

Implementation of Information and Communication Technologies in the Educational Process

Information technology largely determines further economic and social development of mankind. Intensification of learning, which is characterized by an increase in the amount of educational material and a decrease in the time of assimilation, requires the search for effective teaching methods, control tools for knowledge acquisition that would significantly improve the quality of learning. Now, high-quality teaching of disciplines can not be carried out without the use of facilities and capabilities provided by computer technology. The use of computers in education has led to the emergence of a new generation of information educational technologies that can improve the quality of learning, create new means of influence, and interact more effectively with educators and students. New informational educational technologies based on computer facilities make it possible to significantly increase the efficiency of education. The article provides a comprehensive analysis of the current state of information and communication technologies in our education and proposes solutions to the methodological and organizational problems of informatization of education.

Key words: information technology, educational process, education system, informatization, computerization.

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Впровадження інформаційно-комунікаційних технологій в освітній процес

Інформаційні технології значною мірою визначають подальший економічний та суспільний розвиток людства. Інтенсифікація навчання, що характеризується збільшенням обсягу навчального матеріалу та зменшенням часу на його засвоєння, потребує пошуку ефективних методів навчання, засобів контролю рівня опанування знань, які б значно підвищували якість навчання. Зараз якісне викладання дисциплін неможливо здійснювати без використання тих можливостей, що надають комп'ютерні технології. Застосування комп'ютерів та інших гаджетів в освіті спричинило появу нового покоління інформаційних освітніх технологій, що дають змогу підвищити якість навчання, створити нові засоби впливу, а педагогам – ефективніше взаємодіяти зі студентами. Нові інформаційні освітні технології на основі комп'ютерних засобів дозволяють значно підвищити ефективність навчання. Надано всебічний аналіз сучасного стану інформаційно-комунікаційних технологій у вищій освіті України й запропоновано засоби вирішення методичних та організаційних проблем інформатизації освіти.

Ключові слова: інформаційні технології, освітній процес, система освіти, інформатизація, комп'ютеризація.

Today, information technologies have become an integral part of the modern world, they largely determine the further economic and social development of mankind. In these conditions qualitative changes also require a system of training. The urgency of this issue takes place in the modern educational environment, as today qualitative teaching of disciplines can not be carried out without the use facilities provided by computer technologies and the Internet. They enable the teacher to better present the material, make it more interesting, quickly check knowledge and increase interest in learning.

In recent years, the question of using the latest information technologies in the educational process [1–8] is increasingly being raised. These are not only new technical means, but also new forms and methods of teaching, a new approach to the learning process. Outdated methods and means of training do

not meet the current requirements of the modern lesson and are not subject to trends of rapid development of scientific and technological progress. This encourages teachers to introduce innovative teaching methods and the use and adaptation of these technologies in the learning process.

The meaningful basis of mass computerization in education, of course, is due to the fact that a modern computer is an effective means of optimizing the conditions of mental labor in general, in any of its manifestations.

The article gives a comprehensive analysis of the current state of information and communication technologies in our education and proposes ways of solving educational and organizational problems of informatization of education.

Use of information and communication technologies in the educational process

The modern period of development of a civilized society characterizes the process of informatization.

Informatization is one of the main directions of the modern scientific and technological revolution, which is based on the transition from the industrial stage of development of society to information. It is a process of restructuring the life of society based on the use of reliable, comprehensive and timely knowledge in all socially significant activities.

Informatization of society is a global social process, the peculiarity of which is that the collection, accumulation, production, processing, storage, transmission and use of information based on modern means of microprocessor and computer technology is the dominant type of activity in the sphere of social production, as well as on the basis of various means of information exchange.

Computerization of society is connected, first of all, with the development of computer technology, various software, global networks (Internet), multimedia technologies.

The emergence and development of information society implies widespread use of information and communication technologies in education.

Informatization of education in Ukraine is one of the priority directions of reformation. In the broad sense, it is a complex of socio-pedagogical transformations related to the saturation of educational systems with information products, means and technology, in the narrow – the introduction into the institutions of education of information systems based on microprocessor technology, as well as information products and pedagogical technologies, based on these tools.

One of the important directions of the development of informatization of education is new computer technologies. Interactivity, the intensification of the learning process, the feedback of the significant advantages of these technologies, which determined the need for their application in various fields of human activity, especially those related to education and vocational training. Currently, the

number of studies has grown significantly, the subject of which was the use of information and communication technologies in the educational process [1–8].

Information and communication technologies are means related to the creation, storage, transmission, processing and management of information. This widely used term includes all the technologies used to communicate and work with information.

With the advent of personal computers, the term "new information technologies" was introduced, which implies the introduction of new approaches to the educational process that is oriented towards the development of intellectual and creative potential of a person in order to increase its efficiency, due to the use of modern technical means.

New information technologies are characterized by the presence of the World Wide Web, such services as e-mail, telecommunications, providing a wide range of opportunities. Live communication is inseparable from information technology, therefore, at the present stage of development of technical and software information, technologies are called information and communication. In these communications, the computer takes its place. It provides a comfortable, individual, diverse, highly intelligent interaction of communication objects.

In general, information and communication technologies can be defined as a set of diverse technological tools and resources that are used to provide a communication process and create, disseminate, preserve and manage information. Under technological tools and means, computers, the Internet, radio and television programs, as well as telephone communications, are meant. Combining information and communication technologies, designing them for educational practice, it should be noted that the main task before their introduction is adaptation of a person to life in the information society.

Information and communication technologies affects all spheres of human activity, but, apparently, they have the strongest positive impact on education, since they open the door to introducing completely new methods of teaching and learning.

The main directions of the formation of a perspective educational system that are of fundamental importance for Ukraine are:

- improving the quality of education through its fundamentalization, informing students about the current achievements of science in a larger and faster pace;
- ensuring the orientation of training on new technologies of information society and, above all, on information and communication technologies;
- ensuring greater access to education for different groups of the population;
- raising the creative potential of education.

Educational technologies are one of the main elements of the education system, since they are directly aimed at achieving the main goals: education and upbringing. Under educational technologies are understood as the implementation of curriculums and curriculum, and the transfer of student, student knowledge

system, as well as the use of methods and tools for creating, collecting, transmitting, storing and processing information in a particular industry. Science has accumulated vast experience in transferring knowledge from a teacher to a student, creating education and training technologies, and building their models.

The use of modern information technology in education is one of the most important and steady trends in the development of the world educational process. In the domestic educational institutions in recent years, computer technology and other means of information and communication technologies have become increasingly used in the study of most educational subjects.

Informatization has significantly influenced the process of acquiring knowledge. New information and communication technologies training can intensify the educational process, increase the speed of perception, understanding and depth of assimilation of vast arrays of knowledge.

Among the important components of computerization training is the development of software. Programs used in educational institutions are divided into:

– training (directing learning based on available knowledge and individual abilities of students, as well as facilitating the learning of new information);

– diagnostic (test) (intended for diagnostics, testing, evaluation of knowledge, abilities, abilities);

– training (intended for repetition of the fixation of the passed educational material);

– databases (repositories of information from different branches of knowledge, which searches for search in various fields of knowledge find the necessary information);

– simulation (representing a certain aspect of reality by means of parameters for studying its basic structural or functional characteristics);

– modeling (reflecting the main elements and types of functions, modeling a certain reality);

– programs of the type "microcosm" (similar to simulation, but do not reflect reality, they create a virtual learning environment);

– instrumental software (providing specific operations, that is, text processing, drawing up tables, editing graphic information).

The use of information and communication technologies makes it possible to solve the following urgent issues:

- to use the latest information technologies in learning;
- improve skills of independent work of students in information databases, Internet;

- intensify historical education, improve student learning of school history, make the learning process more interesting and meaningful.

The use of information and communication technologies, complete with the traditional textbook, contributes to the following:

- provides a person-centered and differentiated approach to learning;

- ensures the implementation of an interactive approach;
- Increases cognitive activity due to various video and audio information;
- controls through testing and a self-checking system.

One of the important features and benefits of information and communication technologies in comparison with other educational tools is that multimedia programs are primarily designed to actively engage students with knowledge, skills and abilities. Already, the very construction, didactic direction and the solution of the educational (scientific) problem involves active mental activity of students. They can choose the optimal pace of work with the multimedia program in accordance with individual mental, psychological and physiological capabilities and interests; to check the correctness of the answers, to use the visual-auditory and textual information required in the process of perceiving and mastering the knowledge.

Using electronic publications, all types of control can be implemented on the basis of specially designed computer programs. This removes the part of the load from the teacher and increases the efficiency and timeliness of control.

Improving the education system on the basis of information technology, the wide introduction into the educational process of information and communication technologies led to the emergence of virtual universities, an open education system.

The implementation of open education can be accomplished through distance education, which is regarded as a kind of educational system in which the use of distance learning technologies and the organization of educational process is predominantly used, or as one of the forms of education by which mastery of one or another of its levels by that or another specialty is carried out in the course of studying at a distance.

Distant education is a pedagogical system of open educational services provided to the general population at home and abroad through a specialized informational educational environment based on distance learning technologies (multimedia, network, telecommunication, TV technologies, etc.). Distance education involves the realization of open and accessible learning for all, regardless of where the person lives.

Computerization of society is connected, first of all, with the development of computer technology, various software, global networks (Internet) and multimedia technologies.

Multimedia media play an important role in the development of the information society. Multimedia education is a set of hardware and software that allows the user to communicate with the computer, using a variety of natural environment for themselves: graphics, hypertexts, sound, animation, video. Multimedia systems provide the user of a personal computer the following types of information: text; image; animated pictures; audio comments; digital video technologies that allow using a computer to integrate, process and simultaneously

reproduce various types of signals, different environments, means of information exchange, called multimedia.

There are various means of using multimedia in the educational process, among which:

- use of electronic lecturers, simulators, textbooks, encyclopedias;
- development of situational-role and intellectual games using artificial intelligence;
- modeling of processes and phenomena;
- provision of distance learning;
- conducting interactive educational teleconferences;
- construction of control and checking systems of knowledge and skills of students (use of controlling test programs);
- creation and support of educational institutions' sites;
- creation of presentations of educational material;
- implementation of projective and research activities of students, etc.

Benefits of using information and communication technologies in the learning process:

- increasing interest and general motivation for learning through new forms of work and involvement in a priority area of scientific and technological progress;
- individualization of training: everyone works in a mode that satisfies him;
- objectivity of control;
- enhancing learning through the use of attractive and fast-changing forms of information, competitions of students with the machine and with oneself, the desire to get a higher score;
- formation of skills and abilities for creative activity;
- education of information culture;
- mastering the skills of operational decision-making in a difficult situation;
- students access to information banks, the ability to quickly obtain the necessary information;
- intensification of independent work of students;
- increase in the volume of tasks performed;
- increase motivation and cognitive activity due to a variety of forms of work, the possibility of the inclusion of the playing torque;
- expansion of information flows when using the Internet.

Possibilities of use of information and communication technologies in the educational process

Mankind has always tried to use all the possibilities of available modern technology to teach the younger generation. The emergence of a computer capable of processing enormous amounts of information has brought society closer to a qualitatively new stage of development – the information society. It should

be noted the main directions of using computers in the learning process: teaching technology that requires active use of the computer (graphic and text editors, work in computer networks); training for specialized technologies (computer design and animation, layout and layout, music creation, etc.); the study of computer science as a science that considers information and logic models; use of a computer as a technical tool in the study of the foundations of science.

The systematic inclusion of information and communication technologies in the educational process will ensure the formation and development of information and communication culture of pedagogical workers and pupils.

Areas and perspectives of application of information technologies in Ukraine and in the world

Today's world has moved on to a new stage in life, where information plays the main role, as well as the economy that is being built on it. The modern development of the information society is directly related to the need to collect, process and transfer huge amounts of information, the transformation of information into the product, as a rule, significant value. This has led to a global transition from an industrial society to information. The emergence of the World Wide Web has led to a large-scale growth of international communication in various spheres of human life. Information technology provides the ability to work correctly with information and computer technology.

Information technologies should be understood as the complex of interrelated, scientific, technological, engineering disciplines studying the methods of efficient organization of labor of people engaged in the processing and storage of information; computer technology and methods of organization and interaction with people and production equipment, their practical applications, as well as all social, economic and cultural problems associated with them.

Information technology is one of the most important achievements of human activity. They facilitate the organization of communications at all levels of government and is an integral part of creating the foundations for accelerated development of the information society. They provide some opportunity to reduce the material and energy intensity of both individual production and the national economy as a whole. Many world countries have created special conditions for the development of information technology in order to obtain the greatest results from participation in the markets for their implementation, which are actively developing right now. The volumes of development of the market of information systems and technologies in the world exceed 20 % per year. It is important that information systems enable the processing of a large amount of information in real time and access to it from almost anywhere using databases.

It is necessary to stimulate, support and create conditions for the development of information.

Models of basic information technologies in education

For the logical level of computer science is characterized by the improvement of existing, the creation and development of new information technologies. Developed both the theory and the practice of information technology. The methodology is developing, the means of information technologies are improved.

Within the framework of basic technologies, develop specific technologies that solve problems in selected subject areas. Considering that now the rate of conversion of production technologies has become faster than the rate of change of generations, it is necessary not only improvement and additional training, but also repeated development of new types of activity during working life.

Therefore, in the information society there is a problem of learning, and continuous education becomes an integral part of every person's life. In these conditions, informatization means the change of the entire educational system with its orientation towards a new information culture. The development of a new information culture can largely be realized through the introduction of promising information technologies into the educational process, education management and everyday life.

First of all, one should pay particular attention to the problem of providing the field of education with the theory and methodology of both development and effective use of new means of information technology. The theory of information technology should determine the models of basic information processes related to receiving, collecting, transmitting, processing, storing, storing and presenting information. A special place is occupied by models of formalization and knowledge representation.

The allocation of basic information technologies, which can already be attributed to technologies of distributed storage and processing, office technologies, multimedia technologies, geoinformation technologies, information security technologies, CASE technologies, telecommunication technologies, is very relevant. On the basis of the basic applied application information technologies are developed in the fields of application, which allows to receive specific products of the appropriate purpose in the form of means, systems, environments.

Prospects for the application of information technology

Methodically new information technologies in education should be developed with a focus on a specific application. Part of the technology can support the learning process (lectures and practical classes), other technologies can effectively support the development of new textbooks and manuals. Information technologies will also help to effectively organize pilot studies in universities. Particular importance of information technology is acquired with independent work of students on a home computer using modern modeling techniques.

With the introduction of modern information technologies, new opportunities are opened up into education. On the basis of multimedia technology, it is possible to create textbooks, manuals and other teaching materials on the machine carrier, which can be divided into some groups:

1. Textbooks, which are a textual presentation of the material with a large number of illustrations, which can be installed on the server and transmitted over the network to a home computer. With a limited amount of material, this tutorial can be implemented in direct user access to the server;

2. Textbooks with high dynamics of illustrative material. Along with the main material they contain means of interactive access, animation tools, as well as video, in dynamics demonstrate the principles and methods of implementing individual processes and phenomena. Such textbooks can have not only educational, but also artistic purpose. The enormous amount of memory of the media allows you to implement an encyclopedia, a guide, etc. on one optical disk;

3. Modern computer training systems for teaching and research work. They realize the simulation of both processes and phenomena, that is, they create a new learning computer environment in which they teach;

4. Systems of virtual reality in which a pupil or student becomes a participant in a computer model that reflects the surrounding world. For the competent use of multimedia products of this type, it is extremely important to study their psychological characteristics and negative impacts on the student.

5. Distance Learning Systems. In difficult socio-economic conditions, distance education becomes especially relevant for remote regions, for people with low mobility, as well as for self-education and independent work of students. Effective implementation of distance learning is possible only with the purposeful program of creating high-quality multimedia products for educational purposes from fundamental, natural sciences, general professional and special disciplines.

Very important is the principle of continuity of informational training of students, which should be observed both at the stage of school, and at the transition from school to university level. In the structure of higher education, computer science is a fundamental discipline. Along with computer science in the curriculum of specialties may include a series of courses for information preparation, even for non-technical universities, which need to be improved in order for the computer to become a tool for work in any subject area of graduate work. Informational training includes the teaching of methodology and means of modeling. Creation of a forward-looking information environment for continuing education also requires the solution of a number of methodological and organizational problems, including the following:

1. Adoption of a unified system of software and hardware-compatible means of computing and communication technology used in the continuous learning process. This requires the certification of used training facilities and

the implementation of a program for the establishment of certification centers and their effective use;

2. Connecting educational organizations to a single digital network with the further access to the Internet. The solution to this problem is largely realized at present in higher education and is constrained in school education for financial reasons, as well as the complexity of implementation for remote areas;

3. Formation of a unified information environment of continuing education with the creation of databases in the areas and specialties of training, which would include methodological documents, encyclopedias, directories, textbooks and study aids, as well as additional funds, support the educational process. It is relevant to present our achievements and opportunities to the international network. We need to organize the exchange of information resources of our educational system with the international;

4. There is a need to improve the tools of continuing education focused on accelerated material development and the acquisition of sustainable student skills, and which have the goals of individual learning. These include promising software envelopes for the development of computer textbooks and teaching materials, software and hardware for creating computer training systems, tools for technology development of multimedia products, geographic information systems, ect.;

5. It is necessary to organize the infrastructure of informatization of education as an integral part of informatization of society in general. This structure should ensure the creation, replication and implementation of existing information technologies in continuing education.

Ideologically, when informatization of education it is necessary to take into account a number of fundamental positions:

- evolutionary development of the situation of the methodology of education due to the obvious advantages of new information technologies, namely, the possibility of visual, dynamic presentation of information with the use of video and sound, the use of remote access to familiarize with external and the introduction of their own information resource in education;

- continuity and continuity of computer education at all levels of education from preschool to postgraduate. Continuity can be provided with computer support of all subjects and disciplines of the educational process;

- ensuring the freedom to choose methodology, style and means of learning in order to identify the student's creative abilities in conjunction with the possibility of their collective activity on the basis of information technologies and telecommunication systems;

- creation of a scientifically and methodically based system of basic education on the basis of computer technologies. One of the real ways to solve the problem as a whole is the formation and implementation of regional scientific and technical programs with share state and local budget financing with the

additional use of extrabudgetary funds. The subject of special studies of colleges of the Higher School should be the content, methods and means of developing education as a leading system in the future information society. In this, the fundamental place is taken by methods and means of modeling, on the basis of which one can predict the future. Only in the sustainable development of civilization can we hope for the consistent formation of the noosphere as a sphere of the mind. The future development of mankind must be manageable, and in this aspect, of course, the development of education must also be manageable.

Conclusions

At the present stage of computerization of society, computer technologies are becoming increasingly popular in various spheres of life, and they act as one of the tools of knowledge. In general, education is characterized by a large system, the quality of which is impossible without the use of modern telecommunication and computer storage, processing, transmission, presentation of information.

Intensification of learning, which is characterized by an increase in the amount of educational material and a decrease in the time of assimilation, requires the search for effective teaching methods, means of control of knowledge acquisition that would significantly improve the quality of education.

The introduction of new information technologies into the learning process is an objective process of education development. The increase of computer technology and its further improvement extends the ability of teachers to use computer technology not only in the study of computer science, but also the combination of teaching other disciplines using computer technology. The latest developments in the field of information technology change the means of their application in the study of various disciplines in the learning process.

The use of computers in education led to the emergence of a new generation of information educational technologies [4–8], which allowed to improve the quality of learning, create new means of influence, and interact more effectively with educators and students. New informational educational technologies based on computer facilities enable to significantly increase the efficiency of education.

The article provides a comprehensive analysis of the current state of information and communication technologies in our education and proposes solutions for methodological and organizational problems of informatization of education.

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