



**ARTIFICIAL INTELLIGENCE  
TECHNOLOGIES AS THE FORM OF UPTM IN  
PRIMARY SCHOOL: NEW OPPORTUNITIES**

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**PENG Chen**

Zhukou Normal University, PR China  
e-mail: [sanduo@naver.com](mailto:sanduo@naver.com)

<https://orcid.org.0000-0002-3331-639X>

**ABSTRACT**

The idea of using the capabilities of artificial intelligence for the needs of the educational process is not new for modern pedagogy, but its development before the Corona time was rather fragmented. The conditions of the pandemic, self-isolation and protracted quarantine forced to look for new opportunities and forms to continue the educational process in this situation. And here the possibilities of organizing the educational process for all levels of education using artificial intelligence came to the fore. The purpose of this article is to analyze the forms of using the capabilities of artificial intelligence to organize the educational process for primary school students, that became more active because of the COVID-19 pandemic. Using of unique personal teaching methods (UPTM) at schooling always considered to be a sign of identity and elitism of educational process in a particular country. UPTM, on the one hand, are more consistent with the needs of the country and society in preparing the younger generation. On the other hand, this is the possibility of a narrow specification of the educational process. In the process of writing the article, empirical and theoretical research methods were used, that is typical for scientific studies of this kind. As the result, it can be noted that the Quarantine caused by the COVID-19 pandemic played a favorable role in expanding the range of possibilities for using artificial intelligence in the field of education, even in those areas that were traditionally considered to be unsuitable or non-effective for it due to the peculiarities of educational tasks.

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**Keywords:** artificial intelligence; UPTM; primary school; authorial school; communication technology; teacher; professional education.

## АНОТАЦІЯ

### **Штучні інтелектуальні технології як форма УПТМ у початковій школі: нові можливості**

Ідея використання можливостей штучного інтелекту для потреб навчального процесу не нова для сучасної педагогіки, але її розвиток до початку пандемії COVID-19 був досить фрагментованим. Пандемія, самоізоляція та тривалий карантин змусили шукати нові можливості та форми для відтворення навчального процесу в цій ситуації. І тут на перший план вийшли можливості організації навчального процесу для всіх рівнів освіти з використанням штучного інтелекту. Мета цієї статті - проаналізувати форми використання можливостей штучного інтелекту для організації навчального процесу для учнів початкових класів, що активізувалися через пандемію COVID-19. Використання авторських методів особистого навчання (UPTM) під час навчання в школі завжди вважалося ознакою ідентичності та елітарності навчального процесу в конкретній країні. UPTM, з одного боку, більше відповідає потребам країни та суспільства у підготовці молодого покоління. З іншого боку - це можливість вузької конкретизації навчального процесу. У процесі написання статті були використані емпіричні та теоретичні методи дослідження, характерні для наукових досліджень такого роду. В результаті можна зазначити, що карантин, спричинений пандемією COVID-19, зіграв сприятливу роль у розширенні спектру можливостей використання штучного інтелекту в галузі освіти, навіть у тих сферах, які традиційно вважалися непридатними або неефективними для їх використання через особливості навчальних завдань.

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**Ключові слова:** штучний інтелект; UPTM; початкова школа;

## INTRODUCTION

The ability to generate new ideas is the key to success and development of any society, and the education system is not an exception here, but rather the rule. Pedagogy as a science existed for centuries and its structure becomes more complicated from year to year. It leads to appearance of different points of view regarding education and training and, as a result, to the emergence of a heterogeneous network of educational institutions and programs. Over the centuries, discussions have been held about the concept of «education» what and how to teach people. Give everyone the same education or apply differentiated approaches depending on individual capabilities and social needs? Should education be specialized or universal? Should the education be focused on practically useful knowledge or on the general development of a personality?

Throughout the history of pedagogy, many educators tried to create an «ideal» system of upbringing and education. Depending on the eras and countries in which these people worked, their views on upbringing, training and education could not only differ, but also be almost opposite. This is clearly seen when comparing the goals of the educational process in Sparta (which was characterized by one-sidedness and cruelty in upbringing, minimal literacy and laconicism of speech, only music lessons were welcomed) and education in Germany in the 19th century (it upheld the principle of nature conformity, appealed to the undisclosed inclinations of the child, as main educational skills the ability to speak, clearly and beautifully express one's own thoughts was recognized). However, like innovations in other fields, unique personal teaching methods (UPTM) (also called «Authorial School») as a pedagogical phenomenon appears when defects or gaps are found in the standardized educational system used in a particular country.

## LITERATURE REVIEW

Today, it is possible to identify clearly the issues and problems of teaching methods research that are related to artificial intelligence (AI) as a method and form of providing educational services. They can be presented as following:

- possibility of using artificial intelligence in education or “cyber education» (machine learning) as a pedagogical trend (Wayne Holmes, Maya Bilik, Mark Lieberman, Dob Norton, Charles Fadel, Nil Goksel, Aras Barkurt, Ilka Tuomi etc.) - defend the opinion that in the modern world AI is an organic part of the educational process in particular as a result of all spheres of life italization in modern society;

- use of artificial intelligence in teaching exact sciences (mathematics, physics, chemistry, drawing, astronomy, etc.) (Ian Goodfellow, Axler Sheldon, David Morin, Denis Auroux, Andrew Trask, Yoshua Bengio, Aaron Courwilleetc.) – today is probably the most developed problematics as to AI based education. Since the exact sciences are the most logical and algometric ones, they became natural basis for testing the idea of using AI in education as a method and form of learning, and also give the most representative result;

- artificial intelligence for secondary and higher education (Niels Pinkwart, Sannyuya Liu, Carin Berg, Keng Siau, Yizhi Ma, Scott Martin etc.) – based on the position that modern adolescents (the age of middle and senior school, as well as students of higher educational institutions) already have collective learning skills and psychologically are more inclined to individual forms of gaining educational services, AI based learning is almost an ideal form of getting knowledge for them;

- artificial intelligence for children from 0 to 6 (educational robots, computerized nanny programs, etc.) (Andrew Ng, Michiro Negishi, Lasse Rouhiainen, Fernando Buarque, Nicky Roberts, Tahilidzi Marwala etc) – scientific research in this area are carried out both in the area of using AI by parents for daily developmental activities with the child (to learn colors, songs, new words, tactile exercises, etc.), as well as many books for children are published that explain to the child in the form of a fairy tale about AI and its place in the modern world;

- artificial intelligence-based programs for self-education and advanced training (Stuart Russel, Peter Norvig, John Mueller, Luca Massaron, Taria Rashid, Ethem Elpaydin, Aoife D`Arcy etc.) – this area was the first one which gained complete comprehensive AI based programs, that are also certified by states and are actively used in the continuing education and vocational training systems;

- Researchesonotherissues(AIbasedteachingandeducationaltechnologies for the elderly, people with special needs, for studying different sciences and obtaining various skills, etc.) are also underway, but today they are not as massive and

fundamental as the above mentioned.

As to UPTM ( or Authorial School) as a pedagogical phenomenon causes a lot of controversy among teachers, parents, theoretics of the educational process, politicians, etc. The vector of assessments ranges from a sharp rejection and denial of the UPTM progressiveness, seeing it as «experimenting with children and pedagogical egocentrism» (Phyllis C. Blumenfield, Ingrid Calgren, Hannu Simola and others) to completely transferring the activities of elementary and higher schools to the system of Authorial classes and methods (Ian Clark, Carolyn Jackson, John Lyle, Eva Osterlind and others). There are also disputes if it is possible to integrate UPTM in a system of standardized school education (especially in elementary school) without adapting and simplifying it (Frank Pajares, Jang Hyungshim, Edward Deci etc.), or whether this phenomenon should be left for non-formal education (David Wood, Margaret C. Wang, Timothy Reynolds, Carol A. Tomlinson etc.).

As to UPTM and Authorial School in general and in elementary education in particular, the main research regarding this pedagogical problem are taken in the following directions:

- UPTM as a part of self-regulated learning for alignment classes and those whose educational activities are below average (Cecilie Dalland, Kirsti Klette, Stain Martin, Kenneth Barrington and others). In their works UPTM is seen as a group of methods that allow to optimize the learning process and increase its speed while maintaining quality. The researchers mentioned especially emphasize that for these purposes UPTM can be used short-termly to achieve certain goals and to prepare the child for transition to the general education system (Dalland& Klette, 2016);

- since each teacher organizes the educational process in his own style, pace, emotionality, etc., UPTM can be considered the usual daily practice of any teacher, especially in primary and higher education (Eric Gill, Robert Grigg, Bill Bostrom etc). According to this idea the educational process organized by each teacher is an individual creative process because the teacher adapts the general teaching methods to his / her own teaching needs, combining and improving them. As a result, there is an authorial teaching style, which is one of the mandatory attributes of UPTM (Bostrom, 2016); UPTM is seen as a part of effective teaching strategy which is quite popular in teaching-training systems all over the world (Robert Marzano, John Brown, Vicki Phillips, Lyn Olson and others). Today, virtually all programs for teacher training, retraining and

advanced training contain issues as to UPTM. Teachers are encouraged to develop their own educational approaches to work with children of primary school age due to increasing differences between children as to their pre-school training, level of emotional stability, financial and social status, etc. (Phillips& Olson, 2013);

- UPTM as a creative teaching method for different purposes and groups students (children of immigrants, children with special educational needs, children from religious communities etc.) (Marlene Le Fever, Gary C. Newton, Lawrence O.Richards and others). In this case, UPTM is seen as an opportunity to adapt generally accepted educational methods to the needs of each group of children, taking into account its specific characteristics and needs at the moment and in the long term perspective (Newton, 2012).

Due (or even thanks to) the COVID-19 Coronavirus Pandemic, the processes of searching for a new system of educational work with students, and elementary school students in particular, have intensified in the world. These processes can be safely called UPTM, since in the absence of universally recognized methods and standards that, on the one hand, corresponded to the needs of the new situation, and on the other hand, the effectiveness of which would have been verified by time and experience, each teacher was forced to develop his own authorial school for his / her students. This new experience which appeared spontaneously is still waiting for its understanding and implementation in ordinary educational process.

## METHODOLOGY

While making the research mainly empirical and theoretical research methods were used, that is typical for scientific studies of this kind. As to the empirical research methods, such ones as observation and comparison to analyze the background of the problematics were used as well as study of scientific research literature. Among the methods of theoretical research, such ones as abstraction, analysis, synthesis, idealization, induction, mental modeling, ascent from abstract to concrete, etc. were used to predict and substantiate possible development options of AI based technologies and methods of teaching humanities for primary school children at the time after the COVID-19 quarantine ends.



## RESULTS

Elementary school is the most fertile education sector to use the UPTM. It is here that the general foundations of knowledge, skills, behavior, worldview are laid, with which a person will be guided throughout his life. In its importance and practicality, it was the elementary school that, in the course of history, has been in the first place (the requirement of compulsory primary education for everybody was often the cause of revolutions, unrest, changes of dynasties etc.). The appearance and diversity of UPTMs and authorial schools that operate in the system of official education or in parallel with it indicate both a creative search within the educational system and the democratic processes taking place in this sector.

The Coronavirus pandemic turned up to be a real challenge without the exception for every well-established social schemes and models for organizing life and human activities. On the one hand, protracted quarantine and self-isolation as a social phenomenon showed the vulnerability of existing medicine, economics, public administration and education as existing systems. However, on the other hand, the need to continue life and work, even in such conditions, led to a sharp appearance or activation of forms that before the Corona were only under development. Currently, there are many programs of artificial intelligence (AI) that help in education, thanks to which students, schoolchildren and teachers get huge benefits. The use of artificial intelligence capabilities in teaching humanitarian disciplines or humanities (in this article under this concept we mean such subjects as music, drawing, manual labor, natural history, languages etc.) is today the subject of discussion among methodologists. Also very controversial is the problem of using artificial intelligence for younger students in primary education institutions.

## DISCUSSION

### 1. **AI for children age 6-10: age features**

Today in the pedagogical space there are many programs and methods of teaching various disciplines for students of different ages who use the capabilities of artificial intelligence. However, these programs mainly exist in the field of non-formal education or for individual use to increase the level of knowledge. And if for older children such programs are already actively used in the educational process (for self-monitoring, completing and checking homework etc.), complex programs a

re being developed, for primary schools such opportunities are artificially limited by teachers themselves due to traditional ideas about the possibilities and psychological needs of the age period mentioned. Traditional features of this age that influence the educational process and until recently were considered to be the ones that make the process of AI technologies using in primary school unreasonable and impossible are:

- need for active communication;
- the possibility of changing activities (training - game);
- swings of mood and learning activity;
- lack of concentration and memorization habits (Barrington, 2019).

Also, communication with the teacher and other students by computer removes the emotional stress and fear of the teacher, which is present in 78% of primary school students in the first year of school, 45% in the second year of study, and in 15% remains until high school (Bostrom, 2016). AI today is able to help a primary teacher solve many emotional problems that primary school children have both in distance and in lessons with personal classroom communication.

## **2. UPTM or Authorial Schools: History of the Question**

The term of «authorial school» as an educational concept was introduced into world education in the 80s - 90s of the XXth century. In the mid-80s in former USSR took place the process of socio-pedagogical movement that aimed to establish a new education system in the country (more relevant to humanistic pedagogy with its focus on the personality of the pupil, rather than on the demand for class-ideological education). The whole country trend as well as a set of rather provocative publications in the Teacher's Newspaper (Moscow) became the impetus for the idea of holding a competition among the schools which already were using the UPTMs in practice to make this process more centralized and controlled by the state. A competition was held among schools that use UPTM in the educational process to select the technologies that, on the one hand - do not influence the current state educational system, and on the other hand - correspond to the democratic expectations and needs of society in order to recommend them to all schools in the country. The Project competition was held in 1987-1988 and received the name «Authorial School» to emphasize that the specific approach reflects the thoughts of a particular teacher (or group of teachers), but does not contradict the main educational doctrine of the country. Among the 250 schools all over the USSR that took part in the Project after three rounds of the competition according to the decision of the public-state examination commission,



six schools received the right to be called Authorial Schools with mentioning the name of the author (authors) of the educational program (or system) used (Guner, 2019).

With the growing popularity of Authorial schools as a form of getting knowledge and education in USSR, this pedagogical and social phenomenon has received scientific understanding there and in the countries which were influenced by it. In the countries of Europe, the USA, Japan and Canada, due to the greater democracy and autonomy of educational institutions (like schools, colleges, universities), which are supposed by the organization of the educational system in these countries, as well as the presence of a developed system of non-formal educational institutions the term «authorial school» was not recognized and was redone in UPTM as author's methods that can be used in a particular school or by a particular teacher.

Today, the interpretation of the UPTM and «authorial school» concepts and, accordingly, their use as an educational method have differences in Western and post-Soviet pedagogical schools. In countries of the post-Soviet pedagogical system (Russia, Ukraine, Belarus, Kazakhstan, Turkmenistan, Mongolia, Vietnam and some others), these concepts are associated with an alternative system for organizing the educational process, which is often opposed to the state pedagogical doctrine. In this case «progressive school», «school of developing education» and «school of self-determination» are synonyms for the concept that is under consideration (Martin, 2019). In the European and American pedagogical systems, the UPTMs and the «authorial school» are more regarded as additional educational methods that are used in public schools and are designed to motivate children to study, arouse their interest, diversify the forms of work at the lesson and at home, etc. (Laing & Khattab, 2016). Also, the difference in approaches can be traced in the massive of UPTM use in these two systems. The European and American systems enforce a teacher with the right to choose whether to use the UPTM during the lesson, which UPTMs to use, in what amount, etc. The Post-Soviet one, however, implies the complete transition of a certain educational institution to the specific set of UPTMs for all subjects that are taught.

### **3. Elementary School as the UPTM Territory**

Elementary school is the basic part of the entire education system. Elementary school teachers are called upon to teach children creativity, to find out and educate in each child an independent personality able for self-development and self-improvement,



to find effective ways to solve problems, to search for the right information, to think critically, to enter into discussion, communication, etc.

Elementary school for a child means the transition from play to schooling as a leading activity, which is to form the main mental patterns. When a child enters school he/she finds himself/herself in a new social situation, where a teacher becomes the center of it. At elementary school age, educational activities become the leading ones. Education is a special form of activity aimed at changing the students himself/herself into a subject of learning (Guner, 2019).

However this age is characterized by a number of features and needs, which are determined by the level and patterns of a child's physiology, psychology and cognitive development. UPTMs in general contribute to solving problems related to the individual manifestations of the above mentioned factors at a particular elementary school student.

- **Memory** at elementary school age develops in two directions - randomness and meaningfulness. Children involuntarily remember educational material that arouses their interest, presented in a playful way, associated with vivid visual aids, etc. But, unlike preschoolers, they are able to purposefully, arbitrarily memorize material that is not very interesting to them. Every year, in elementary school sphere appear UPTMs based on randomness memory. Elementary school students, as well as preschoolers, usually have good mechanical memory. Many of them throughout the course of elementary school mechanically memorize educational texts. This method of studying for students most often leads to significant difficulties in secondary school, when the material becomes more complex and larger in volume and solving of educational problems requires not only the ability to reproduce the material, but also to think it over, analyze, compress etc. UPTMs are designed not only to make the process of mechanical memorization of educational material for elementary school students easier and more interesting, but also to smoothly shift the emphasis from mechanical memorization to the semantic one;

- It is in elementary school age that **attention** develops. Without the formation of this mental function, the learning process is impossible. During the lesson, the teacher draws the attention of students to the teaching material, holds it for a long time. A younger student can concentrate on one thing for 10–20 minutes. UTMs at elementary school can help to increase the time of productive attention of a child. Hometasks created with the help of UPTMs can contribute to the training of

attention and concentration not only during school lessons, but also at home;

- **Motives** are incentives for activities related to the satisfaction of any needs. In elementary school students they act as a concrete reflection of needs. For example: the satisfaction of school training needs may be prompted by a student`s desire to please parents, to earn teacher`s praise, schoolmates` approval and interest in the subject. Several motives can act immediately as a stimulator, that is also successfully used in modern elementary school UPTMs (using the system of prizes for the correct answers, a rating system in the class, rewards of various forms, etc.) (Grigg, 2010; Dalland & Klette, 2016; Barrington, 2019). Also today, because of new social challenges, elementary school is to deal with issues that traditionally began to be considered in secondary and high school. We are talking about questions of gender education and self identification, religious and gender tolerance, foundations of legal and economic education, search and analysis of information when using the technology of online learning, etc. (Martin, 2019). In this regard, the number and variety of UPTMs used in elementary school today is constantly growing and such UPTMs are becoming more and more complex. Also, there is a constant process of dying off of some UPTMs, which were traditionally used in primary education (in most cases this applies to UPTMs using handouts, cards, one- and two-dimensional images, etc.) (Grigg, 2019).

Besides that, the technological revolution in education and the massive use of the Internet and computer in general (the process started in late 80s of the XXth century) led to a unique situation: on the one hand, it became technically easier for a teacher to fill the context of a UPTM (Trucano, 2012), but on the other, he/she faced the task of diversifying computer technologies using UPTMs towards the ones based on tactility, fine motor skills, group activities, etc.

#### 4. AI based programs for primary school education process

**Automatic rating.** A specialized computer program based on artificial intelligence, which is able to give ratings even for creative tasks in the field of reading and studying languages according to specified parameters (for example: the number of verbs in the essay, graphic parameters of letters, presence / absence of keywords, etc.). (Tuomi, 2018). Such programs can evaluate students` knowledge, analyze their answers, give feedback (recommendations based on given parameters) and make up individual training plans on the subject. (Guner, 2019). Also, similar programs today are able to analyze not only written, but also oral theists, as well as graphic tasks (from assignments for calligraphy to drawings made by younger students);



**Virtual assistants.** At the moment, there are already assistants for teachers who are able to respond accurately and quickly to students' questions, thanks to built-in computers with AI. (Marr, 2019). Also, simpler virtual assistants "live" in the mobile phones of primary school students. On the one hand, they favorably affect the emotional state of the child (the child has confidence in his/her abilities, since he/she always has someone who will help him/her in a difficult situation at a lesson). On the other hand, the choice of an assistant (its color, shape) reflects the child's inner world at a particular point of time and can serve as a certain type of monitoring the child's emotional state. Also, often such virtual assistants in mobile phones require the child to perform certain duties (feed, play, entertain it, etc.), which contributes to the child's self-discipline and aesthetization of his/her personal space;

**Virtual lessons.** It is difficult to overestimate the visual and emotional effect that virtual lessons create for younger students. With the help of AI based technologies, teachers can not only illustrate lessons in music (virtually attending concerts), arts (through virtual tours of galleries and museums), but also create the «presence effect» in the forest, on the seashore, etc. when primary school students study such subjects as ecology, natural history, history, literature, etc.

During the quarantine period caused by COVID-19, computer and AI became an organic and obligatory participant of the educational process, even in primary school. Many students due to temperament, personal features of character, etc. found this form suitable for them. It can be concluded that the primary school in the period after the quarantine becomes more AI.

### **5. AI based programs for primary school teachers**

This section presents artificial intelligence-based technologies designed to facilitate the work of a primary school teacher and make it more productive.

**Interval training.** These types of programs aim to check the residual knowledge of primary school students. Their essence is that the AI, based on the standard school curriculum and the tasks that the student passed in the personal account, tracks his / her progress and is able to find out information that most likely the student could forget and give recommendations for its repetition (Grigg, 2010). These types of programs are especially useful for teachers at the beginning of the new school year to find out which topics should be repeated with primary school students in the classroom and what should be left for independent repetition at home;

**Feedback for teachers.** Primary school, and especially the humanities there, is the fertile ground for individual, creative and innovative techniques. Each primary school teacher to one degree or another develops his/her own methodology, finds own approaches to instill in the child love for the process of obtaining knowledge in general and for a specific subject in particular. Primary school teachers willingly share their methodological findings with each other - this is considered normal (Martin, 2019). Today, chatbots with AI are increasingly used to determine the “viability” of the particular methodological innovation. They are able not only to collect opinions through a dialogue interface, but to find out the reasons for this or that opinion;

**Personalized training.** Personalized learning refers to a variety of educational programs in which the pace of learning and the educational approach are optimized for the needs of each student. Experience takes into account learning preferences and the specific interests of different students. Artificial intelligence easily selects the right pace for the student so that he/she can better learn the program. In primary school, such programs are recommended as additional tools for students with special educational needs (both for lagging students and those whose success is above average) (Williams, 2019). Such programs are extremely important for primary school, since children at this age have a different reaction rate, the rate of assimilation of the material, are characterized by bursts of educational activity, which can be replaced by apathy.

The progress in AI and machine learning is impressive; this area of education is constantly evolving. There are so many good ideas that AI can implement. In general, AI can significantly improve education systems due to its ability to optimize many parts of the teacher’s work and, ultimately, giving them more and more time to spend on their students.

## CONCLUSIONS

For today it is already obvious that the world will never be the same again and we are to face the Pre and Post Corona world`s differences everywhere: both in global processes and at the level of daily little things. Education is of no exception. Going to school makes major changes in a child’s life. The whole way of his/her life, social position in the team, in the family changes dramatically. From now on, studying becomes the leading activity, and the most important duty of the child is to learn, to acquire knowledge. Studying is a serious work that requires organization, discipline and willful efforts of a child. He/she joins a new team, in which he/she will live, study,





develop. UPTMs are designed to soften this transition and lay the foundations for subsequent educational activities based on the principles of interest, positive perception of this type of activity, creativity, positive motivation, etc. For a teacher, UPTM is an opportunity to expand the lesson's tools, make better specification in the choice of methods to convey knowledge to a student (students), to present information in a form that is more acceptable to a particular student (or group of students), his/her/their needs, level of knowledge and development, emotional and psychological state and etc. Artificial Intelligence based technologies that before the Coronavirus Pandemic played an important role in certain aspects and fields of study as an additional component, during the Corona period began to dominate at all levels of educational services. This trend should continue after the removal of the restrictions associated with the pandemic. Under a great concern among teachers due to the peculiarities of the psychological development of children has always been the question of AI based teaching methods active use with an age group of 6-10 years (primary school period), especially in teaching humanities. The main argument against was the dominance of individual forms of work in such types of training without the interaction of children with each other. In other words, the weakened communicative aspect. Today, this problem has been already solved both at the technical level (conference-call formats widen the teaching opportunities in general a lot), as well as the concept of "communication" has been expanded to include communication using video communications and other popular sources.

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