

Digital Transformation of Education and Artificial Intelligence

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ABSTRACT

The problem of digital transformation of the education system in the Russian Federation is considered. The problems connected with the use of artificial intelligence technologies to create a fundamentally new quality education system are discussed. The problem of digital transformation of education, features of introduction of technologies of an artificial intellect in a modern reality is stated. The concept of electronic adaptive learning, in particular, adaptive intellectual learning platforms, is considered. The basic trends in modern electronic education which make possible realization of adaptive electronic learning in the digital environment are briefly listed. It is shown that the adaptive digital environment is the center of formation of value professional competences and attitudes of the learner. The specifics of using artificial intelligence to ensure inclusion and equality in education are presented. The prospects of using artificial intelligence in the Russian Federation on the basis of the developed National Strategy of Artificial Intelligence Development till 2030 are considered.

Keywords: *digital transformation, artificial intelligence, e-learning, adaptive intelligence platform, mobile learning, inclusive education*

1. INTRODUCTION

The digital economy and the digital society, as global trends of the modern era, require adaptation and modernization of the education system, the main purpose of which is to prepare people for life and professional activity in the conditions of the digital society and digital economy [1].

Construction of the digital economy and formation of the digital education system are significant priorities of the Russian Federation state policy, which is set forth in federal strategic documents. The goal of digital transformation of the educational process is to create an effective educational system that meets the needs of the digital economy and ensures maximum use of the potential of digital technologies [2].

Digital technologies that are important from the point of view of the educational process implementation may include telecommunication technologies providing for the creation of new generation communication networks; technologies of artificial intelligence and processing of large data (BigData); virtual and augmented reality; cloud technologies; Internet of Things (IoT); blockchain technologies and others.

The formation of new requirements to the implementation and content of the educational process, especially in terms of its personalization in the form of development of individual educational routes and providing a practice-oriented approach stimulates the introduction of various

forms of digital education, including adaptive systems, blended learning, case studies, mobile learning, gamification, project activities, etc. All these trends are inexorably taking over the educational market and changing it [3]. In order for new educational technologies to be most effective, it is necessary to develop reliable and reliable indicators that can help the logic of cognitive processes, as well as the fundamental impact on learning outcomes.

2. UNIVERSITIES AND ARTIFICIAL INTELLIGENCE: A NEW REALITY OF EDUCATION

2.1. Digital Transformation of Education

The mass digitalization of all spheres of life, the widespread use of the Internet, the spread of unified standards, competencies and qualifications in education require rethinking the processes of educational transformation, which are associated with another change in the technological mode and models of economic growth in the conditions of the fourth industrial revolution.

The digital transformation of education can be interpreted as a transition from the standard technology of material passage to the formation of required professional competencies for each student. This task can be solved by

optimizing the learning process and actively involving students in project professional activities, taking into account their individual abilities and interests. The main aspects of the digital transformation of the learning process include, first of all, the transition to an individual educational trajectory, changing the methodology of conducting educational work, modification of the principles and regulations of the educational institution [4].

The new digital environment, against the background of a general growth in the importance of real and virtual communities in all spheres of human life, is becoming a center for the formation, transmission, and implementation of professional value competencies and attitudes. The main goal of such innovations in the education system is to ensure that individual characteristics of students are taken into account, which should, for example, allow one to achieve acceptable educational results, while others - in-depth and/or accelerated education. The formation of a digital professional portfolio of each person throughout his or her life contributes to the systematization of value systems and their actualization [5], which together transforms social and political relations and opens the prospects of effective management of educational system resources according to the identified criteria for certain groups and members of society.

2.2. Artificial Intelligence: The Age of Implementation

Artificial intelligence can be defined as the direction of modern science, which studies the methods and properties of intelligent systems to perform creative functions, until recently, traditionally considered the prerogative of man and allowing to achieve results that are at least comparable to the results of human intellectual activity. The main technological principles of artificial intelligence (AI) include neural networks, machine learning, deep learning, cognitive computing, computer vision, etc.

Programs based on deep learning technologies are now capable of identifying faces and emotions, recognizing speech, handwritten text, speech-by-speech, identifying a person's social type by text, assessing credit risks, predicting weather, and property values based on a series parameters (object area, area, infrastructure features, availability of natural objects), etc. Almost all applied or research tasks fall into one of five categories for artificial intelligence that:

- pattern recognition, image processing;
- word processing, work with language tasks;
- recognition of speech, emotions by voice, processing of audio signals;
- regression and prediction of time signals;
- machine creation (the generation of voice, music, handwritten numbers or handwritten text in a specific handwriting, the creation of poems and songs, etc.).

Deep learning technologies show impressive results. Many international corporations devote significant resources to

access advanced scientific research in this area. British startup in the field of AI "Deep Mind" in 2014 allocated more than \$ 500 million to create AlphaGo [6]. In 2017, the British company Improbable, which is developing on the SpatialOS platform, received more than half a billion dollars to create a large-scale simulator of reality. Improbable plans to create a large virtual world. The investors were the Japanese media corporation Softbank. This is one of the largest startup investments currently known. [7]. It is assumed that with the help of SpatialOS, scientists will be able to create simulations of entire cities to simulate the behavior of millions of people, which is one of the company's goals: to design multifaceted, stable virtual worlds and use this data to influence how people make decisions.

Speaking about investments in the field of AI, it is worth noting separately that SoftBank Corporation, led by Masayoshi Son, has even stumped the silicon valley. Local experienced venture capitalists are used to investing in small startups, and then determine the most successful among them. Now the strategy is changing: the S. Masayoshi fund allocates huge amounts (up to \$ 30 billion at a time) to the most successful and largest startups in the selected category.

In 2018, California-based Sequoia Capital, known for its investments in Apple, Google, PayPal, YouTube, Instagram and WhatsApp, announced the creation of an investment fund of \$ 12 billion. For comparison, just five years ago, it cost \$ 1.7 to create the same fund. billion. Former Sequoia rival Silicon Valley company Kleiner Perkins, which has invested in more than 850 startups, including Amazon, Google, Netscape, Snapchat, Twitter, announced the completion of its work [8].

At present, new horizons of AI research are opening up. All this requires the ability to develop complex mathematical algorithms, manipulate large amounts of data, use them to train neural networks.

2.3. Artificial Intelligence in Education

Today, AI is the most important area of IT research. In Russia, artificial intelligence has already touched upon such areas as collection and processing of large volumes of data, knowledge management. intelligent diagnostic systems and infrastructure monitoring, educational platforms, individual training trajectories, etc.

The application of artificial intelligence in education has been the subject of scientific research for many years [9-11]. Developments include AI issues as well as research in psychology, neuroscience, linguistics, sociology and anthropology to promote adaptive learning environments that are personalized, inclusive and effective.

The rapid spread of artificial intelligence technologies in the coming years may have a marked impact on changing educational content and lead to the emergence of qualitatively new digital educational materials and tools [12]. When planning the use of AI in education, special attention should be paid to the unique potential of educational analytics based on intellectual data analysis - a

technique that allows to identify problems and predict shortcomings in the process of knowledge transfer and assimilation, as well as contribute to improving the quality of the educational process [13]. AI and other digital innovations have already demonstrated their positive impact in terms of creating a qualitatively new digital educational space in different countries [14-16].

In July 2019, representatives of 100 Russian universities participating in the "Island 10-22" educational event at Skolkovo Institute of Science and Technology signed a document with the leadership of the University "20.35" on the launch of a unified training program in artificial intelligence technologies at their sites. The network project, in which students, lecturers, managers and scientists will be able to participate, was launched in September 2019. It is expected that in the near future universities will also be able to directly introduce artificial intelligence technologies into educational and scientific processes, as well as the sphere of university management based on data analysis.

2.4. Artificial Intelligence Technologies and E-Learning: Intelligent Adaptive Platforms

E-learning, i.e. training using information and communication technologies has recently become widespread. An analysis of the current situation allows us to conclude that personalization is becoming a global trend in e-learning [17]. The growing popularity of this learning process can be explained, on the one hand, by the natural desire for an individual approach to personal requests and needs, on the other hand, by the growth of a person's need for greater efficiency and comfort in the process of acquiring professional competencies and skills in the new technological structure and informatization of society.

There are several trends in modern electronic education that make it possible to implement adaptive e-learning in a digital environment: the availability of a huge amount of educational data on the Internet, the possibility of detailing educational content, and high data correlation. Adaptive learning, one of the most promising areas of application of artificial intelligence in education, can be interpreted as some kind of training model or concept that uses new technologies to increase the level of knowledge of students, taking into account individual needs and characteristics and with the possibility of building an individual learning path.

Modern intelligent adaptive platforms take into account the enormous amount of data the source of which is the educational system. The ability to process and analyze this data gives great advantages in changing and adapting the learning process. Here, AI technologies work simultaneously with the Big Data, Data Mining, Learning Analytics methodologies and tools.

In Russia, there is still no single platform that allows you to build a personal learning path. However, a number of companies use artificial intelligence and data analysis

methods to build educational platforms with similar capabilities [18].

In 2015, the team of the Stepik Russian educational platform began developing an adaptive recommendation system, the functionality of which includes an individual selection of educational content depending on the level of knowledge and requests of students. Such an approach makes it possible to achieve greater effectiveness in training, since adaptive recommendations allow you to create interactive lessons with automatic task verification and feedback. This is a kind of virtual teacher, which helps the student to select individual material for the successful development of the course.

The Internet company Yandex and the educational holding Enlightenment agreed to create an educational platform for students, teachers and parents. The corresponding agreement in June 2017 was signed at the St. Petersburg International Economic Forum. The online educational platform Yandex.Enlightenment is designed to automatically evaluate the knowledge of students. The new digital service helps teachers to improve the individual educational results of each child, using Yandex technological solutions and the existing Enlightenment methodological complexes, advanced scientific developments in the field of digital pedagogy.

Yandex took on the task of developing a platform based on existing technologies of machine learning, computer vision, speech synthesis, etc. Enlightenment will provide modern educational and methodological materials on school subjects for different ages, taking into account the needs of students.

A beta version of this digital educational platform was presented at the Moscow International Salon of Education in April 2018.

In Russia, there are other examples of the use of AI in education. For example, the Russian startup Parla is a virtual English teacher. Parla is a mobile application that uses artificial intelligence, the program adapts to the student and learns with him. During registration, the application analyzes the user account on the social network and draws up an individual training plan. This is a commercial product, but the basic functionality of the application is free. The commercial version, in particular, has the ability to increase the number of bonuses inside the application, which makes the energy endless and allows you to turn on Parla offline. Free use of the application requires a permanent connection to the network.

In July 2019, Tomsk State University of Control Systems and Radio Electronics signed a memorandum of cooperation with the University platform 20.35, the Agency for Strategic Initiatives (ASI) and IT companies on cooperation in a network project on artificial intelligence. Within the framework of the new project, it is planned to create a joint database for the formation of digital models of competencies of specialists using artificial intelligence technologies, as well as the creation and improvement of recommendation services using AI technologies, participation in the creation of digital content and the implementation of educational activities that can

ensure the development competencies in the field of artificial intelligence.

Experiments on the introduction of adaptive technologies in training are carried out in commercial projects in the field of HR. In the Russian market today are most noticeable Competentum, Ispring, E-mba. There are attempts to implement AI when teaching languages (Skyeng, Lingualeo, Websoft), as well as programming and design (Geekbrains, Netology). Knewton, Blackboard, Loud Cloud, Geekie, and others are known among foreign intelligent learning systems. All these systems use various intellectualization algorithms and training models. It is important that the process of automated formation of an educational trajectory is advisory in nature, and the effectiveness of the implementation of e-learning on adaptive digital systems depends on the learner's belief in the intelligence of the platform used.

2.5. Artificial Intelligence and Inclusive Education

In early March 2020, a week of mobile learning was held in Paris at UNESCO headquarters. This event is one of the most important events of the United Nations in the field of the use of digital technologies in education, which has been organized by UNESCO and its partners for several years. This year, the week of mobile learning was dedicated to the topic "Artificial Intelligence and Inclusion". The main task of the organizers and partners of the event is to promote the use of artificial intelligence to ensure universal and safe access to quality education, including inclusiveness and equality in the field of education.

The events of the week of mobile learning include workshops, symposiums, forums and collectively create a global platform for demonstrating promising educational applications and practices. One of the main issues is the use of artificial intelligence technologies to ensure digital, gender equality and access to quality education and training throughout the life of any person [19].

It should be noted that inclusiveness and equality are basic moral principles that underlie the implementation of the goals in the field of sustainable development and are designed to ensure coverage of all segments of the population with digital educational technologies. Currently, AI-based technologies are used to overcome gender inequalities and inequalities in access to education for people with disabilities. The use of AI-based tools in the educational process should stimulate teachers to more actively introduce inclusive learning models and facilitate the involvement of students with learning difficulties in learning materials, children with disabilities, as well as people learning in a language other than their native language.

In order to solve existing moral and ethical problems, to prevent any bias against a certain vulnerable group of the population, as well as to guarantee ethics and gender equality, transparency in the use of student data, the

development and application of AI algorithms and tools should be implemented based on relevant regulations Noah base. Digital innovation and artificial intelligence must also become a shared collective digital asset, especially in terms of universal access.

It is necessary to develop and use AI technologies so that they contribute to the creation of non-discriminatory and generally accessible learning opportunities throughout life, as well as the official recognition, certification and certification of learning outcomes.

Algorithmic and other AI-based tools require further improvement and a specific focus on the development of skills such as interpersonal communication, global citizenship and others necessary to ensure personal fulfillment and relevance in the labor market.

2.6. The future of artificial intelligence in Russia

Artificial Intelligence is one of the trend areas covered by all developed countries of the world. In order to develop the artificial intelligence in Russia, the Decree of the President of the Russian Federation from October 10, 2019 № 490 approved the National Strategy for the Development of Artificial Intelligence until 2030 in the Russian Federation, which defines the objectives of the development of artificial intelligence in Russia.

In order to study the best foreign experience in AI development, work is underway to create a centre for the fourth industrial revolution on Sberbank's platform, which is scheduled to open in 2020. It is planned that the centre will work in the following areas: Internet Things, Robotics and Smart City.

Sberbank has prepared proposals for the development of artificial intelligence in Russia. This area was divided into seven sub-technologies: computer vision, natural language processing, speech recognition and synthesis, recommended systems and intelligent decision support systems, advanced methods and technologies in AI, neuroprosthetics and, finally, neuro-interfaces, neurostimulation and neurosensing.

In the near future, it is planned to develop a federal state educational standard for training in AI technologies; to organize competitive support for the development and launch of pilot new-generation educational programmes for secondary vocational and higher education in AI; to create demonstration schools of the future, to develop standards for the collection and use of educational data required for the operation of AI technologies, as well as to create a national database of educational data with open access to impersonalized people.

Besides, it is planned to create an open AI university for professional retraining, to develop financial and tax incentives for companies organizing corporate AI schools and universities.

In the field of algorithms and mathematical methods it is proposed to form centers of excellence on the basis of leading universities in priority areas of research in the field

of AI; to ensure the participation of Russian researchers and research teams in major international research projects in the field of AI; to update the criteria for assessing the results of research in the field of AI taking into account the contribution to the development of new models and algorithms; to develop a program to support international internships for the most talented students.

3. CONCLUSION

When used effectively, the AI can be a valuable tool for any educator, helping to find the most appropriate learning strategies to enhance a learner's knowledge by analyzing the learner's learning style, strategy, and overall progress [20]. In order to make AI in education as effective as possible, it will be necessary to develop reliable and reliable indicators that include difficult to measure characteristics such as creativity and curiosity. Data can also help us better understand cognitive processes and the fundamental impact they have on learning outcomes.

AI technology enters our lives with confidence, providing completely new tools for processing data and information. The process of obtaining new knowledge increasingly depends on technological innovation. Future education is built around new innovative digital technologies and tools. Internet-based resources enable learning to be more flexible and individualized.

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