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USE OF ARTIFICIAL INTELLIGENCE IN THE EDUCATIONAL ENVIRONMENT: A QUALITATIVE STUDY OF THE TECHNOLOGY'S POTENTIAL

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ABSTRACT

Objective: The article analyzes the advantages and disadvantages of using artificial intelligence (AI) in the digital educational environment. The study aims to identify the potential of AI in the educational process, as well as the benefits and risks associated with the application of AI-based technologies in educational environments.

Methods: Qualitative methods were used to collect data, including a review of existing literature on the use of AI in education. The analysis focused on identifying the main areas of AI application and the challenges associated with its use.

Results: The results show that the advantages of using AI include task automation, personalized learning, and student performance forecasting, among others. However, risks such as the imperfection of AI technologies, insufficient methodological support, and concerns about data security were also identified.

Conclusions: The systematic application of AI's advantages can enhance the efficiency of the educational process, especially if psychological and pedagogical factors are considered. However, it is crucial to balance AI use with human intervention to ensure a comfortable and effective educational environment.

Keywords: AI. Educational process. Digital Technologies. Digital educational environment. Teachers. Gamification.

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RESUMO

Objetivo: O artigo analisa as vantagens e desvantagens do uso da inteligência artificial (IA) no ambiente educacional digital. O estudo visa identificar o potencial da IA no processo educacional, bem como os benefícios e riscos associados à aplicação de tecnologias baseadas em IA em ambientes educacionais.

Métodos: Métodos qualitativos foram utilizados para coletar dados, incluindo a revisão de literatura existente sobre o uso de IA na educação. A análise focou em identificar as principais áreas de aplicação da IA e os desafios associados ao seu uso.

Resultados: Os resultados mostram que as vantagens do uso da IA incluem a automação de tarefas, a personalização do ensino, e a previsão de desempenho dos alunos, entre outros. No entanto, foram identificados riscos como a imperfeição das tecnologias de IA, a insuficiência de suporte metodológico, e preocupações com a segurança de dados pessoais.

Conclusões: A aplicação sistemática das vantagens da IA pode melhorar a eficiência do processo educacional, especialmente se forem considerados fatores psicológicos e pedagógicos. Contudo, é crucial equilibrar o uso de IA com a intervenção humana para garantir um ambiente educacional confortável e eficaz.

Palavras-chave: IA. Processo educacional. Tecnologias digitais. Ambiente educacional digital. Professores. Gamificação.

1 INTRODUCTION

In modern education, where technological innovation plays a significant role, artificial intelligence is becoming an integral part of digital education. The emergence and development of this technology opens up new opportunities in the field of learning, unites students from all over the world, and improves the quality of education (Borodina et al., 2023; Chumakova et al., 2023).

One of the main reasons for using AI in the educational environment and other fields of activity is its ability to analyze and classify large arrays of data in real time (Akhmetshin et al., 2024a, 2024b; Diuldin et al., 2024). Based on these data, machine learning algorithms can create personalized learning programs tailored to the needs of each student (Ahmad et al., 2022; Alam, 2022; Galizina et al., 2021).

AI can significantly improve access to education for those who lack either geographical or social mobility. With the help of AI, e-learning platforms provide access to high-quality education to millions of students, regardless of their location or financial status (Sinitsyna et al., 2023).

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It is of scientific interest to identify the main advantages and disadvantages of using AI in the digital educational environment. This topic is controversial. Our research focused on collecting and analyzing different viewpoints on using AI in the digital educational process.

The study aims to identify the potential of AI in the educational process and the advantages and disadvantages of using AI-based technologies in the digital educational environment.

2 LITERATURE REVIEW

The education sector has started using AI relatively recently, but at this stage of scientific activity, research in this area is actively developing. This is conditioned by a great interest from various professional communities and to some extent a wide range of participants in the educational process.

Many scholars consider the use of AI in digital education. They dwell on various aspects of this topic: the benefits of using AI (Borodina et al., 2021), the risks of using AI (Avdeev et al., 2023), and the forecast for the greater use of AI in the educational process (Borodkin, 2023). Based on the focus of our research, we identified the following fields of AI application.

1. The methodological activities of teachers. Scholars have identified types and areas of using AI in the educational process. For example, chatbots and smart systems are popular in online learning. Students engaged in distance learning receive constant feedback using chatbots (Nguyen et al., 2023; Yufeia et al., 2020). A promising area of using AI in the educational process is gamification (Karpova et al., 2021) when lectures are held in a game format using virtual reality (Ybyraimzhanov et al., 2022). The development of this field will improve the visibility of educational materials and expand the possibilities for conducting virtual experiments (Baker, 2021; Gribkova, 2022; Wang et al., 2018).

AI-powered educational materials have an incomparable advantage over traditional textbooks and teaching methods. They allow students to master new information at their own pace, revise it, get additional training in areas where problems arise, and move faster in areas where knowledge has already been mastered (Fiok et al., 2022).

Such teaching materials open up new opportunities for educators. They can better track each student's progress, providing detailed information about their strengths, weaknesses, and learning preferences. This helps them to adapt the learning process and offer additional tasks and materials suitable for each student (Sekeroglu et al., 2019). This personalized education contributes to a better assimilation of the learning material and increases motivation to study.

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2. Consulting systems. Information and consulting systems based on AI are already used for teaching students history, logic, mathematics, and other courses. These systems include various software and hardware solutions designed to automate basic processes in an educational institution (Tsilenko et al., 2023). They facilitate and simplify the work of administrators and teachers, reducing the time spent on routine operations and increasing the time allocated for the learning process.

3. Knowledge management systems for the automatic assessment of students' knowledge. Automatic assessment by AI includes the creation of personalized curricula, analysis of large amounts of data, and automatic grading of students' works (Al Braiki et al., 2020). This saves time, reduces the likelihood of human errors, and improves the quality of student knowledge.

4. Educational analytics using AI involves the use of AI-powered methods for working with big data and preparing analytical materials aimed to increase the efficiency of the educational process (Panigrahi, 2020).

Despite the advantages of using AI in education, there are potential risks and challenges. It is important to balance the benefits of AI with human intervention and find the best way to introduce this technology into the educational process.

In addition to the advantages and risks of using AI in digital education, we propose to consider and determine the influence of AI-powered technologies on teaching and analyze the main opportunities for their use.

3 METHODS

To highlight the main advantages and risks of introducing AI-based technologies into the digital educational environment, we selected works by scholars from different countries on this topic. This study used the methods of desk review and comparative analysis. For a comprehensive analysis, studies were selected that contained the definitions of the following terms: "AI in education", "AI in the digital educational environment", "risks of using AI in education", and "benefits of using AI in education".

When searching for studies, we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards, validated for use in social science research (Eskerkhanova et al., 2023; Mirzagitova et al., 2023; Stepanova et al., 2023).

The PRISMA requires that all steps of searching and reviewing be recorded and described in detail. The PRISMA flowchart consists of four steps: identifying articles, screening them, deciding on their eligibility, and finalizing their list for a systematic review.

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Step 1: Collect data

We selected scientific works written on the following topics: “AI in education”, “AI in the digital educational environment”, “risks of using AI in education”, and “benefits of using AI in education”. References were retrieved from Scopus, Web of Science, Google Scholar, elibrary.ru, and official websites where the main international legal acts are posted. We collected 172 publications in several categories.

Step 2. Filter the data using selection criteria

Scientific works were selected in accordance with these criteria:

1. The author must have at least two publications on the topics “AI in education”, “AI in the digital educational environment”, “risks of using AI in education”, and “benefits of using AI in education” over the past 10 years;

2. The author must have more than 70% of their research on legal topics;

3. The author’s profile must indicate that their publications are devoted to legal sciences;

4. The scientific work must be written between 2010 and 2024.

Using this approach, we initially selected more than 172 publications.

Step 3: Filter the data by reading the full text

We read the full texts of those scientific works, whose titles and abstracts made it difficult to determine whether they were relevant to our research. After careful sampling, 45 papers were selected.

The use of desk review and comparative analysis highlighted the main areas of application of AI in the digital educational environment and the risks and benefits of using AI for teaching students.

4 RESULTS

The results demonstrated that the advantages of using AI in the educational process include the following:

– 27% of the selected works call automation an advantage of using AI, i.e., the use of AI can simplify some routine tasks, such as checking assignments and tests, collecting and analyzing data, and performing other administrative functions. This allows educators to focus on more creative and developmental tasks, such as interpersonal communication and individualized support for students (Chen et al., 2020; Huang et al., 2021; Hwang et al., 2020; Khosravi et al., 2022);

– 17% indicate the accessibility of educational programs. Using AI, it is possible to create

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interactive educational programs and online courses available to the user at any time and from anywhere in the world. This allows students to learn the educational material, depending on their pace of learning and level of preparation. This approach is especially useful for people who are unable to attend traditional educational institutions, for example, due to geographic distance or financial constraints (Chen et al., 2022; Pedro et al., 2019; Roll & Wylie, 2016);

– 16% mention an individual approach to students, i.e., AI can personalize the educational process. Due to smart data analysis systems, AI can analyze student progress and knowledge levels, identifying the individual needs of each student. Based on this analysis, AI can offer personalized materials, assignments, and courses specifically designed for each student. This approach allows for the most efficient allocation of each student's time and resources, optimizing the educational process (Alam, 2021; Knox, 2020; Ouyang & Jiao, 2021);

– 15% highlight the function of forecasting student performance: AI provides data on the progress of students and, based on these indicators, predicts their future success (Akgun & Greenhow, 2022; Gabidullina et al., 2023);

– 13% recognize control over learning outcomes. Traditionally, teachers have limited time to evaluate student work. The use of AI allows them to quickly analyze works and provide detailed feedback and recommendations to students to improve their skills. This approach helps students understand their mistakes, develop skills, and improve the quality of their work (Flogie & Aberšek, 2022; Nagao, 2019);

– 12% dwell on analytics: AI based on big data forecasts the number of applicants and the demand for specialists in the labor market. The analysis of large arrays of data on the educational process also allows one to identify patterns in predicting difficulties in learning (Luan et al., 2020).

In addition to the advantages, experts highlighted the risks and disadvantages of using AI in the educational process:

– 47% of the selected works emphasize the imperfections of AI, i.e., it can make mistakes and produce incorrect forecasts and decisions, which can negatively affect the educational process (Gocen & Aydemir, 2020; Goksel & Bozkurt, 2019; Pham & Sampson, 2022);

– 31% claim that there is insufficient methodological support for AI: this technology is still under development and has not been sufficiently studied for use in education, so difficulties may arise when applying AI in methodological practice (Bates et al., 2020; Holmes & Porayska-Pomsta, 2022; Joshi et al., 2021);

– 22% show a violation of personal data security: the use of AI in education is associated

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with the collection of a large amount of confidential information about students and teachers, so there is a risk of personal data leaks, identity theft, and fraud (Gurinovich et al., 2023).

5 DISCUSSION

Based on the obtained results, we drew conclusions about the potential of using AI in education.

First, we could not identify the main benefit of using AI. The most popular option is the ability to automate educational processes using AI (Chen et al., 2020; Huang et al., 2021; Hwang et al., 2020; Khosravi et al., 2022). Other advantages include the availability of educational programs (Chen et al., 2022; Golubeva et al., 2023; Pedro et al., 2019; Roll & Wylie, 2016); an individual approach to students (Alam, 2021; Knox, 2020; Ouyang & Jiao, 2021); student performance prediction (Akgun & Greenhow, 2022); control of learning results (Flogie & Aberšek, 2022; Nagao, 2019); analytics (Luan et al., 2020). These will give the maximum effect if they are used in combination.

Second, it is necessary to consider additional psychological and pedagogical factors that allow better use of these advantages. Using AI in the learning process can help reduce anxiety in students. This is due to the fact that AI does not express value judgments which are typical of the teacher and are not always well received by students. AI is unbiased so students worry less and focus more on gaining knowledge. AI does not express likes or dislikes, which only increases the efficiency of obtaining and consolidating professional knowledge (Owoc et al., 2019).

Third, the use of AI in education contributes to the development of skills needed for the future labor market. Students working with AI gain skills in adapting to technological changes, critical thinking, collaboration, and creative problem-solving (Kabzhanova et al., 2024). The knowledge and use of AI is also becoming an important competence required in many industries (Chassignol et al., 2018; Malika et al., 2022; Rakhimgalieva et al., 2021).

Despite the benefits of using AI in education, potential risks must be considered. In our research, we identified the following disadvantages of using AI in the digital environment: the imperfection of AI (Gocen & Aydemir, 2020; Goksel & Bozkurt, 2019; Pham & Sampson, 2022; Schiff, 2021); insufficient methodological support for AI (Bates et al., 2020; Holmes & Porayska-Pomsta, 2022; Joshi et al., 2021); violation of personal data security (Gurinovich et al., 2023; Revyakina et al., 2024; Sultonova et al., 2023).

One of the main risks is associated with the lack of the human factor. Using AI in education can affect the emotional connection between the teacher and students. This interaction

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plays an important role in the educational process, helping students understand and adopt the learning material. Based solely on AI, students may feel alienated and isolated, which can negatively influence their learning process and motivation (Holmes et al., 2023).

The active use of AI can have a negative impact on the labor market. Many educators fear that AI can replace teachers, reducing the number of jobs in education (Yaroshenko et al., 2023). However, scholars claim that this may affect teachers or employees of educational organizations who are more focused on performing routine functions.

The risks of using AI in education can be mitigated through the development of ethical ideologies and proper training of teachers and administrators. For AI to truly benefit students, there needs to be a balance between the use of technology and human interaction, while also ensuring privacy and data security.

6 CONCLUSIONS

The scope of this study was limited by the source sample. However, we believe that the data obtained during the analysis are not distorted. By applying a system of advantages and disadvantages of AI in the educational process, teachers and administrative workers will be able to avoid the main risks when using AI. AI in education should be used with caution and due regard to a particular situation. In this case, the impact of research limitations can be reduced and the potential of this technology in creating a better educational environment can be maximized.

In further research on using AI in digital education, it is necessary to consider ways to overcome unequal access to AI and pay more attention to digital inequality in education and the need to train personnel who can effectively use AI systems.

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