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**THE DIDACTIC TEACHING CONCEPT BASED ON COMPUTER TECHNOLOGIES
IN THE CONTEXT OF THE METHODOLOGY AND TECHNOLOGIES
OF CREATION AND TEACHING EDUCATIONAL COURSES
AT ESTABLISHMENTS OF HIGHER EDUCATION**

The article deals with the introduction of new information technologies in education, which has led to the emergence of new educational technologies and forms of learning that are based on electronic means of information processing and transmission. The focus is on a number of issues related to the ever-increasing flow of new information, the complexity of knowledge, the lack of illustrative material, and the emergence of multimedia tools and technologies to solve these problems. The situation is also emphasized that arises with the use of computers in the learning process. The main feature that distinguishes the computer from the usual technical means of learning is the ability to organize a human dialogue with the computer through interactive programs. It is specified that in the presence of a interactive programs, the computer can act as an intermediary between the teacher and the student, and take over part of the learning process. It is noted that the use of computer tools requires a different form of knowledge, the organization of students' cognitive activities and the choice of teaching methods. The main provisions of the form of learning with the use of computer tools, which contains a certain didactic concept, are singled out which can be formulated as follows: 1) the learning process is based mainly on the student's independent cognitive activities; 2) the student's cognitive activities must be active; 3) training should be personality-oriented. In addition, the following principles of creating e-learning tools are defined: 1) the principle of distribution of educational material; 2) the principle of interactivity of educational material; 3) the principle of multimedia presentation of educational information; 4) the principle of adaptability to the student's personality traits.

Keywords: education; information technologies; educational technologies; electronic means of teaching; illustrative material; multimedia tools; multimedia technologies; learning process; interactive programs; computer; cognitive activities; teaching methods; e-learning tools; educational material.

Formulation of the problem. The introduction of new information technologies in education has led to the emergence of new educational technologies and forms of education based on electronic means of processing and transmitting information. The emergence of powerful computer multimedia systems and interactive computer programs has become the basis for the intensive development

of distance learning (DL). But, despite the variety of technical means and technologies used in the educational process, it should be noted that the quality of training depends primarily on the perfection of the educational material, the form of its presentation and the organization of the educational process. Therefore, even in the traditional teaching scheme, there are many problems associated with the constantly growing flow of new information, the complication of knowledge, and the lack of illustrative material. In these conditions, the emphasis on intensive independent work does not give positive results for the same reasons.

The advent of multimedia tools and technologies can solve these problems. The introduction of a computer into the educational process not only frees the teacher from routine work in organizing the educational process, it makes it possible to create rich reference and illustrative material presented in the most diverse form: text, graphics, animation, sound and video elements. Interactive computer programs activate all types of human activities: mental, speech, physical, perceptual, which speeds up the process of mastering the material. Computer simulators help to acquire practical skills. Interactive testing systems analyze the quality of knowledge. The use of multimedia tools and technologies makes it possible to build such a training scheme in which a reasonable combination of conventional and computer forms of organizing the educational process gives a new quality in the transfer and assimilation of the knowledge system. Such technologies are especially relevant in distance learning, where the possibility of obtaining high-quality education from remote educational centers is realized.

However, the creation of effective computer-based teaching tools is a rather difficult and time-consuming job. This is especially true for multimedia programs.

Firstly, the teacher who is the creator of multimedia requires more than just professional knowledge; he/she needs to have

knowledge in the field of computer technology, design, screenwriting and acting and many others, knowledge and skills, which are sometimes far from his/her main profession. Therefore, as a rule, a multimedia project is carried out by a team of authors.

Secondly, to create multimedia programs, modern tools and software are needed, which are distinguished by a high level of prices. As a result, the creation of multimedia is only within the power of specialized teams that have the necessary hardware and software.

Nevertheless, the course author plays a very important role in this team. Possessing the primary material and knowing how to build the learning process, he/she is a central figure in the team of authors. It is he/she who develops the course multimedia script and determines the ways of its presentation. But for this, the author of the course must have a certain knowledge of software and hardware and multimedia creation technologies.

Analysis of recent research and publications. Enough literature on computer training tools has recently appeared [1-6]. Most of the authors of these books pay attention to questions of a methodological and didactic nature, which are common to any educational medium. There is practically no analysis of the use of electronic teaching aids in the educational process.

The purpose of the proposed study is to describe the didactic teaching concept based on computer technologies in the context of the methodology and technologies of creation and teaching educational courses at establishments of higher education.

Presenting main material. Despite the fact that technical teaching aids (TTA) are actively used in the educational process, they are an auxiliary didactic tool. The decisive role in traditional teaching belongs to the teacher who is the interpreter of knowledge [7]. Communication between a teacher and a student forms the basis for the transfer of information, an important feature of which is the availability of prompt feedback. However, from the earliest stages of the development of communication means in interpersonal relations, mediated communication with feedback divided in time is used. It is this that is the basis of distance learning. Obviously, the psychological and informational richness of mediated communication depends on the level of technical means used in this case. But even with the most sophisticated means of communication, the use of traditional teaching methods based on the teacher-student dialogue will not give the effect of direct communication, not to mention the manifold increasing cost of such technology.

A different situation arises with the use of a computer in the educational process. The main feature that distinguishes a computer from conventional TTA is the ability to organize a dialogue between a person and a computer through interactive programs. In the presence of a telecommunication channel, a computer can both act as an intermediary between a teacher and a student, and take on a part of the educational process. The computer has the ability for this to store and efficiently process information presented in multimedia form. The ability to access remote databases (electronic libraries) via the Internet, the ability to communicate with any partners through electronic conferences, the ability to transfer information in any form and of any volume should be added to this. Thus, the computer can not only be used as a didactic tool in the traditional learning process, but also realize with its help the possibility of learning at a distance, which is not inferior in quality to the technologies of full-time education.

Of course, the content of education and its goals do not depend on the form of education. However, the use of computer tools requires a different form of knowledge representation, the organization of students' cognitive activities and the choice of teaching methods.

First of all, this is due to the emergence of the possibility of optimizing the educational process by transferring its center of gravity to the students' independent work, enhancing these activities and increasing its efficiency and quality. The use of computer tools allows one to receive primary information not only from the teacher, but also with the help of interactive training programs that help the student, with a certain degree of competence, to master a particular discipline. Having unlimited space and time frames for obtaining information, a student in the process of independent work can be in constant consultation with various sources of information. In addition, the computer allows one to constantly exercise various forms of self-control, which increases the motivation of cognitive activities and the creative nature of learning.

The next important consequence of the use of computer tools is the use of innovative teaching methods, which are of a collective research nature. These methods take an active form aimed at finding and making decisions as a result of independent creative activities [8].

Teaching with the use of computer tools refers to the class of intensive methods, however, the use of hypertext structures of educational material allows one to create an open system of intensive learning, when the

student is given the opportunity to choose a suitable program and learning technology, i.e. the system is adapted to the student's individual capabilities. Education becomes flexible, not bound by a rigid curriculum and mandatory classroom activities.

As technology improves, the role of the teacher is increasingly reduced to managing the educational process, but this does not diminish his/her influence in cognitive activities and does not oust him/her from the educational process.

Thus, the form of teaching with the use of computer tools differs from the existing ones both in the organization of the educational process and in teaching methods. This form of education is based on a certain didactic concept, the main provisions of which can be formulated as follows:

1. The learning process is based mainly on the student's independent cognitive activities.

This principle determines the attitude of the subjects of the learning process and the teacher's role in the learning process. Undoubtedly, personal communication between a teacher and a student is an invaluable quality of full-time education and it will never be replaced by a student's communication with any, even the most intelligent, machine.

However, in such a pedagogical situation, the decisive factor is the teacher's talent, which in the conditions of mass education does not have the same effect as in individualized teaching.

If, however, the goal is to maximize the disclosure of the student's creative abilities, then it is necessary to create such an educational environment that would maximally contribute to this. And here, first of all, it is necessary to ensure maximum student access to educational information. Modern tools and technologies allow one to do this. Now almost all educational establishments of higher professional education have information resources provided with means of remote access via the Internet. In this case, the main technical training tool is a computer. The teaching functions of a computer are implemented through computer training programs (CTP). Having various purposes (theoretical material, simulators, control programs), these training programs have such an important common property as interactivity. It is this property of the program that helps to reproduce the effect of teacher-student communication. The development of CTP is a rather complicated procedure, but the main element in it is the teacher's participation. This makes it possible to transfer the teacher's pedagogical individuality to the

computer program, that is, what is the basis of the pedagogical school in traditional pedagogy.

Creation of computer training programs requires from the teacher certain specific knowledge in the field of information technologies, but the most important thing here is to understand that CTP requires a different organization (structuring) of educational material.

So, what is the teacher's role in this learning environment, which is a sea of information, means of access to it and training programs.

The first is the management of the educational process, which includes consulting students at all stages of the curriculum and monitoring the quality of students' knowledge. In this case, the function of the interpreter of knowledge, which in the traditional disciplinary model of teaching belongs to the teacher, passes in this (information) model [7] to the student himself/herself.

The second, and no less important, is the teacher's educational function. Education is a complex and multifaceted process of development of professional and personal qualities, and "live" communication in the process of upbringing a personality is the basis of the existence of human society. In distance learning, direct communication between a teacher and a student will not be canceled at all. Just how intense it should be depends on many factors.

There are two possibilities to partially compensate for the absence or deficiency in direct (physical) communication between the teacher and the student.

The first one is the organization of their communication by means of network technologies (mail technologies, video and sound conferences), among which the most effective and as close as possible to face-to-face one is video conferencing. But its implementation is hindered by technical factors.

Another possibility of organizing communication between a teacher and students is a tutorial as a system of support and accompaniment of the educational process through tutors (teachers – consultants).

The tutors' functions are described in sufficient detail in the literature [7]. It is important to understand that the regulation of these functions is rather arbitrary and, in fact, is determined by the tutors' professional qualities.

2. The student's cognitive activities must be active.

The active nature of computer-based learning is closely related to the principle of self-education. Self-education is impossible

without the student's active participation in the educational process. Active participation is primarily determined by intrinsic motivation, expressed as a desire to learn [8; 9]. Distance learning requires active cognitive independent thinking activities. Therefore, with distance learning, it is necessary to use such methods and technologies that contribute to the ability to independently obtain the necessary information, isolate problems and ways to rationally solve them, critically analyze the knowledge gained and apply it in practice and to obtain new knowledge.

According to I.Ya. Lerner and M.M. Skatkin, there are five general didactic methods, determined by the nature of the trainees' activities: explanatory-illustrative, reproductive, problem presentation, partly exploratory, research. These methods are effectively used in traditional pedagogy [10].

Among them, a special place is occupied by productive methods based on the student's active participation in the educational process. Active teaching methods by the type of communication between a teacher and a student belong to the "many to many" group and are subdivided into: role-playing games, discussion groups, forum, project groups, etc. Without dwelling on the characteristics of these methods (their description can be found in [8; 9; 11]), we note that in distance learning they can be effectively used even in the so-called virtual classrooms, when students are separated in time and space.

The basis for the implementation of these methods is telecommunication networks and information technologies of network learning.

3. Teaching should be student-centered.

The concept of "student-centered learning" presupposes the differentiation and individualization of learning, depending on the student's psychological and pedagogical properties.

Increasing the effectiveness of the educational process is possible only on the basis of individualization of educational and cognitive activities. Such personified training in conditions of mass demand is possible only on the basis of high teaching technologies, built on computer tools and technologies.

It is obvious that the new computer form of education can be used both within the walls of the university and outside it. It is quite clear that learning with the use of computer technologies ultimately leads to a change in the educational paradigm [8], the core of which is individualized learning in a distributed educational and communicative environment. And in this respect, the concept of distance and time loses its primary meaning: it becomes unimportant where the

source of information is located – in the next room or across the ocean.

Computer-based education is largely based on technical infrastructure: the computer (as a tool for posting and presenting educational information) and computer networks (as a means of accessing it). Therefore, one of the principles that must be taken into account when creating e-courses is *the principle of distribution of educational material*.

Information learning resources can be divided into two groups: located directly at the student (local components) and located on the computers of the training center (network components). The way information is placed imposes certain requirements on the technologies for creating resources and accessing them.

Local components include printed materials, audio and video recordings on magnetic tape, and information on computer-readable media (hard disks and laser disks).

Computer technologies for preparing printed products are now widespread. They allow the author to independently prepare and print his/her text.

The technologies of recording video and audio material is well established. Methods of their use in the educational process have also been developed.

Computer training programs have also been used in education as additional teaching aids for a long time. However, in distance learning, the computer becomes the main didactic tool and instead of scattered training programs, an integral interactive course is needed, which presents all the educational information with sufficient completeness. *The principle of interactivity of educational material* is the second important principle that should be taken into account when developing educational and methodological support for distance education.

A large amount of information requires the use of an appropriate medium. Well established and widespread CD-ROM technology is well suited for multimedia courses. An interactive multimedia course makes it possible to integrate various environments for presenting information – text, static and dynamic graphics, video and audio recordings into a single complex that allows the student to become an active participant in the educational process, since information is issued in response to his/her corresponding actions. The use of multimedia makes it possible to take into account the individual characteristics of the perception of information to the maximum extent, which is extremely important in the computer-mediated transfer of educational information from the teacher to

the student. Thus, the third principle that should be taken into account when creating an electronic course is *the principle of multimedia presentation of educational information*.

To create multimedia courses, specialized (authoring environments) or universal (programming systems) tools are used. The former are designed for “programming without programming”, i.e. the program is created automatically by the authoring environment. To work with the latter, knowledge of the programming language is required.

The advent of modern visual design systems, such as Visual Basic or Delphi, largely removes the differences between these tools, since they allow one to develop an interface interactively. At the same time, they do not limit freedom to ready-made solutions.

Information-and-communication technologies (ICT) are the basis of the online courses. Telecommunication technologies are used to deliver educational materials or organize controlled access to them.

Various HTML editors are widely used to create educational materials provided in the form of Internet resources. The use of scripting languages allows one to make an HTML document interactive and provide information transfer to the server. However, keep in mind that the most common browsers Internet Explorer and Netscape Communicator use different versions of HTML, so one should not use markup commands when preparing one's materials that are not included in the many commands supported by both browsers. It should also be noted that the HTML language is developing quite dynamically, so that documents that satisfy the new language standard may not be rendered correctly by older versions of browsers.

When deciding on the provision of educational materials via the Internet, it is necessary to take into account that a long wait for a server reaction, a disconnection of the connection and similar situations associated with the use of on-line technologies with poor quality of telecommunication channels, disrupt the normal course of the educational process and negatively affect the student's attitude to network access. In addition, the use of browsers for viewing imposes additional restrictions on the nature of the presentation of educational information.

It should be noted that the programming systems used to create local components make it possible to include access to Internet resources in a multimedia course, integrating network and local resources.

Any new form of education, including distance learning, requires the creation of a psychological-and-pedagogical basis, without which it is impossible to talk about the suc-

cess and quality of the educational process. Therefore, one should also highlight a number of psychological principles that affect the success and quality of distance learning.

A special place is occupied by the problem of technological implementation of taking into account a person's psycho-physiological characteristics when developing a course.

The success of learning is mainly associated with the peculiarities of the sensory-perceptual processes that determine the perception of information and constitute the processes that create the ability to retain information in memory and reproduce it.

Modern learning technologies based on the ubiquitous use of computing technologies have potentially tremendous potential. However, the full use of computerized technologies requires a serious study of the problem of interaction between humans and technical means. In fact, we are talking about the formation of a biotechnical system in which controlled information flows are distributed in some way. The complexity of such a complex with non-optimal use of the student's psycho-physiological capabilities may be excessive. This leads, as practice shows, to a low efficiency of the learning process. This very reason, in many cases, serves as the basis for the rejection of automated technologies in education.

The amount of information offered to students over a certain period of time varies greatly depending on their individual characteristics. There are a number of formal techniques that make it possible to find out the existing level of knowledge, however, experienced teachers “intuitively” feel the mood of the audience, its contact, readiness to perceive the material and accordingly adjust the course of the lesson. This is one of the problems of automated learning systems, as there is no feedback, the computer cannot feel a person's emotional state. The situation is aggravated by the fact that the perception of new information has several phases. A dose of information processed by the body for a fixed period of time forms an information load. The positive or negative impact on the body of the given load depends on the ratio of orientational and defensive reactions. Information load is considered positive if, by causing orienting reactions, it affects the defensive reflex to a minimum extent. Obviously, high efficiency of the learning process can be achieved only if there is no information overload.

The main problem on the way of training optimization from the point of view of the preservation and development of adaptive reserves is the assessment and correction of a person's state in the process of acquiring

new knowledge. Hence follows the fourth principle that should be taken into account when developing an electronic course, i.e. *the principle of adaptability to the student's personality traits*.

Conclusions. Summarizing the above mentioned, we can conclude that despite the decisive role of independent work in teaching with the use of computer technologies, the main subjects of the educational process are the student and the teacher. A student's participation in cognitive activities on an equal basis with a teacher is one of the conditions for quality education both in the traditional system and in preschool education. Therefore, the main requirement for distance learning technologies is to maintain the benefits of face-to-face distance learning. The use of the principles formulated above in the development of educational-and-methodological support allows meeting these requirements to the maximum extent.

Further directions of research. These results can form the basis for the development of the classification of electronic teaching means.

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КОНЦЕПЦІЯ ДИДАКТИЧНОГО НАВЧАННЯ НА ОСНОВІ КОМП'ЮТЕРНИХ ТЕХНОЛОГІЙ У КОНТЕКСТІ МЕТОДОЛОГІЇ І ТЕХНОЛОГІЙ СТВОРЕННЯ ТА ВИКЛАДАННЯ ОСВІТНІХ КУРСІВ У ЗАКЛАДАХ ВИЩОЇ ОСВІТИ

Анотація. У статті йдеться про впровадження нових інформаційних технологій в освіту, що привело до появи нових освітніх технологій та форм навчання, які базуються на електронних засобах обробки та передавання інформації. Зосереджено увагу на низці проблем, пов'язаних із постійно зростаючим потоком нової інформації, ускладненням знань, відсутністю ілюстративного матеріалу, а також на появі мультимедіа засобів і технологій, що дозво-

ляють вирішити ці проблеми. Також наголошується на ситуації, що виникає з використанням комп'ютера в навчальному процесі. Головною особливістю, що відрізняє комп'ютер від звичайних технічних засобів навчання є можливість організації діалогу людини з комп'ютером за допомогою інтерактивних програм. Уточнено, що за наявності телекомунікаційного каналу комп'ютер може виступати посередником між викладачем і студентом, і брати на

себе частину навчального процесу. Зазначено, що застосування комп'ютерних засобів потребує іншої форми подання знань, організації пізнавальної діяльності студентів та вибору методів навчання. Виокремлено основні положення форми навчання із застосуванням комп'ютерних засобів, що містить у собі певну дидактичну концепцію, які можна сформулювати таким чином: 1) процес навчання будується здебільшого на самостійній пізнавальній діяльності студента; 2) пізнавальна діяльність студента повинна мати активний характер; 3) навчання має бути особистісно-орієнтованим. Крім того, визначено такі принципи створення електронних навчальних засобів: 1) розподіленості навчального матеріалу; 2) інтерактивності навчального матеріалу;

3) мультимедійного подання навчальної інформації; 4) адаптивності до особистісних особливостей студента.

Ключові слова: освіта; інформаційні технології; освітні технології; електронні засоби навчання; ілюстративний матеріал; мультимедійні засоби; мультимедійні технології; навчальний процес; інтерактивні програми; комп'ютер; пізнавальна діяльність; методи навчання; електронні інструменти навчання; навчальний матеріал.

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