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DIGITAL EDUCATIONAL ENVIRONMENT IN INSTITUTIONS OF HIGHER EDUCATION

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DIGITAL EDUCATIONAL ENVIRONMENT IN INSTITUTIONS OF HIGHER EDUCATION

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The monograph presents modern educational technologies that can be used in the educational process of a higher educational institution. The monograph is aimed mainly at students of various study specialties, teachers. The monograph collects the opinions of scientists and teachers regarding the possible use of information technologies in the learning process, considers the main services and tools for evaluating written works, conducting an oral survey, and organizing online testing.

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Chapter 1

Digital technologies in education: possibilities and tendencies of usage

1.1. Prospective technologies of education

When discussing the problems of introducing information technologies into education (informatization of education), the term "information and communication technologies" (ICT) is often used.

The term "ICT" is widely used in official language. At the same time, in the social and political context, the term "digital technologies" (DT) becomes the most popular. Currently, it has acquired a special resonance in connection with the programs of digital transformation of the economy and education.

Going back to history, even half a century ago, computers were highly valued as a tool to increase the effectiveness of teaching and learning processes, but today they have changed qualitatively, they have gone beyond the boundaries of laboratories and turned into an everyday tool that has become widely available, and their potential for improvement educational process has increased significantly.

The main thing that happens in the process of digital transformation of education is not the creation of computer classrooms and Internet connection, but the formation and distribution of new models of work of educational organizations. They are based on a synthesis:

– the emergence of new highly effective pedagogical practices that are successfully implemented in a digital educational environment and are based on the use of digital technologies;

– the need for continuous professional development of teachers;

– new digital tools, information sources and services; – creation of organizational and infrastructural conditions for making the necessary changes.

So, the education system is information production, which is always carried out in an information environment.

The last decades, we have been witnessing a transition from "a paper" to a "digital" information and educational environment. The content of the digital transformation of education consists in achieving the necessary educational results and moving towards the personalization of the educational process based on the use of digital technologies.

The digital transformation of education helps to overcome inequality, primarily the digital divide. Like any new technologies, digital technologies are rapidly improving, becoming cheaper, becoming mass, displacing previous "paper" information technologies. However, this process is uneven: there is a gap between those who have access to digital technologies and those who do not for one reason or another. Such a gap, which arises due to inequality in access to digital technologies, is usually called the "digital divide".

The development of information and communication technologies leads to the reduction of the technological digital divide. But inequality persists between those who use digital technologies actively to perform productive, creative work and those who use them passively to perform traditional routine functions.

In some countries, the technological digital divide in education has already been bridged. All participants in the educational process have mobile digital devices and constant access to high-speed Internet, and a full-fledged digital educational environment is deployed in educational institutions. In Ukraine, this process is being actively implemented, therefore the national strategy for the digital transformation of education envisages the achievement of two goals:

– reducing inequality in access to digital technologies by developing a digital educational environment: connecting educational institutions to high-speed Internet, expanding wireless access zones, developing network services, wide use of modern digital tools by all participants of the educational process;

– overcoming inequality in the use of digital technologies by updating the content, methods and organizational forms of educational work, modernizing educational programs, developing and implementing in practice effective digital educational and methodological materials and transitioning to a personalized organization of the educational process.

The functioning of modern higher educational institutions should take place in a mode of constant renewal and development. According to this

approach, the priority directions are the filling, support and maintenance of information sites, monitoring the level of information and professional competence of teachers, providing information assistance to teachers in creating individual sites, information support of the educational process, and improving the computer and technical literacy of teachers. The use of information and communication technologies in vocational and technical mass institutions makes it possible to create a single information space, where educational normative documents, educational and methodical materials, manuals, recommendations are placed, which will help applicants and teachers to improve the learning process and increase the level of pedagogical skills.

The use of information and communication technologies in institutions of higher education creates conditions for the integration of teachers into the national and international educational space, which enables online information on the results of scientific research in the field of pedagogy, psychology, and the theory of teaching specific educational subjects. There are various ways of using information and communication technologies in the educational process, including: use of electronic lecturers, simulators, textbooks, encyclopedias; development of situational role-playing and intellectual games using artificial intelligence; modeling of processes and phenomena; provision of distance education; conducting interactive educational teleconferences; construction of systems of control and verification of students' knowledge and skills (use of control test programs); creation and support of sites of educational institutions; creating presentations of educational material; implementation of projective and research activities of student youth, etc.

The use of information and communication technologies in the educational process contributes to: increasing the motivation of students to study; informatization of higher education; intensification of the learning process; personality development; development of skills of independent work with educational material; increasing the effectiveness of training due to its individualization

Let's focus on the main modern learning technologies.

Technologies of artificial intelligence of education

Recently, our knowledge about which functions are available to a machine and which only to a human is constantly changing. Experts interpret artificial intelligence (AI) as a field of informatics that combines fundamental

research, promising developments and applied projects, as well as numerous technical solutions and applications.

II methods continue to develop when solving the most diverse groups of tasks: games (chess, poker, Go, etc.), interaction with a computer using natural language, recognition of visual images and handwritten text, building expert systems, systems for automatic car control, machine translation, designing intelligent robots, etc. We can say that artificial intelligence has any technical device that:

– designed to interact with the surrounding world (for example, through visual perception or speech recognition);

– demonstrates intellectual behavior usually characteristic of a person (for example, evaluating available information and making decisions to achieve one's goal).

Cloud computing, mobile Internet and high-speed access to the global network have made systems using AI accessible to mass users. We constantly turn to it, forming search queries, performing machine translation, using chatbots, today children have "Alice", who can also read their favorite fairy tales from the Internet, explains why it is snow and suggests the solution to an arithmetic problem. There is every reason to believe that such innovations will help to transform the current model of education, where the teacher is the only and main source of true knowledge.

Although pedagogical developments using II have appeared relatively recently, several areas of their application have already been identified.

– Intelligent educational systems and chatbots used in a number of schools and universities: personalization of educational work, provision of quick feedback directly during educational work.

– Automated evaluation: the use of pattern recognition and natural language communication methods allows for the automation of evaluation of such educational results that usually require expert evaluation (for example, essays).

– Customizable learning materials: II helps students create their own lecture materials, break textbooks into convenient pieces of information, and generate a summary of the contents of books and other educational literature.

– Educational analytics: using II methods to work with big data and prepare educational analytics in order to increase the effectiveness of educational activities.

– Consulting systems: II methods are used in the construction of information and consulting systems that help to effectively use the possibilities of the digital educational environment.

– Gamification and virtual reality are widely used to organize game situations, increase the visibility of learning, increase the motivation of students, conduct virtual experiments. The combination of AI methods and the Internet of Things (IoT) opens a new perspective for education.

The term "IoT" is used today to describe a variety of technologies for connecting physical objects to a digital network (smartphone, household appliances, etc.). As a result, any object can become "smart", transmit and receive data from other devices over the network, accumulate and use information about what is happening in the real world. The Internet of Things concept is based on the fact that all objects (things) are equipped with various sensors and "communicate" with each other using wireless communication. This opens up unexpected opportunities for creating a "smart" human habitat (smart homes, smart offices, smart cars, etc.).

Today, the growth in the number of "intelligent" (programmable) IoT devices significantly exceeds the growth in the number of traditional end devices (smartphones, tablets, PCs, etc.). This segment of digital technology remains one of the fastest growing. The reduction in cost and proliferation of IoT devices will have an impact on the education system very soon.

Technologies of virtual reality in education

The first experiments in the field of virtual reality (VR) construction using digital technologies began in the USA at the Massachusetts Institute of Technology more than half a century ago.

At that time, the basic idea of VR practically did not change:

– the computer generates an image (three-dimensional image, sound background, etc.);

– the display system transmits this image to the senses of the VR system operator (user);

– sensors attached to the user collect and transmit to the computer information about the user's actions (for example, about turning the head or changing its position in space);

– the computer uses the received information to change the virtual reality formed by it and its generated image, which is received (transmitted) to the user's senses.

Today, VR is a rapidly developing computer technology. Modern computers are able to form a living virtual (simulated by a computer system) environment for the user, with which the user interacts with the help of a wide range of specialized input/output devices: headphones, microphone, computer glasses, specialized gloves and suits for transmitting tactile interaction. The equipment used for contact with virtual reality allows the user to immerse himself in the artificial computer world, move in it, see it and hear it, interact with virtual objects, etc.

Currently, there are several options for virtual reality systems:

– ordinary (classical) virtual reality (Virtual Reality – VR), where the user interacts with a virtual world generated by a computer (it exists virtually, in the form of a computer program);

– augmented, or computer-mediated, reality (Amended Reality – AR), where information generated by a computer is superimposed on images of the real world;

– mixed reality (Mixed Reality – MR), where the virtual world is connected with the real world and includes it.

VR/AR/MR technologies can be used to solve a wide variety of tasks. Organization of joint work. A virtual reality helmet makes it possible to conduct video conferences that are more realistic than conventional web conferences and similar to a telephone conversation.

MR technology allows the participants to feel really close to each other. Such "virtual meetings" can be widely used for virtual travel, getting to know other cultures, learning foreign languages, etc. Study of natural and scientific disciplines. Virtual reality glasses allow students to find themselves in scientific laboratories, observe and conduct realistic virtual experiments, interact with macro– and micro-objects, travel to the world of mathematical objects, etc. Study of humanitarian disciplines. Students get the opportunity to visit museums and places of historical events, communicate with virtual models of historical figures, reconstruct events of the past, etc. Practicing skills. Models in virtual reality give students the opportunity to safely and without fear of possible mistakes form such skills, the development of which in real conditions is fraught with dangers or faces other limitations (Availability of equipment, high cost of work, danger to other people, etc.).

For example, MR applications are already used in medical education.

Blockchain technology in education

An integral part of the educational process is the final and intermediate assessment – exams, qualifying papers and other educational activities, during which students demonstrate their educational achievements (knowledge, skills, skills, qualifications). Here, a reliable and safe way of recording, storing and using the obtained results is needed. In a digital educational environment, you can abandon paper documents and use blockchain technology.

Blockchain, a data storage technology based on the creation of a distributed ledger, was proposed to work with the digital currency bitcoin. This technology guarantees a safe and inexpensive way to store records in digital format, as well as control their changes. To add a new item, you need to have the appropriate rights or perform some set of actions.

The blockchain itself is a chain of data blocks (texts, images, videos, software programs) that are linked to each other and stored as identical copies on many different computers. The main advantages of blockchain technology include its ability to form users:

– self-confidence (the ability to publicly declare oneself and at the same time control and manage access to accumulated information and personal data);

– trust in it (the technology gives users confidence in the operations they perform and their results, including payments and issuing certificates);

– a sense of transparency of its work (the user making the transaction is sure that all recipients will have access to it);

– a sense of stability (all records are stored indefinitely and cannot be changed);

– a sense of autonomy (no central controlling authority is needed to manage transactions or keep records).

Blockchain can be successfully used in the field of education to form a digital portfolio for storing certificates and diplomas, exam and creative works, exam results and educational achievements (texts of completed tests, video recordings of examinees' performances, etc.) in the form of unique digital records in a distributed database.

Blockchain allows you to demonstrate the results and creative works stored here to anyone who needs it, protect authorship, apply for inventions and receive recognition.

The value of this technology for education is that it ensures reliability and security, and the records themselves can contain different types of data. For example, blockchain can be used to store information about exams, issued diplomas and certificates, along with information about who conducted or issued them and when.

In this way, the paper document loses its uniqueness – here everyone can immediately, without going to the archives of the organization that issued it, verify its authenticity and get a certified copy. As new developments emerge, blockchain technology will become more and more important for the digital transformation of 16 education, combining the work of various educational organizations, creating a good basis for the development of education.

E – learning

Creating an environment in which students were not chained to a stationary computer, but were able to move with it, became possible with the advent of portable computers (notebook, laptop).

During the quarantine introduced in all educational institutions of Ukraine, mobile learning technologies prove that electronic (mobile) learning can be as effective as classroom learning, if the methods and technologies correspond to the tasks, there is interaction between students and there is timely feedback between teacher and student. After all, successful e-learning programs are based on the consistent and comprehensive efforts of students, teachers, coordinators, support staff and administration.

Determining the innovativeness of the equipment and the possibilities opened up by computer technologies in ensuring the visibility and accessibility of educational material, the computer laboratory is integrated into the traditional system of education, which is focused on the translation of knowledge from the teacher to the student.

Creating an e-learning environment in an educational institution allows to radically change the paradigm of knowledge transmission. This model, which is focused on the principles of "learning always and everywhere", creates conditions for the implementation of the principles of personally oriented education.

The introduction of electronic learning (E-learning) into the Ukrainian education system is relevant, it allows to carry out education at a distance, at any time, to export domestic educational services, etc.

E – learning – (abbreviation of Electronic Learning) – a system of electronic learning, a synonym for such terms as electronic learning, distance learning, learning using a computer, network learning, virtual learning with the help of information and electronic technologies. The development of E-learning puts forward a new promising model of learning, which is based on the use of the latest multimedia technologies, the Internet with the aim of improving the quality of learning, facilitating access to resources, services, as well as exchange and joint work at a distance. In the world market of educational services, e-learning is progressing and developing in all countries of the world.

E-learning can be used for the following purposes:

– independent work with electronic materials, using a computer, mobile phone, etc.;

– receiving consultations, holding meetings, evaluations of a remote expert (teacher), the possibility of remote interaction;

– creation of a distributed community of users who conduct joint virtual educational activities; – timely continuous delivery of electronic educational materials; standardization and certification of electronic educational materials, technologies, distance learning tools;

– formation and improvement of the information culture of all participants in the educational process; – assimilation, popularization and transfer of innovative pedagogical technologies, increasing the effectiveness of teachers' activities;

– the opportunity to develop educational Web-resources;

– the opportunity to obtain modern knowledge at any time, from any place;

– availability of education for persons with physical disabilities.

E-learning tools include electronic textbooks, educational services and technologies. Modern students belong to the network generation, for them the use of electronic information has become the norm. It should be noted that students have a positive attitude to the latest information technologies for learning, seeing the possibility of independent learning, self-improvement, creating a career, and most of all, it allows them to quickly and cheaply acquire knowledge.

E – learning allows you to choose:

– convenient place and time for studying;

– a method of qualitative assimilation of knowledge;

– the possibility of constant contact with the teacher;

– individual study schedule; – ways to save time and money.

According to each of these groups, the goals and tasks of education are determined, a schedule of the educational process is built, during which everyone must answer the following questions: What? As? Why? Why?

E-learning is currently the most promising direction of distance learning development. In addition to distance learning, E-learning is a supplement to correspondence education, given that the technologies used in the development of electronic training courses are effectively used in traditional education.

A comparison of E-learning with a traditional form of education makes it possible to note the following advantages of E-learning:

1. A significant possibility of access – applicants have the opportunity to access electronic courses via the Internet from any place where there is access to the global information network.

2. Lower prices for obtaining educational and methodical literature via the Internet.

3. The possibility of developing electronic courses that are built on a modular basis.

4. Flexibility of training – duration, sequence of study material, possibility of independent choice according to own capabilities and needs.

5. Carrying out training at the workplace, at home, on the road using the mobile Internet.

6. The possibility of development and self-improvement in accordance with the requirements of time (use of services) Web 2.0, etc.

7. Carrying out an objective assessment of knowledge.

New services that have received the name of "social services" Web 2.0 (the second generation of network services on the Internet, unlike the first generation, allow users to work with services together, exchange information, as well as work with mass publications).

Web 2.0 social services

Web 2.0 social services are modern tools, network software that supports group interaction. These group interactions include:

– personal actions, opinions of participants (WikiWiki), placement of media files (Flickr), photos, video clips, radio broadcasts;

– creation of thematic services based on the geoinformation system Google Mars (Google maps);

– communication between participants. Currently, the technology "Blog" has become the most widespread – blog – the origin of the English word, which means the action of Web-logging or blogging – an entrance to the World Wide Web or the Web, in which a person keeps his collection of records that resemble a diary [1, p.19] .

The use of Web 2.0 in the educational process changes the understanding of the network user: from a reader to a creator, a distributor of collective communication to a creator. The active development of social networks promotes the involvement of people of different ages, professions, the open transfer of one's own knowledge, its acquisition through the tool of joint work, the preservation of knowledge due to the constant monitoring of open resources, the convenient and pleasant use of simple tools, the acquisition of informal knowledge on the basis of which conclusions are built.

To ensure the effectiveness of E-learning, it is still necessary to take into account the rules for the use of the latest IT, integrated programs, and the use of multimedia learning technologies.

M – learning (mobile learning)

Mobile learning (mobile learning or m-learning) is considered a new stage of development of electronic learning (e-learning), which uses mobile devices and wireless access to educational resources as a means of learning.

Today's realities are such that almost all students have a smartphone with them. The survey confirms the fact that 70% of students are more inclined to work using mobile devices than on a computer or laptop. Therefore, mobile learning is considered as one of the best ways to increase teacher productivity and student motivation. Since mobile learning is used in a blended learning system in a higher education institution, it is assumed that e-learning as an integral component of blended learning is already implemented.

It is necessary only on the basis of the existing model of e-learning to ensure the presence of the following main components:

1. Educational and methodological support for studying disciplines (adapted educational resources, mobile content, etc.).

2. Mobile-oriented environment for placing educational resources of disciplines (adapted distance learning platform for the use of mobile devices).

3. Pedagogical staff who have completed training in the field of using mobile technologies and know the methodology of mobile learning (increasing the qualifications of professors and teaching staff).

4. Technical support (the availability of a mobile device with wireless access to the Internet via Wi-Fi or mobile communication for each subject of training). Modern mobile devices make it possible to create such types of content as a mobile application, a mobile site, adapted electronic educational tools, social networks and user content, unique mobile content (augmented reality), certain types of content prepared by a teacher Mobile site. Using a mobile site is currently the most common way to access educational materials.

A mobile site can be a regular site built using a certain content management system (Joomla!, WordPress, etc.), a teacher's personal blog, a distance learning platform. Such sites use simplified methods of displaying educational information adapted to mobile devices and are not burdened with additional functionality.

A mobile application is the main software used on smartphones, tablets and other mobile devices. Despite the basic system applications that are installed by default on the user's mobile device, it is possible to download additional applications from online stores (App Store, Google Play, Windows Phone Store) and others, free of charge or for a fee. Mobile applications allow you to quickly check e-mail, view mobile content, communicate with other people using various messengers, etc. A feature of educational mobile applications, in addition to educational content, is a notification system (which always reminds you that you need to work) and the ability to work offline (individual components of the mobile application are downloaded to your phone and you can work with them).

Educational applications for individual disciplines are created very rarely, because for this the teacher needs to know the appropriate programming language. However, it is possible to use ready-made applications for the organization of training – information (for informing students about important events), communication (for communication and organization of various types of communication – seminars, conferences, etc.), mobile versions of computer software (browser, text, spreadsheet , graphic, video and other editors), calendars (to create a general study plan), etc.

Adapted electronic means of educational purpose. The use of adapted electronic teaching aids is not yet a very common type of content, as it requires certain skills from the teacher who is a potential developer but not an IT specialist. However, confident PC users can easily create such an electronic tool in the form of an electronic textbook or manual and place the necessary elements in it – text, graphics, formulas, videos, etc. The difficulty lies in the development of more complex tools that are implemented using interactive elements, such as tests or feedback.

A separate type of content. Modern phones can reproduce almost all types of information – text, graphics, sound, video, animation, etc. Therefore, the teacher can prepare a set of educational materials in advance, which the student can use both during classes in the classroom and during independent study.

Social networks and user content. Any popular social network has its implementation for mobile devices. Despite the entertainment functions, social networks can be used in education. They make it possible to quickly exchange data, teachers – to submit various types of educational material or report on important events, students – to present their own developments for general consideration, etc.

Unique mobile content (augmented reality). To implement augmented reality, a special program is installed on the mobile phone, which complements the image of the real object with the necessary virtual objects (video and audio materials, 3d models, text content, etc.) and displays them on the mobile phone screen. The application first finds and identifies the object, and then displays the virtual objects on the screen. The process of creating augmented reality takes place with the help of a video camera of a mobile device. All virtual objects are placed in the cloud and are called in the process of recognizing the real object to which they belong.

Broad opportunities in the use of mobile devices also open up in the organization of communication and interaction of subjects of education, in particular, it is appropriate to note the following advantages:

– subjects of the educational process can interact with each other "face to face", since mobile devices are small in size and allow to move freely, unlike computer-oriented learning, when each subject of the educational process is "tied" to one place;

– the possibility of interaction both with one student and with the group as a whole;

– use of various mobile applications for organizing training sessions and communication (Viber, Skype, WhatsApp, etc.);

– possibility of communication regardless of location and time From this standpoint, mobile learning can be defined as an approach to learning that uses mobile electronic devices to create a mobile educational environment where students can use them as a means of accessing online learning materials anywhere, anytime. Mobile learning is, on the one hand, a type of distance learning, and on the other, electronic learning.

Compared to electronic and distance learning, mobile provides the subject of learning with a greater number of "degrees of freedom" – higher interactivity, greater freedom of movement, a greater number of technical means, the main of which are UMPC – ultra-mobile PCs, Tablet PCs – tablet PCs, ultra-portable laptops, PDAs (personal digital assistants), audio players for recording and listening to lectures, multimedia museum guides, multimedia educational consoles, e-books, mobile phones, smartphones and many others.

So, in the information society, when as a result of the development of high technologies and informatization, the level of requirements for the professional qualities of the presentations of higher education institutions and their responsibility increases. Therefore, in order to be competitive in the conditions of great competition and growing information flows, teachers must be able to learn continuously – learn throughout life.

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1.2. Educational technologies of learning intensification: Formation of 21st century skills in 21 days

The educational process is an intellectual, creative activity in the field of higher education and science, which is carried out at the university through a system of scientific-methodical and pedagogical activities and is aimed at the transfer, assimilation, multiplication and use of knowledge, skills and other competencies in the student of education, as well as at formation of a harmoniously developed personality. To achieve all competencies, it is necessary