system and information and communication technology's influence on the process of information seeking behavior: Case of students of Islamic higher education. *Int J Inf Sci Manag.* 2019;17(1):73–82.
- [10] Al Njadat EN, Al-Ja'afreh S, Almsaiden AH. Educational technology and its impact on the efficiency of the educational process in higher education. *Cypriot J Educ Sci.* 2021;16(4):1384–1394. DOI: 10.18844/cjes.v16i4.5987
- [11] Chancusig Chisag JC, Gamboa JC. The model of adoption of the information and communication technology for the teaching process-learning: Case Universidad Tecnica de Cotopaxi. *J. Ponte.* 2019;75(1). DOI: 10.21506/j.ponte.2019.1.6
- [12] Siswanto D, Priyandoko G, Tjahjono N, Putri RS, Sabela NB, Muzakki MI. Development of information and communication technology infrastructure in school using an approach of the network development life cycle method. *J Phys Conf Ser.* 2021;1908(1):012026. DOI: 10.1088/1742-6596/1908/1/012026
- [13] Strbo M. Modern e-learning based information and communication technologies (ICT) as a part of teaching process. In: Proceedings of the 6th International Conference on Inventive Computation Technologies; 2021 Jan. 20-22; Coimbatore. Coimbatore: RVS Technical Campus; 2021. P. 1212–1218.
- [14] Wiyono BB, Indreswari H, Prestiadi D. The use of technology-based communication media in the teaching-learning interaction of educational study programs in the pandemic of Covid-19. In: Proceedings of 2021 IEEE 11th International Conference on Electronics Information and Emergency Communication; 2021 Jun. 18-20; Beijing. Beijing: IEEE Press; 2021. P. 103–107.
- [15] Utéza M, Reffay C. Distance learning in the time of covid-19 lockdown: New opportunities for information and communication technologies in education? 2021:91–98 [cited 2023 Jan. 08]. Available from: <https://files.eric.ed.gov/fulltext/ED622403.pdf>
- [16] Triyono A, Nuariyani NW. Information and communication technology (ICT) and women empowerment in Indonesia. *Humanit Soc Sci Rev.* 2019;7(3):255–260.
- [17] Cervantes-López MJ, Pena-Maldonado AA, Ramos-Sanchez A. Use of information and communication technologies as a support tool for medical students' learning. *CienciaUAT.* 2020;15(1):162–171. DOI: 10.29059/cienciauat.v15i1.1380.
- [18] Tselykh M. Communication and information technologies in preparing students for research work. *Int J Media Inf Lit.* 2019;4(2):60–65.
- [19] Jaiswal P. Integrating educational technologies to augment learners' academic achievements. *Int J Emerg Technol Learn.* 2020;15(2):145–159. DOI: 10.3991/ijet.v15i02.11809
- [20] Grigoriev SG, Grinshkun VV. Informatization of education. Fundamentals. Moscow: Nauka; 2005.
- [21] Denilkhanova KhYa, Muradova PR. The goals of introducing ICT tools into education. *New Sci From Idea Result.* 2016;2-2:104–107.
- [22] Stoyanova E, Bartosh D, Galskova ND, Kharlamova M. Typology of e-learning technologies for foreign languages. *Stud Linguist Cult FLT.* 2017;2:48–59.
- [23] Abylova GZh. The role and place of multimedia in education. *Int Sci Rev.* 2016;15(25):28–29.
- [24] Kiselev GM. Information technologies in pedagogical education. Moscow: Dashkov and K; 2014.
- [25] Abdikerimova G, Shekerbek A, Tulenbayev M, Beglerova S, Zakharevich E, Bekmagambetova G, Manbetova Z, Baibulova M. Detection of chest pathologies using autocorrelation functions. *Int J Electr Comp Engin.* 2023;13(4):4526–4534. DOI: 10.11591/ijece.v13i4.pp4526-4534
- [26] Zholmagambetova B, Mazakov T, Jomartova S, Izat A, Bibalayev O. Methods of extracting electrocardiograms from electronic signals and images in the python environment. *Diagnost.* 2020;21(3):95–101. DOI: 10.29354/diag/126398
- [27] Latka D, Waligora M, Latka K, Miekisiak G, Adamski M, Kozłowska K, Latka M, Fojcik K, Man D, Olchawa R. Virtual Reality Based Simulators for Neurosurgeons - What We Have and What We Hope to Have in the Nearest Future. *Adv Intell Syst Comput.* 2018;720:1–10.
- [28] Latka K, Kolodziej W, Domisiewicz K, Pawus D, Olbrycht T, Niedzwiecki M, Zaczynski A, Latka D. Outpatient Spine Procedures in Poland: Clinical Outcomes, Safety, Complications, and Technical Insights into an Ambulatory Spine Surgery Center. *Healthcare.* 2023;11(22):2944. DOI: 10.3390/healthcare11222944
- [29] Nurdaulet I, Talgat M, Orken M, Ziyatbekova G. Application of fuzzy and interval analysis to the study of the prediction and control model of the epidemiologic situation. *J Theor Appl Inform Technol.* 2018;96(14):4358–4368.
- [30] Mazakov TZ, Jomartova SA, Shormanov TS, Ziyatbekova GZ, Amirkhanov BS, Kisala P. The image processing algorithms for biometric identification by fingerprints. *News Nation Acad Sci Rep Kazakhstan, Ser Geol Tech Sci.* 2020;1(439):14–22. DOI: 10.32014/2020.2518-170X.2
- [31] Okrój S, Jatkiewicz P. Differences in performance, scalability, and cost of using microservice and monolithic architecture. In: Proceedings of the

- ACM Symposium on Applied Computing (pp. 1038–1041). Tallinn: Association for Computing Machinery; 2023. DOI: 10.1145/3555776.3578725
- [32] Zaki HO, Ab Hamid SN. The Influence of Time Availability, Happiness, and Weariness on Consumers' Impulse Buying Tendency amidst Covid-19 Partial Lockdown in Malaysia. *J Pengurus.* 2021;62:81–90. DOI: 10.17576/pengurusan-2021-62-07
- [33] Hou R, Ye X, Zaki HBO, Omar NAB. Marketing Decision Support System Based on Data Mining Technology. *Appl Sci.* 2023;13(7):4315. DOI: 10.3390/app13074315
- [34] Kondratenko YP, Encheva SB, Sidenko EV. Synthesis of intelligent decision support systems for transport logistics. *Proceed 6th IEEE International Conf Intell Data Acquis Adv Comput Syst: Technol Applic, IDAACS'2011.* 2011;2:642–646. DOI: 10.1109/IDAACS.2011.6072847
- [35] Stepanchuk O, Bieliatynskyi A, Pylypenko O. Modelling the Bottlenecks Interconnection on the City Street Network. *Adv Intell Syst Comput.* 2020;1116 AISC:889–898.
- [36] Mazakova A, Jomartova S, Mazakov T, Shormanov T, Amirkhanov B. Controllability of an unmanned aerial vehicle. In: ENERGYCON 2022 - 2022 IEEE 7th International Energy Conference, Proceedings. Riga: Institute of Electrical and Electronics Engineers; 2022. DOI: 10.1109/ENERGYCON53164.2022.9830244
- [37] Mazakov T, Jomartova S, Ziyatbekova G, Aliaskar M. Automated system for monitoring the threat of waterworks breakout. *J Theor Appl Inform Technol.* 2020;98(15):3176–3189.
- [38] Orazbayev B, Orazbayeva K, Uskenbayeva G, Dyusseimbina E, Shukirova A, Rzayeva L, Tuleuova R. System of models for simulation and optimization of operating modes of a delayed coking unit in a fuzzy environment. *Sci Rep.* 2023;13(1):14317. DOI: 10.1038/s41598-023-41455-0
- [39] Zaki HO, Rashid SFA, Adznan S. Media Sosial dan Iklan Tajaan: Analisis Bibliometrik dan Rangkaian (Social Media and Sponsored Ads: Bibliometric and Networking Analysis). *J Pengurus.* 2023;68(2023). DOI: 10.17576/pengurusan-2023-68-05
- [40] Kondratenko YP, Kozlov OV, Gerasin OS, Zaporozhets YM. Synthesis and research of neuro-fuzzy observer of clamping force for mobile robot automatic control system. *Proceed 2016 IEEE 1st Int Conf Data Stream Mining Process DSMP 2016.* 2016;1:90–95. DOI: 10.1109/DSMP.2016.7583514
- [41] Bezshyyko O, Bezshyyko K, Dolinskii A, Kadenko I, Yermolenko R, Ziemann V. Numerical model of an internal pellet target. *AIP Conf Proceed.* 2005;773:437–439. DOI: 10.1063/1.1949580
- [42] Belytskyi D, Yermolenko R, Petrenko K, Gogota O. Application of machine learning and computer vision methods to determine the size of NPP equipment elements in difficult measurement conditions. *Machin Energet.* 2023;14(4):42–53. DOI: 10.31548/machinery/4.2023.42
- [43] Rzhetskyi A, Gozhyj A, Stefanchuk A, Oborska O, Lozynska O, Myklich K, Basyuk T. Development of mobile application for choreographic productions creation and visualization. *CEUR Workshop Proceed.* 2019;2386:340–358.
- [44] Chyrun L, Gozhyj A, Yevseyeva I, Dosyn D, Tyhonov V, Zakharchuk M. Web content monitoring system development. In: CEUR Workshop Proceedings (vol. 2362). Kharkiv: CEUR-WS; 2019.

Використання сучасних інформаційно-комунікаційних технологій в освітньому процесі

Куміссай Аvezова*

Докторант
Казахський національний педагогічний університет імені Абая
050010, просп. Достик, 13, м. Алмати, Республіка Казахстан
<https://orcid.org/0000-0003-4720-6586>

Анарбек Козібай

Доктор педагогічних наук, професор
Казахський національний педагогічний університет імені Абая
050010, просп. Достик, 13, м. Алмати, Республіка Казахстан
<https://orcid.org/0009-0001-1199-2557>

Олена Байзакова

Кандидат педагогічних наук, доцент
Казахський національний педагогічний університет імені Абая
050010, просп. Достик, 13, м. Алмати, Республіка Казахстан

Жанар Жумагалісва

Кандидат технічних наук, старший викладач
Казахський національний педагогічний університет імені Абая
050010, просп. Достик, 13, м. Алмати, Республіка Казахстан
<https://orcid.org/0009-0009-3108-9793>

Мадіна Тукен

Магістр, викладач
Казахський національний педагогічний університет імені Абая
050010, просп. Достик, 13, м. Алмати, Республіка Казахстан

Анотація

Актуальність. Сучасні суспільні умови в галузі освіти зумовлюють модернізацію освітнього процесу, яка характеризується використанням у ньому широкого спектру інформаційно-комунікаційних технологій (ІКТ). Школа впроваджує реформу, вирішуючи тактичні, методичні та організаційні завдання. Це пов'язано з тим, що впровадження вищезазначених інструментів дозволяє раціонально організувати освітню діяльність, зокрема, пришвидшити процес донесення інформації вчителем, що безумовно сприяє розвитку всього освітнього середовища. Відповідно, вчителі надихаються на пошук сучасних методів викладання, підвищується рівень їхнього професійного розвитку та компетентність батьків, це звільняє їх від непродуктивної рутинної роботи.

Мета. Мета дослідження – проаналізувати та дослідити способи використання ІКТ в освітній діяльності та визначити найбільш ефективні з них.

Методологія. Для досягнення мети дослідження були застосовані різні методи наукового пошуку, а саме: аналіз і синтез, порівняння та типологізація, що дозволило в повній мірі виконати всі поставлені завдання цього дослідження.

Результати. Також було досліджено усталені підходи до використання сучасних засобів навчання в освітній діяльності залежно від віку та рівня володіння персональним комп'ютером (ПК) учнів. Встановлено, що сучасний навчальний заклад та його педагогічний колектив мають бути готовими до використання ІКТ як технічно (забезпечення навчальних аудиторій усім необхідним обладнанням), так і інтелектуально (вчитель повинен знати і вміти використовувати інформаційно-комунікаційні технології під час професійної діяльності та допомагати іншим набуті цієї навички).

Висновки. Необхідно констатувати той факт, що більшість навчальних закладів не відповідають двом вищезазначеним критеріям використання ІКТ. Практична цінність дослідження полягає у можливості використання тестів статті у педагогічній практиці. Також, стаття може допомогти у підготовці навчально-методичних посібників з відповідних предметів.

Ключові слова: електронні засоби навчання; мультимедіа; персональний комп'ютер; освіта; студент.