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The Use of Artificial Intelligence in Education in the Age of Digitalization

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Abstract

The authors of the article consider the domestic experience of introducing new digital technologies using artificial intelligence (AI) at the Plekhanov Russian University of Economics from the point of view of a student, teacher, administrative and managerial staff. The development of neural network technologies, artificial intelligence technologies in the educational field, and human resource management in society determines and directs the vectors of training modern specialists who are able to resolve complex contradictions in the current system of social organization and respond to a number of challenges related to ethical and social aspects. The systematic emphasis on ensuring continuity in the educational process of a modern young specialist forms a set of his competencies capable of providing not only answering complex answers and questions in the labor market, but also shaping, developing the student's correct formulation of tasks and their solution.

Keywords: *digital technologies, artificial intelligence, neural network technologies, education, human resource management, social system.*

Introduction

The use of digital solutions by educational institutions is very common nowadays. At the same time, the process of digitalization in many universities is uneven. A special place in digitalization is the active introduction of artificial intelligence technology into the practice of the educational process.

In Decree of the President of the Russian Federation No. 490 dated October 10, 2019 "On the development of Artificial Intelligence in the Russian Federation" [1] and the National Strategy for the Development of Artificial Intelligence for the period up to 2030 [2], the term "artificial intelligence" reads as follows: "a set of technological solutions that allow simulating human cognitive functions and obtaining specific tasks, results comparable at least with the results of human intellectual activity." The use of artificial intelligence can open up new perspectives for the education system. The question is, is society ready for this?

Speaking at the St. Petersburg International Economic Forum (SPIEF), Rector of Tomsk State University E. Gadzhinsky noted: "Artificial intelligence is actually a tool for expanding human cognitive capabilities" and "we must accept this technology and think about how to use it with its power and potential for the development of education" [3]. N.A.. Korovnikova also believes that "increasing the level of digital competence of all subjects of education, as well as the generation and subsequent development of a digital educational space that meets the requirements of effective use of educational AI technologies in teaching" [4]. Vyacheslav Yurchenkov, Head of the Center for Educational Technologies at Sberbank University, noted: "Let's be realistic: artificial intelligence in education, even if it is immediately implemented, will not give you immediate results. There will not be less work right away, because it will be necessary to collect data, mark it up correctly in order to train the system, and it will subsequently give the necessary results to both the teacher and the listeners" [5].

The introduction of artificial intelligence into education in our country still raises many questions. It is noted that artificial intelligence will never replace the system of education and the transfer of values from teacher to student. Indeed, there are quite strong sentiments in social networks suggesting the rejection and

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even sabotage of everything digital in education. And it's not even about artificial intelligence – there are, for example, those who are not ready to use cards to identify students at the entrance to the school and an electronic diary. There are even those who sincerely believe that teachers use digital solutions solely because the government pays extra for each task in the DSP. At the same time, the number of supporters of digitalization is also quite large: the growing number of online schools and their popularity can serve as an indicator, not only as an institution of additional education, but also as an alternative to classical secondary schools. It is difficult to predict whether there will be a winner in the dispute between traditionalists and innovators, and whether the wheel of progress will be able to overcome pessimism about numbers in general and AI in particular.

The discussion that in the context of global instability, fundamental geopolitical and financial and economic changes in the world, where artificial intelligence plays an increasingly important role in various spheres of our lives, and education is no exception, does not lose relevance in scientific discourse (Annenkova A.V., 2023; Bilalova U.M., 2020; Bryzgalina E.V., 2021; Vovk E. V., 2022; Gavrilina Yu. I., 2024; Gambeeva Yu.N., 2021; Gretchenko A.I., Gretchenko A.A., 2024; Gritsai L.A., 2024; Elsakova R. Z. et al., 2024; Korovnikova N.A., 2021; Lapina M. A. and others, 2023; Besteva L.V., 2020; Lyubimov A.P. et al., 2019; Mindigulova A.A., 2022; Mosolkina D., 2023; Paskova A.A., 2019; Platov A.V., Salakhova A.A., 2018; Semenova D.A., Shpak A.E., 2023; Sokolov N.V., 2022; Strunin, D. A., 2023; Taran V. N. et al., 2022) since the beginning of cardinal reform transformations in the educational sphere at the beginning of the XXI century [6-25]. Therefore, the preservation and enhancement of artificial intelligence is more important than ever for most countries, including the Russian Federation.

And this, in turn, requires the teaching staff to develop and implement new models in the educational process that combine distance and blended education based on the integration processes of large information models and special algorithms, simplistically called artificial intelligence.

The integration of artificial intelligence into the educational process contributes not only to improving the quality of learning, but also to creating a more inclusive and adaptive educational environment where each student can achieve their maximum capabilities. This new era of education prepares students for life in a rapidly changing world saturated with technology and innovation. Artificial intelligence can be used to automate many administrative actions of teachers and optimize the management processes of educational institutions. This allows educators to focus on teaching and interacting with students, minimizing routine tasks. In addition, AI can offer tools for creating interactive learning materials and simulations, which significantly increases the level of student engagement.

In addition, the current digitalization of the Russian economy requires a reorganization of the educational process as a whole. There will be a transition from learning "for the future", aimed at memorizing significant amounts of information, to the development of project/group work competencies. This approach will ensure that students understand real-world tasks and gain practical experience at the university.

The current era is commonly referred to as the era of digitalization, which is rightly considered the industrial revolution that replaced informatization and computerization. It covers production, finance, education, culture, social and other spheres of our lives. Already, a significant part of the population uses the Internet daily in their daily lives – they make online appointments with a doctor, pay for housing and communal services, taxes and fines, purchase goods from online stores, use online banking, and electronic document management is being actively introduced at enterprises. The emergence of breakthrough technologies based on the use of artificial intelligence and robotics leads to the replacement of humans in industrial and household processes.

Digitalization, or in other words, the total penetration of digital technologies into all spheres of life, entails a change in the world of professions. Some of them, consisting of routine actions, are in danger of disappearing completely. For example, such as: tour agents, cashiers, bank employees, construction workers, newspaper and magazine workers, dispatchers, farmers, accountants, employees of enterprises, fast food workers. The professions of postman, packer, machinist, logistician, librarian and many others are also becoming obsolete.

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Research Methods and Organization

The authors chose a civilizational (socio-cultural) approach as the methodological basis of the study, taking into account the most important dialectical patterns occurring in the context of the transition of the economy to the use of digital technologies using artificial intelligence. This approach to research on the development of countries and the global community is supported by many both domestic and foreign scientists. It is also effective in managing human resources in the context of the formation of the digital economy and the active introduction of artificial intelligence into public administration practice.

The most important aspect of this approach is comprehensive research in the field of artificial intelligence management from the point of view of accumulated Russian historical experience, technological, economic and socio-cultural level of society development. It should be noted that, guided by the research rules underlying the civilizational approach, studying one or another aspect of social dynamics and highlighting the prerequisites and patterns of transformation of the artificial intelligence management system in the context of the transition to the digital economy, it is necessary to take into account the multidimensional, civilizational nature of the functioning of a state or a group of states representing a civilization. This is also relevant when justifying the changes in the impact of economic instability on the formation of personnel policy in the country.

When conducting research on the practice of artificial intelligence management during the transition to a digital economy using artificial intelligence, the authors of the article used the following general scientific methods: observation, description, analysis, induction.

The research results presented in the article were based on the analysis of scientific papers by leading Soviet, Russian and foreign economic scientists. An interdisciplinary research approach was used to draw conclusions based on literature analysis. Internet resources and static databases, including Rosstat, were used.

Research Results and Discussion

Since the second half of the 20th century, the problems of artificial intelligence related to human knowledge and the need to store it have been raised in research conducted by both foreign and domestic scientists. During this period, there is a paradigm shift in this field of research. There is a search for solutions to the most important tasks related to manipulating the knowledge of a person describing a specific subject area, which includes solving several tasks.

The most important aspect of using artificial intelligence in education, in our opinion, is its ability to identify problems at an early stage, such as declining academic performance or misunderstanding of teaching materials. With predictive analytics, educational institutions can step in in a timely manner, providing additional resources or support to those students who need it.

Trends in artificial intelligence are driving rapid growth in educational technology. Student engagement is enhanced through customized courses, interactive and gamified skills acquisition classes, etc. The global AI market in education is projected to grow to USD 20.54 billion in 2027, with an average annual growth rate of 45.6% between 2022 and 2027 [26].

Companies are collectively investing billions of dollars in a wide range of artificial intelligence applications, from educational app development, robotics, virtual assistance, and natural language to computer vision, and machine learning in education.

Due to its many advantages, artificial intelligence in education simplifies the performance of various tasks and makes the learning process simple. Here are some popular examples of artificial intelligence in education, where technology is changing learning and education.

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Personalized learning. Everyone adapts to knowledge in different ways. Some people learn fast, while others need time. In the traditional education system, there was no concept of individual learning for each student. This is where artificial intelligence comes to the rescue.

Identify the vulnerabilities of the group. One of the powerful advantages of artificial intelligence technology in education is the preservation of the positive impact of distance learning on the environment. However, many believe that artificial intelligence will soon replace the human factor in learning. Now this may be the case in other industries, but not in the education sector. Artificial intelligence and education go hand in hand, complementing manual and virtual learning.

Closing the skills gap. This applies not only to students. Upgrading the skills and training of the existing workforce can boost morale and stimulate the desire of the entire company to improve and innovate.

Round-the-clock assistance using interactive artificial intelligence. People all over the world choose distance and corporate learning courses where they don't have to take time away from their studies, family, or work. Here, chatbots with artificial intelligence can solve registration requests, provide instant solutions, provide access to necessary training materials, and provide assistance.

Artificial intelligence in exams. Artificial intelligence can be actively used in exams and interviews. This way you can identify suspicious behavior and warn the supervisor.

The field of application of artificial intelligence is currently very diverse. This includes technologies for personalized and adaptive learning, analysis of the behavior of all participants in the educational process, and increasing the accessibility and inclusivity of the environment.

Thanks to the development of digital technologies, regular education is becoming knowledge-intensive and human-centered. Recently, the trend has been such that if a person wants to be in demand in his industry, he needs to continuously study, gain new knowledge and skills.

Generative artificial intelligence allows you to create text and visual content and instantly translate text. Gamification based on artificial intelligence algorithms is widespread.

For example, if we talk about students, we can identify which tasks are easy and which are difficult. This allows you to discover talents and develop the necessary skills in the process of studying the topic. If we talk about teachers, digital technologies can help with routine. Teachers can check papers faster thanks to automatic test checking, identify problematic topics for each student and focus on them.

In addition, the AI service will be useful for teachers to review their teaching practices along with the best practices of effective teachers, and identify methods to improve students' sustainable academic performance.

Currently, new opportunities are being created for everyone to identify and maximize their potential in a rapidly changing world. Therefore, it is necessary to follow the trends in the industry and focus on developing solutions using personalized educational trajectories in order to navigate students through all the variety of offers. It is important to respond to user requests. Some Russian universities have extensive experience in developing online programs for any business needs, with personalization of methodology and subject matter.

Generative artificial intelligence creates new opportunities and tools that make it possible to close routine processes, and extracurricular students can quickly receive support through automated tutoring bot systems.

One of the current methodological trends is the interpenetration of educational environments. This implies that the modern learning process should include both online and offline spaces. The key advantage of this approach to learning is the availability of educational materials from any device and the ability to complete tasks at a convenient time. The ability of online programs to adapt to different types of perception: for

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visuals, audials and kinesthetics. Offline, in turn, allows you to create an effective environment for learning and working on joint projects.

For example, Sberbank of Russia, together with one of the Moscow educational schools, launched the All-Russian Digital Marathon competition, in which residents of the country over the age of 18 can participate. During the competition, they will test their digital skills, compete for prizes and receive recommendations for development based on the results. The competition uses the experience of evaluating the skills of IT specialists and the training format that are used in this educational institution.

The question arises: "How can I increase the motivation for learning in an adult?"

Education today is like a new fitness, many people have a regular need to form and maintain their cognitive and professional fitness.

It is important to create an environment in which students motivate each other to acquire new skills and knowledge. The accumulated experience shows that the most effective is the peer-to-peer method, which is based on the principle that people learn better and more effectively when information is transmitted by different people in a single educational context.

In addition, it is important to personalize the educational trajectory, taking into account personal goals, interests, experience, and the pace of learning. To begin with, you can formulate a personal goal – it must be specific, measurable, achievable, relevant, and time-limited. Setting goals helps you focus on specific steps to achieve educational results and, if necessary, understand when to adjust your development vector. Regardless of age, everyone can and should develop the habit of learning.

Indeed, there are many successful applications of artificial intelligence in education. And it's not just about experiments: there are successful practices that have been developed over the years, there is an evidence base on how they can improve the quality of education, including for the most difficult categories of students.

There are a number of educational platforms that use artificial intelligence models in order to analyze the learning process and, in accordance with the data obtained, personalize the further program in a certain way. This is important because every student, whether it's about school, university, or a continuing education program, has their own pace of information acquisition and perception of information. Artificial intelligence is able to identify and take into account all these factors when planning and creating models. Without such personalization, you can ruin the potential of someone who is able to learn faster than average, or if the teacher focuses on better-performing students, laggards do not even learn basic knowledge.

Another promising area is the use of machine vision to recognize students' homework assignments. One of the bottlenecks of the modern education system is checking homework assignments.: This takes up a lot of the teaching staff's time, is not always regularly checked, and in any case does not provide prompt feedback to the student to eliminate gaps in knowledge or skills. As a result, the effectiveness of working on errors is seriously reduced. Meanwhile, there are applications that allow you to point the smartphone camera at the solution, it will be recognized, compared with the reference one, and the student will almost instantly see where there are errors, incorrect design, etc. The teacher can also see the analysis of students' work and sort out complex or controversial cases. Based on the data obtained, he can integrate individual modules into the learning process, analyze additional examples, and so on. It is clear that the use of such tools is possible only for unified tasks, for example, natural science disciplines. Teachers will have to handle the verification of creative assignments themselves, at least for now.

The use of artificial intelligence in education is hindered, among other things, by the fact that the development of solutions requires very serious investments either from the government or from business. Currently, China is the leader, where they invest a lot of money in the development of such resources. For

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example, tax incentives for educational startups based on artificial intelligence, which attracts venture capital investors.

With the advent of a new direction – machine learning, it became necessary to optimize the search for a solution that helps to remove the limitations in this subject area of knowledge that are necessary to solve a particular problem, in particular, building a system that includes a set of methods that combine systems such as speech communication, machine translation, computer vision, biometric identification, etc. etc . Thus, access to the necessary information in a specific space (social, physical, informational) appeared.

Some Russian scientists (Chubukova S.G., Gorodnova, N.V., Gagarina G.Yu., Gretchenko A.I., and others) note that "... artificial intelligence is characterized as a system of innovative solutions that partially replace human cognitive functions and obtain results comparable to human intellectual activity. This complex includes information and communication infrastructure and software" [27-29].

A number of regulatory legal acts provide the initial foundations for understanding the essence and content of artificial intelligence technologies. In particular, the Decree of the President of the Russian Federation "On the development of artificial Intelligence in the Russian Federation" approved the national strategy for the development of artificial intelligence until 2030, introduced the concept of artificial intelligence as "a set of technological solutions that allow simulating human cognitive functions (including self-learning and finding solutions without a predefined algorithm) and obtaining results when performing specific tasks.", comparable, at least, with the results of human intellectual activity. The complex of technological solutions includes information and communication infrastructure, software (including those using machine learning methods), processes and services for data processing and solution search" [1].

According to the National Security Strategy of the Russian Federation (dated December 31, 2015, No. 683): "national security is the state of protection of 133 individuals, society and the state from internal and external threats. It includes the defense of the country and all types of security, primarily state, public, information, environmental, economic, transport, energy, and personal security" [30].

The Decree of the Government of the Russian Federation dated August 19, 2020 No. 2129-r "On approval of the Concept for the Development of regulation of relations in the field of artificial intelligence and robotics technologies for the period up to 2024" [31] presents the regulatory framework for the use of artificial intelligence, defines approaches to changing the regulatory system in order to ensure the possibility of creating and applying such technologies, taking into account the rights of citizens and ensuring the security of individuals, society and the State.

Starting from September 1, 2023, the Government of the Russian Federation, together with subordinate organizations, is conducting an experiment on the selection of employees for civil service using artificial intelligence on the "State Personnel" platform based on the Federal State Budgetary Institution "State Technologies", which will last until November 1, 2024[32]. The proposed pilot project is related to the use of artificial intelligence to hire personnel for public service. This project is being carried out as part of an experiment to evaluate the effectiveness and benefits of such a solution.

In our opinion, this project can contribute to solving the following tasks:

1. ***Reducing the time required for the search and selection of candidates***. Since the recruitment process for public service can be long and time-consuming, the use of artificial intelligence will significantly speed up this process, allowing HR specialists to focus on other tasks of shaping the organization's personnel policy.

2. ***Automation of the candidate selection process.*** Using modern technologies and machine learning algorithms, as well as neural networks, artificial intelligence will be able to scan resumes, analyze professional skills and experience, and evaluate candidates' suitability for a particular government position.

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3. ***Increase the quality of hiring.*** Artificial intelligence is able to analyze a large amount of data, which makes it possible to identify hidden talents and potential of candidates that may be overlooked in traditional personnel selection.

4. ***Reduction of subjectivity in the selection of candidates.*** The use of artificial intelligence will eliminate subjectivity based on objective data and criteria, as the human factor can be biased and vary from recruiter to recruiter.

At the same time, it is necessary to note the negative factors that this pilot project may entail.:

1***. Lack of flexibility and creative thinking.*** Artificial intelligence in personnel management may not be able to take into account nuances, emotions, and context, which may be important in solving complex problems related to government employees. They may be limited in their ability to adapt to complex situations that require flexibility and creative thinking.

2. ***A potential barrier to human interaction.*** The decrease in emotional connection and understanding, which can be important during the hiring and management of government employees, is closely related to the introduction of automated artificial intelligence systems. The latter can reduce personal contact and interaction between employers and candidates.

3. ***Potential biases.*** Unfairness in the process of selecting candidates or making decisions about the personnel of government agencies based on unreliable assumptions is possible, since artificial intelligence algorithms may have a bias based on insufficiently diverse data or erroneous initial information.

4. ***Job cuts.*** A shortage of jobs and an increase in unemployment is also possible with the use of artificial intelligence, which can help replace a number of line staff in the civil service. At the same time, poverty and unemployment pose serious threats to national economic security. They can lead to social tension, increased inequality, worsening consumer demand, loss of talented personnel, and increased social and medical spending by the state.

Note that although the use of artificial intelligence in public service employment can bring significant benefits, it can also pose a threat to economic security. We will highlight only a few important aspects that should be taken into account.:

1. ***Dependence on technology.*** In the process of using artificial intelligence when hiring for public service, there is often a close dependence on technology and external suppliers of machine learning systems. Therefore, the unavailability, as well as the inability to maintain these technologies, can lead to disruption of the recruitment process and difficulties in the work of the organization.

2. ***Vulnerability to cyber attacks***. Compromising candidate data and resumes or the interference of cyber attacks and hacker attacks in the personnel selection process can seriously damage the work of government agencies.

3. ***The risk of discrimination.*** Discrimination against certain groups of candidates resulting from the use of certain machine learning algorithms prone to decision-making based on stereotypes and bias can lead to unfair selection of personnel and violation of the principles of equality and fair access to work.

The active introduction of digitalization into the educational process is inextricably linked with developing digital technologies based on the use of artificial intelligence. Artificial intelligence is playing an increasingly important role in various areas of our lives, and education is no exception. And this, in turn, requires the teaching staff to develop and implement new models in the educational process that combine distance and blended education based on the integration processes of large information models and special algorithms, simplistically called artificial intelligence.

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According to experts, there is a sharp increase in artificial intelligence in the country. In 2025, it will reach up to 800 billion rubles, while in 2024 this figure was more than 300 billion rubles, depending on the calculation schemes and metrics. The contribution of artificial intelligence to Russia's GDP in 2025 may amount to up to 2% [33].

Conclusion

Digitalization in the field of education objectively requires more and more innovations and technologies based on artificial intelligence in order to improve the quality and accessibility of education. Already today, some higher education institutions use artificial intelligence technologies such as intelligent learning systems, which make it possible to assess the level of knowledge of students and form adaptive groups to solve more complex tasks assigned to students. Intelligent moderation allows the teacher to monitor the progress of the student's assignment and eliminate repeated errors.

The main difficulty of implementing artificial intelligence, especially in the application of machine learning, is the selection of data for training neural networks. The huge amounts of data generated in the education system are currently not suitable for use in machine learning, as the main assessment procedures are not structured according to assessment criteria and content. This means that the first step towards the introduction of artificial intelligence in education should be the fullest possible digitalization of educational content.

Another factor that will restrain the intensification of the spread of artificial intelligence in education in the near future is the negative attitude of some students towards the new tools and its capabilities. We must ask ourselves the question: are we ready to accept the fairness of a student's assessment by artificial intelligence, or would we prefer a traditional assessment in the course of traditional live learning? The answer to this question will obviously be different for each university, for each student, his parent and teacher. But it is also obvious that in recent years artificial intelligence has become an increasingly relevant tool in the field of education, and this is indisputable.

An explosive expansion of the use of artificial intelligence in education is possible. This can happen if the rapid development of the industry creates some new technologies that allow solving learning tasks on the one hand - massively, and on the other hand – with a focus on individual educational needs.

There is also a flip side to the coin. With the development of artificial intelligence, services will be developed that will allow a large proportion of students not to bother with learning tasks, but to use artificial intelligence and machine learning systems to create texts and perform standard learning tasks, primarily related to the analysis and preparation of texts, especially in the humanities.

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