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THE COMPUTER EDUCATIONAL SYSTEMS WITH REFERENCE TO CONTEMPORARY PEDAGOGICAL THEORIES

Many of research results evaluating the existing computer applications, with reference to prevailing educational theories, show that they have a very little impact on the improvement of educational effectiveness. This phenomenon occurs particularly in computer educational systems based on the concept of teacher-oriented education and highly individualised knowledge acquisition. This assumption does not take into consideration possibilities of using information technologies in education which have appeared in recent years. Characteristic features of systems, which reduce learning activities of a subject are clearly emphasised and criticised by contemporary educationists. Computer educational systems should be a component part of an effectively and fully realised teaching-learning process and treated as a tool which actively assists learners with different interaction forms [1]. The Internet services play a particularly important role in this processes. The medical variety of services provide the teaching processes of medicine students with many new educational platforms. Digital video records of various operations and treatments can effectively be used as the educational resources.

1. INTRODUCTION

Development of information technology and multimedia coupled with widespread access to the Internet services gave rise to quite new possibilities for didactics thanks to a change in the way educational tasks are realised. Recently many new projects of distance education by means of the Internet have appeared. The knowledge bases including didactic materials such as multimedia presentations whose construction, content and layout influence the educational effectiveness, are the integral component part of systems supporting both “stationary” and distance education. In contemporary interactive multimedia systems, there should be a possibility of adjusting the content and the way the educational programs are operated to the individual needs of a user by: differentiating of the scope and layout of educational content, checking the learning speed, selecting adequate transfer forms and offering a possibility of choosing stimuli influencing the user.

The teaching results are dependent on the possibility of adjusting didactic materials to individual cognitive preferences of a student [2]. It is, thus, necessary to deeply and thoroughly analyse the multimedia materials’ structure and distance education systems in order to improve effectiveness with reference to contemporary teaching theories.

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2. THE ROLE OF INFORMATION TECHNOLOGIES IN EDUCATION PROCESSES EVOLUTION

A role of information technologies in education systems is determined by two main factors:

- very remarkable development of information technologies allow to apply methods of unheard-of educational possibilities. No hitherto used educational medium had many unusual applications, with new ideas that seemed not to be fulfilled, come true.
- the second factor is bounded with a change of the current paradigm in contemporary pedagogy.

The advent of new technologies aroused great interest in educational groups. Various application fields with the new medium were very encouraging. Unfortunately, the expectations have not been fully satisfied until now. It turned out that the assumptions, overrating the information technology power, its non-adjustment to school conditions and the concept of education connected with teacher-oriented methods made it impossible to achieve the desired results.

A very clear influence of the new technology on teaching results could be noticed only in the initial stage. Presumably, it was caused by the novelty value of this educational method which considerably attracted pupils' attention only at an early stage.[1] This situation was characterised by E. De Corte who quoted his research results. According to him, the main reason why it may end in a failure is the fact that the computer in school is perceived as yet another teaching medium which is to be adjusted to existing, unchanged conditions of the didactic process. In the first stage of using information technology in education, the software being created was of the "drill and practice" type [1]. In this case, the information technology did not generate any new quality but it duplicated work already done. The strategy of enriching the set of educational media with computer did not yield desired results and, thus, teaching effectiveness was not improved. A low-level stimulation of learners' mental activity was defined as a possible cause of this phenomenon. Educational programs were used mainly for doing arduous drills and specific possibilities of computer applications such as interactivity, diversified transfer of information and data analyses were not used in the educational process to a satisfactory extent. It was also noticed that computers at school did not improve the teaching quality and results and consequently did not cause any change in the way of thinking. [1] Therefore, it was necessary to verify the role of information technology in education. It was directly connected with its rapid development and the appearance of new powerful computational units. A new attitude to computer in education was expected. There occurred a widespread view that introducing computers to "teaching-learning processes" is absolutely necessary. According to E. De Corte, computer is not only a supplement to traditional teaching but is the integral component part of education because it offers various possibilities such as information transfer, information processing, computer animation and computer simulation of processes and phenomena, which make it possible to apply different forms of interaction and co-operation (e.g. by means of computer network). [1] Simultaneously, an evolution into intelligent teaching systems using artificial intelligence was observed. The author defines the difference between the traditional way of supporting teaching i.e. computer-assisted instructions (CAI) and intelligent systems. This difference lies in the fact that CAI are the static systems which include teachers' decisions referring to the educational process while individual analysis of teaching results which is to be used for decision-making referring to the teaching- learning process is characteristic of intelligent teaching systems. [1] A detailed and thorough description of a learner is a necessary

condition which must be taken into account while designing intelligent teaching systems. The educational process is dependent on the above analysis. Hence, the model of a learner, including “all aspects of his behaviour and knowledge which may have an influence on his achievements and learning process” should be the most basic element of intelligent teaching systems [1].

This trend seems to be developing vigorously nowadays. At the same time, there appears a change in educational methods and forms which indicates that teacher-oriented education gives way to learner-oriented methods. The educational process is treated as a cognitive process based on the assumptions of cognitive psychology. According to this conception, a man is treated as a structure which processes incoming information to which he adds a definite value and meaning. [3] Learning depends on the information received by senses from the outside world and internal cognitive structures which came to existence as a result of earlier experiences.

3. CONTEMPORARY PEDAGOGICAL THEORIES AND THEIR INFLUENCE ON LEARNING PROCESS ORGANIZATION

Cognitive science exerts currently a great influence on designing didactic tasks [4]. Hence, multimedia educational materials designed for self-learning and distance education should include the achievements of cognitive psychology which is a sub-discipline of cognitive science [5]. Accepting such an approach to the educational process is a basis for a debate about the effectiveness of the teaching-learning process and is related to an in-depth analysis of the way in which the incoming information is perceived.

Each man has his own cognitive preferences connected with factors which condition in an individual way the perception process. Awareness of the fact that out of all information coming from the surrounding environment, a man is aware only of what he, at a given moment, focuses his attention on, plays a vital role while designing multimedia presentations. “Thus, the most important task of the attention is to make observations have an access to the consciousness and to place them in the memory as recollections which will be able to be recalled in future”. [6] Many researchers prove that a greater number of methods applied in the learning process does not improve remembering ability because of varied perception systems influencing cognitive abilities of individuals. The way of acting within the range of perception is connected with an individual learning style of each student. Cognitive styles should be defined as “ways of functioning (constant to each individual) within the range of cognitive and intellectual activities” [8]. All elements of educational process, including distance education, should take into consideration individual properties of cognitive functioning of learners. In the process of designing multimedia presentations, special emphasis should be put on the learner’s free choice of presentation types which must be in accordance with preferences and properties of the perception process of each individual [2]. Currently designed didactic programs aimed at a vast circle of recipients exert an influence on the users through a wide range of constantly changing presentation forms, not including individual cognitive abilities of learners [6]. In distance education systems, this problem may be solved by creating multimedia packages which offer a choice of an adequate presentation form according to the principle of individualised education [2]. Such possibilities are provided by modern information technologies which make it possible to teach by means of text, graphics, spoken word, film and animation.

The constructivist theory has currently a great impact on the organisation of education [8] where constructivism as a philosophy of learning has been defined. There are assumptions that our individual perception of the world we live in is being built through the analysis of our experiences gained in the learning process. A certain system of meanings arises in the learning process in each learner who acquires knowledge individually but in a social context. In the constructivist model of the educational process, presented by theorists, learning means building structures of knowledge in learner's mind. The learning process should, thus, move from the general to the particular, beginning with elementary structures which are gradually completed in the course of learning. The structures should be full, correlated to one another and must refer to the whole surrounding reality. Particular elements should be understood in the general context. Hence, there is a need to perceive facts with reference to the whole conceptions. According to the constructivist theory, education is, on the assumption, interdisciplinary while learning is of the complex type and should consist in constant experiencing and including new items of information into the system of knowledge on the surrounding world. The effectiveness of education depends on: to what extent individual preferences of learners are taken into consideration, knowledge already acquired, experience, characteristic features of each individual, environment and culture (social context) [2].

The realisation of the assumptions of constructivist theories in the educational process demands from multimedia presentation designers using problem-solving methods, registering the cognitive activity of a learner, showing adequate directions and providing elementary knowledge. While designing computer presentations which are part of knowledge bases, the principles of constructivist theory of education should be taken into consideration to achieve high quality in the teaching process. It should be reached [2], by:

- making the educational content (dependent on the learner's level) accessible to a student. Such an approach rules out the standardisation of teaching materials which is so commonly used in “stationary education”,
- using the spiral structure of educational content in multimedia presentations which enables learners to assimilate and combine new information with the knowledge acquired before in accordance with the principle of structure extension and completion,
- using the cause and effect relationship in the structure of educational content, which is conducive to the stimulation of reasoning process in learners,
- providing learners with the knowledge connected with the surrounding world (knowledge which is the embodiment of reality) by means of various differentiated forms of information transfer,
- using in didactic materials, if possible, such learning methods which are based on problem-solving through individual acquiring of knowledge,
- monitoring the learning process consisting in the analysis of activities taken up by a learner, checking and evaluating his progress on the basis of the above analysis; the realisation of this task requires a special organisation of modules checking and registering an individual learning process history of each student,
- checking to what extent the educational content was assimilated by a learner should be realised with reference to higher purposes [9],
- making the realisation of the social context in the learning process possible through ensuring extensive communication with all participants of the educational process; the exchange of experience and the dialogue with other participants of the teaching-learning process should be

the integral component part of the educational process because asking questions repeatedly stimulates higher level of thinking; this assumption refers mainly to distance education,

- supplementing didactic materials available in the form of presentations with more practical classes is highly recommendable because there is a constant need for the experiencing and shaping of definite abilities inseparably connected with the domain of knowledge under study.

The analysis of the educational process requires considering the theories connected with the organisation of communication process. [15] It is an undisputed fact that the replacement of direct contacts by information technology reduces the possibility of effective and successful communication which is a difficult process and requires undertaking very reasonable actions. It is not enough to have technical means for the information transfer at one's disposal; it is also necessary to make the information clear to the recipient. Only well-planned communication process may be successful and help achieve the fixed aims. In each communication process there are at least three following elements: sender, message, recipient. In the complex model, the communication channel, i.e. the distance which a message covers from the sender to the recipient, is also included [10].

The author of [10] defined 7 basic steps in the communication process. An in-depth analysis of these steps should make communication effectiveness better.

Step 1 consists in proper wording of a message. In order to make a change in the knowledge structure of a learner, an adequate selection of educational content must be carried out. This choice is determined by the anticipated aim.

In step 2, properly chosen educational content must be given a form which means that it is necessary to decide in what way and by means of what methods this message is to be transferred to the recipient-learner.

Step 3 makes it possible to decide in what way a given message is transferred (the Internet, CD, printed text etc.).

In step 4, the most fundamental functions in the communication process are overtaken by the recipient after the information transfer. The first stage of the communication process was completed - the sender worded a message and transferred it to the proper recipient.

Step 5 means the comprehension of the meaning of a given message by the recipient. It is extremely important that the message from the sender should be properly interpreted by the recipient. Hence, both the sender and the recipient should have the same coding system at their disposal.

Step 6 signifies the recipient's reaction to the message. Having interpreted this message, the recipient takes a decision whether or not the communication is to be continued. The sender may only wait to see whether the recipient does what he is expected to do.

Step 7, connected with the evaluation process is of vital importance in the communication process. The sender learns from the feedback whether the message sent by him has been received and properly understood. The sender gets the feedback whether the communication is successful. The sender becomes the recipient because he himself receives a message. The communication process starts again. The effectiveness of the communication process depends on the communicative competence of the sender and the recipient [2].

Communication is not an easy process. In case of distance education, the arising disturbances include the sphere of indirect contacts established by means of technical media. It results mainly from the incomprehension of the essence of communication in which what really matters is not

what is to be transferred but what is to be achieved by the transfer [10]. The basic disturbances in the communication process include e.g. an incomplete message which may be unclear. The communication may be also disturbed by an inadequate selection of the way in which a given message is conveyed. Even if a message is well-considered and its sender uses adequate presentation forms, it may encounter various problems e.g. problems resulting from the malfunctioning of the telecommunication network which makes the Internet communication impossible. The comprehension of the transferred message may be difficult, if not impossible, when the sender and the recipient do not speak the same language (semiotic community). While preparing a presentation, it is necessary to thoroughly define the group of recipients who will be provided with the message, objectives of the presentation, subject of the presentation and the way it is carried out. Thus, there is a need to take into consideration the number of participants in the communication process, age, sex, homogeneity of a given group with reference to a definite feature, needs, motives for participating in the process, expectations and properties (knowledge, education, experience) [10].

A special attention is turned into connections between emotional / motivational and information processes. Motivation and emotions, which appear in the course of information processing, play a very important role in the educational process. The realisation of assumptions of cognitive psychology requires that a learner should be treated as an independent, well-motivated subject who is “shaping himself according to his own project” [11]. This tends to appear particularly in the process of self-education. Therefore, teaching and learning should be cognitive processes. In this case, the teacher is supposed to create conditions for learners’ cognitive work. These assumptions may serve as instructions for all educational institutions planning and organising the teaching-learning process. Interactive didactic means may play an extremely important role in the process of realisation of the above mentioned assumptions [11]. The commonly used Internet created quite new possibilities for the realisation of the cognitive theory assumptions.

The realisation of the intelligent educational system which takes into consideration a definite model of a learner may be a serious challenge to designers. It should be also assumed that, according to currently prevailing conception, learning means having to actively built knowledge and skills through integration with the surrounding environment and reorganisation of one’s intellectual structure [1]. According to these assumptions, the computer system should support constructive knowledge acquisition processes in learners. Therefore, the existing computer educational systems should be evaluated from the above point of view.

In literature, special emphasis is put on the fact that the learner’s activity and commitment may be, alas, ignored. Because the educational process is entirely dependent on decisions taken by the intelligent educational systems we may get, in this way, “instructionism” systems instead of “constructivism” in education [12]. New projects of intelligent educational systems take into account the critical remarks and enable learners to take an active part in the process of knowledge acquisition. The appearance of a fellow student or a guide commenting on the learner’s actions and offering help according to his activity is a commonly used solution [1].

According to the above assumptions one may lead to a conviction that the computer education should not introduce, in a rigid way, knowledge and intelligence into the monitoring and structuring of the learning process. Anyhow, instead of it the computer support of the teaching process should create conditions for the learner to an active development of his cognitive abilities [1].

4. CONCLUSIONS

The currently done research processes, into new applications of information technologies application, the example MAMS based [] distance learning system was elaborated in the Institute of Informatics, Dept. of Computer Systems, University of Silesia. This load gives directions for future analysis that should be taken into consideration with artificial intelligence, cognitive science, educational technology and research on teaching and learning.

The elaboration and checking of research thesis, for designing computer-assisted effective learning systems, is a very serious challenge at present [13].

A contemporary school is still looking for new, alternative and more effective educational forms adequate to the needs of information society. The asynchronous education, connected with distance education which uses the Internet and interactive methods, has become an alternative to synchronous “stationery” and “non-stationery” education.

One of sample projects of a distance education system was elaborated at the University of Silesia, supplemented with a set of laboratory experiments and lectures [14].

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COMMENTS
