

# **Models of Application of IT in Teaching in the Condition of Transformation of the Education System and Searching for a New Paradigm**

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## **ABSTRACT**

**Humanity is on the verge of the fourth industrial revolution in anticipation of global changes. A global reform of education is expected - from the change of the paradigm itself and the creation of a new teaching methodology to the creation of new forms, methods and teaching methods. However, there are many difficulties and unsolved scientific problems in this direction. For example, what the “education paradigm” is, how it is related to the teaching methodology, the ways of transforming the education system, and its initial and final goals are not defined. The article discusses new models of the application of information technologies in teaching, which can be used as a kind of basis for finding answers to these questions.**

***Keywords:** paradigm of education, information technologies, model of application of information technologies, interactive school cabinet, information and educational environment*

## **I. INTRODUCTION**

We live in an amazing time - a time when the rapid development of information technology literally before our eyes is changing the face of human civilization. According to Klaus Schwab in the book "The Fourth Industrial Revolution" today we are at the origins of the revolution, which in the foreseeable future will radically change our life, our work and our communication [1]. Indeed, the emergence of new technologies, which at first are perceived as something exotic and not particularly necessary, after a relatively short period of time becomes quite common and necessary, without which we can no longer imagine a full life, so it was with computers, the Internet, tablets, smartphones. In the near future, other new technologies will appear that will radically change our lives.

The fourth industrial revolution will have a profound impact on the entire structure of the world economy. The changes will affect all spheres of human life, including everyday life, labor activity, leisure, industrial sphere, health care, transport, communications, legal field, etc. The education system is no exception. The specificity of the education system has always consisted in the fact that it worked ahead of the curve and prepared the student for a comfortable

life in the future society. Therefore, the new industrial revolution leads not only to its change, but to a cardinal transformation. Education reform is already underway in all developed countries of the world and its pace is only increasing. For example, it is believed that the widespread introduction of new forms of distance learning would surely take place in the near future, and the corona virus epidemic was actually only a trigger factor that slightly accelerated this process.

A global reform of the entire education system (preschool, school, university and professional) is ahead. Moreover, it is already clear that it will not be limited to revising the forms, methods and teaching methods. Everything is much deeper. First of all, there will be a change in the old paradigm and the search for a new paradigm of education. In parallel with the search for a new paradigm of education, a new teaching methodology will be formed, and then, on its basis, new forms, methods and teaching methods will be developed. And this process, apparently, will be repeated.

## **II. SCIENTIFIC PROBLEMS**

In this direction, there are many unsolved scientific problems that need to be solved in the near future. First, you need to define the terminology. In pedagogical

science, there is still no consensus on what constitutes the concept of "education paradigm". For example, the concepts of "pedagogical paradigm" and "paradigm of education" are widely used, which contradict the general scientific concept of "paradigm of science" [2], [3], [4], [5], [6], [7]. A number of scientists defend the principle of polyparadigmality in the field of education and even introduce the concept of an interparadigm approach in the context of polyparadigm modern education. It is necessary to put things in order in this matter. Secondly, it is not determined how the educational paradigm affects the teaching methodology, how their interaction and mutual influence is carried out. Third, at what stage of their interaction or under what factors of mutual influence, it is advisable to start changing the forms and methods of teaching when necessary to develop a new teaching methodology.

It should be noted that at present the problem of finding ways to reform the education system and the related scientific problems of finding a new paradigm of education and a new teaching methodology are still open and debatable. The initial stage of their solution may be the development of a new model (or new models) for the use of information technology in teaching.

### **III. MODELS OF APPLICATION OF IT IN TEACHING**

There are at least three approaches to the use of information technology in teaching.

The first approach is the use of information technology within the traditional learning system as an interactive learning support tool.

This approach implements models of information technology application in teaching Teacher - Computer ... Computer - Student, Teacher - Computer - Network - Computers (s) - Student (s) [8]. These models used electronic educational resources (EER), but they were placed directly on the computers of the teacher or students. Accordingly, all the necessary services for working with these resources were located there. It is noted, that in the models of using information technologies for schools and universities, the differences are minimal.

Since the beginning of the 2000s, the multiservice approach to the use of IT in teaching began to develop and today has already become widespread. The essence of this approach is that the application of IT is carried out through various interconnected software and hardware services. Conventionally, the services of the modern information and educational environment can be divided into the following classes:

- interactive school cabinet;

- system of automation of educational process management;
- reference and information system;
- distance teaching system.

The set of equipment for an interactive school cabinet usually includes:

- teacher's notebook (professor);
- interactive whiteboard and projection equipment;
- means of individual work of schoolchildren (students);
- systems of operational control of students' knowledge based on electronic voting consoles [9].

The means of individual work of schoolchildren (students) is an important component of an interactive school cabinet, which allows to fully implement an activity-based approach to teaching. Tablet computers or laptops, specialized microcomputers, computers, laboratory or other equipment in accordance with the specifics of the subject under study can be used as means of individual work in an interactive subject room. All of them have certain didactic capabilities. What opportunities will be used within a particular subject, when and how, of course, is determined by the teaching method. The teaching methodology using an interactive classroom subject differs significantly from the traditional teaching methodology.

Several models of IT application as part of an interactive school cabinet have been developed, depending on the form of teaching, teaching objectives, and the specifics of the school subject. The simplest is the model "Teacher - Interactive whiteboard - Student (s)", or its modification in combination with electronic voting consoles. Such a model has found widespread use in explaining educational material using presentations or electronic educational resources, when a demonstration experiment and the use of individual student work tools are not required.

A fairly widespread universal model of using information technology is the model "Teacher - Teacher's Tablet - Interactive Whiteboard - Student's Tablet - Student". In this model, the student's tablet is a means of individual work of students and allows for the implementation of frontal, frontal-individual and individually - differentiated forms of organization of education [10]. The advantage of this model is its flexibility. For example, it allows the use of various EER, including distributed EER. On its basis, it is possible to implement collective creative educational work using EER, for example, the development of a collective project. It can be carried out both under the

guidance of the teacher and with his minimal participation.

In teaching mathematics all over the world the model "Teacher - Interactive whiteboard - Graphical calculator of the student - Student", or its modification "Teacher - Graphical calculator of the teacher - Interactive whiteboard - Graphical calculator of the student - Student" is widely used. The difference between the models is that in the first case, instead of the teacher's graphing calculator, his software emulator for the interactive whiteboard is used. In this model, a graphical calculator is a means of individual student work. It somewhat resembles both a tablet and a calculator, but in fact it is a specialized math microcomputer designed specifically for teaching mathematics. An example of such a graphing calculator is the CASIO CG-50. If desired, it is easy to switch from this model to the model "Teacher - Teacher's Tablet - Interactive Whiteboard - Student's Tablet - Student" by installing graphing calculator software emulators on the tablets, or a special tablet version of the ClassPad.Net graphing calculator platform [10].

It is noted, that in terms of their equipment, interactive school cabinets are equivalent for both school and university education. The difference is that university education rarely uses voting consoles to test students' knowledge. Due to the specifics of academic subjects and the complexity of assignments, professors prefer to conduct computer testing.

The services of the educational process automation system for schools include:

- management of the quality of education of an educational institution;
- drawing up and managing the schedule of classes;
- monitoring the implementation of the teaching load;
- electronic journal;
- homework;
- portfolio of teachers and students;
- school news;
- announcements, etc.

The information system contains:

- reference information for students;
- reference information for parents;
- electronic journal;
- schedule;
- announcements;

- electronic parent meeting, etc.

Similar services have services for the automation of the educational process and the information system of universities.

A distance learning system usually focuses on a set of equipment for distance learning and on a platform that is at the disposal of an educational institution, or on one of the free platforms. Accordingly, the set of system services is usually determined by the platform capabilities.

Despite all the achievements and positive aspects of this approach, the models of using IT in teaching and teaching methods based on them are still largely focused on the traditional education system. Therefore, the didactic capabilities of the equipment of interactive school cabinets are not fully realized. In addition, services for automating the educational process and the information system work most of the time separately from the educational process itself. This is also wrong. Apparently, in the course of the fourth industrial revolution and the related education reform, the third approach of using IT in education will be implemented.

Another approach is informational technologization of the educational process, when the construction of the educational process will be based on the goals of teaching and the didactic capabilities of interactive teaching tools. It is the didactic capabilities of IT that will be the determining factors in the choice of forms and methods of teaching, the development of optimal teaching methods. All this will require a serious restructuring of the educational process, will fully reveal the didactic capabilities of modern interactive teaching tools, significantly increase the effectiveness of teaching and the quality of education.

#### **IV. IT TEACHING MODELS THAT WILL BE APPLIED IN THE NEAR FUTURE**

Among the main factors that determine the appearance of human civilization and the direction of transformation of the education system is the development of artificial intelligence (AI) systems [1]. Nevertheless, AI systems have already found their application in software for voice input of texts, translators of texts into various languages, in various virtual assistants and intelligent consultants. IT is becoming more intelligent and talking with a computer is gradually becoming the norm. Researchers are increasingly using the term "collective intelligence", which is associated with the constant availability of automated personal consultants whose functions include maintaining certain records, processing requests and responding to user and customer requests.

AI systems are gradually becoming part of our personal ecosystem. They listen to us, help us, do

routine work for us, and warn our desires, even if they are not asked about it [1]. In them, AI works on digital footprint algorithms that automatically search for content and build it depending on user preferences. They are capable of self-learning and self-adjustment, and it is in this direction that they are now developing. So far, such systems are most widely used in browsers and Internet news platforms, but developers of various educational environments are showing increasing interest in them.

It is obvious that the models of IT application in teaching will change in the near future. Although interactive teaching cabinets in the usual sense will remain for some time, transparent interactive whiteboards will first replace interactive whiteboards. Then virtual reality systems will be combined with transparent interactive whiteboards. Later, they will be replaced by digital vision systems in combination with implantable technologies that will allow people to control the information process by the power of thought and eye movement [1]. AI systems will help optimize the learning process. Work in this direction is already underway. For example, the basic concept of the formation and development of a digital intellectual ecosystem of a mixed university has already been developed [12]. A model of in-depth professionally-oriented practice of undergraduates in the conditions of network interaction has been developed [13], which can serve as a basis for the development of appropriate programs and methods.

So, in the models discussed above, an AI component already appears. First, the AI will act as an assistant to the teacher, then as an advisor, and then its advice will be more and more advisory in nature. Later, the role of the teacher will gradually be reduced to an active observer. AI systems will be implemented in all services of the educational information environment of educational institutions, forming an intelligent information educational environment (IIEE). IIEE will significantly optimize the learning process, increase the effectiveness of learning and the quality of education through the maximum individualization of learning in accordance with the needs of the student, his intellectual preferences and abilities. IIEE will build individual educational trajectories for all educational subjects.

The forms of education will change. If full-time education in the classroom will be transformed for a long time, but will remain, since school education performs not only teaching, but also educational functions, then in university education in the near future distance learning forms will become a priority. The corona virus epidemic has already shown the economic benefits of introducing distance learning. IIEE will allow you to optimally build the educational process. Also, IIEE of universities will help solve the problem of

corporate and blended learning and immediately prepare specialists for the requirements of the employer. The development of IIEE will allow not only to optimize the educational process, but also to optimize the content of education and its structure.

## V. CONCLUSION

Recently, the media have often demonized the processes associated with the fourth industrial revolution, paint pictures of the collapse of the entire education system and human society, the transformation of people into zombies and half-robots. This should not be believed. The process of development of human civilization has always been and will be aimed at meeting the needs of people, at making our life more comfortable, more interesting, and more meaningful. The upcoming reform of the education system should be perceived as necessary for human society. As for teachers, university professors, scientists, leaders of the education system at all levels, everyone has a lot to do, but interesting and necessary work. They will have to change the entire education system to meet the needs of society, from the development of a new paradigm of education to the creation of new teaching content, forms and methods of teaching, and new teaching methods in fundamental.

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