MAIN PROBLEMS OF ORGANIZING THE USE OF ARTIFICIAL INTELLIGENCE IN PRIMARY EDUCATION MATHEMATICS LESSONS

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Annotaion. This article analyzes the key challenges encountered when organizing the implementation of Artificial Intelligence (AI) technologies in primary school mathematics lessons.

Keywords: Artificial intelligence, primary education, mathematics teaching, educational technologies, pedagogical challenges, teacher qualifications, ethical issues

Аннотация. Данная статья анализирует основные проблемы, возникающие при организации внедрения технологий искусственного интеллекта (ИИ) в уроки математики в начальных классах.

Ключевые слова: Искусственный интеллект, начальное образование, преподавание математики, образовательные технологии, педагогические проблемы, квалификация учителей, этические вопросы

Annotatsiya. Ushbu maqola boshlang'ich sinf matematika darslarida sun'iy intellekt texnologiyalarini joriy etishni tashkil etishda yuzaga keladigan asosiy muammolarni tahlil qiladi.

Kalit so‘zlar: Sun'iy intellekt, boshlang'ich ta'lim, matematika o'qitish, ta'lim texnologiyalari, pedagogik muammolar, o'qituvchilar malakasi, axloqiy masalalar

Twenty-first century skills are tools that can be used by everyone to improve the way we think, learn, and live in today's fast-changing world. Equipping students with 21st-century skills lays the foundation for success in the real world. These skills include, among others, critical and creative thinking, problem solving, metacognition, the ability to communicate and collaborate with others, and global citizenship. In preparing young people for the Fourth Industrial Revolution (41R) and arming them with 21st century skills, teachers must ensure that students are flexible until they finish school, can adapt to a constantly changing work environment, work cross-culturally, and be able to occupy leadership positions in artificial intelligence (AI) technologies have the potential to radically change the modern field of Education, In particular, AI has enormous potential in elementary school math classes. AI-based applications, virtual teachers, and interactive math games can make the learning process more interesting and productive, increasing the craving in learners for mastering fundamental concepts such as numbers, actions, and geometric shapes (Ahmedov, 2023). It is expected that flexible approaches to individual needs, constant monitoring of knowledge levels, and the ability to identify difficulties will significantly improve the quality of education. However, there are a number of serious problems in implementing these technologies. This article aims to provide a comprehensive analysis of the key challenges in organizing the use of AI in primary school mathematics lessons, with a particular focus on areas such as technological infrastructure, teacher training, curriculum integration, ethical issues, and assessment challenges. A deeper exploration of these issues will help identify the measures needed to fully realize the potential of AI in education.

The available literature has extensively covered the role and benefits of artificial intelligence in education, highlighting its effectiveness and innovative potential. Artificial intelligence technology has brought major changes to the world of

education, from personalizing learning to administrative efficiency. However, the introduction of AI also faces significant challenges that hinder its widespread adoption and use. This chapter discusses the six main problems faced in the introduction of AI technology in education, namely gaps in access to technology, lack of digital literacy, data privacy and security, relevance and quality of AI content, cost of implementation and resistance to change.

1. Lack of access to technology. The gap in technology use is one of the biggest challenges in implementing artificial intelligence in education. Many schools, especially those in remote areas, are struggling to provide the equipment, such as computers and tablets, needed to access AI-based technologies. According to Zawacki-Richter et al. (2019), educational institutions in developed regions have better access to technological infrastructure, while many schools in remote areas still rely on traditional teaching methods. Additionally, internet connectivity is a major obstacle in many cases. Education and others (2020) noted that many schools in rural areas lack sufficient internet connectivity to support Al-based e-learning platforms. This exacerbates the inequality in educational quality between developed and underdeveloped regions. To reduce this gap, it is necessary to improve digital infrastructure.

2. Lack of digital literacy. The lack of digital literacy among teachers and students is a major obstacle to the implementation of AI technology. Teachers often lack the technical knowledge to optimally use artificial intelligence in teaching. Holstein et al. (2020) argue that due to the lack of knowledge about AI and the resulting gap, many teachers are reluctant to use this technology in the classroom. Students are facing similar challenges in digital literacy. Jia et al. (2021) show that students' low digital literacy limits their ability to make the most of AI-based technologies. Many students don't understand how AI platforms work or how this technology can support their

learning. To bridge the digital divide, the government and private sector must work together to provide hardware subsidies and develop internet networks in remote areas. Improving digital literacy among teachers can be achieved through ongoing training and technology education programs for students.

3. Data privacy and security. Data privacy and security are major challenges in the application of AI in education. AI-based systems often require personal information from students to provide a personalized learning experience. However, collecting this information increases the risk of privacy violations. Another problem is the lack of transparency in how to manage student data by technology providers. Koedinger et al. (2019) argue that educational institutions should ensure that student data is protected by clear security policies and that international standards are followed. To overcome these challenges, educational institutions and governments must work together to develop strong data privacy policies. Dvivedi et al. (2021) suggest that schools provide ethics training for teachers and administrators, as well as implement encryption technology to protect student data from potential misuse.

4. Relevance and quality of AI content. While AI has great potential to support learning, the quality and relevance of the content produced often pose a challenge. In some cases, the AI system provides irrelevant or inappropriate responses to the learning context. Another problem is the lack of integration between AI technology and the national curriculum. Therefore, technology developers need to work closely with teachers to ensure that AI-generated content is up to date and meets local educational standards. Regular evaluation of AI systems can help improve content quality and relevance.

5. Implementation costs. The cost of implementing AI technology is one of the biggest barriers for many educational institutions. In addition to the initial costs, maintaining AI technology also requires significant resources. Dwivedi et al (2021)

argue that many educational institutions do not have the funds to regularly update their hardware or software. This makes AI difficult to implement in the long run.

6. Resistance to change. Resistance to change is another challenge that often arises when implementing new technologies, such as AI, in education. Teachers who are accustomed to traditional teaching methods often resist the use of new technologies. Fear that AI will replace the role of teachers may be one of the main reasons for this resistance. Educational institutions with a conservative culture also tend to respond slowly to technological change. By starting with small-scale implementations and involving teachers in the adaptation process, institutions can build confidence in this technology. The application of artificial intelligence technology in education requires a mature strategy and support from various stakeholders.

Akhmedov (2023) analyzed the role and advantages of AI in primary school mathematics education, noting that AI-based programs, virtual teachers, and interactive games make the learning process more interesting and effective. Platforms such as DreamBox Learning, Prodigy, Matific, and SplashLearn serve to make it easier for children to master mathematical concepts. This increases interest in students through personalized approaches and allows for continuous monitoring of their level of knowledge. However, the specific challenges associated with the infrastructural and pedagogical preparation required to effectively implement such platforms in every primary school are often not adequately addressed. Creating personalized content and constantly updating it, as well as ensuring the technical support of complex systems, requires significant financial and human resources.

Kadirov (2024) recognizes the transformative power of AI in education, but also the complex situations it brings. Automated assessment systems, virtual assistants, and personalized programs reduce the administrative burden on teachers. This source openly acknowledges that the integration of AI raises serious questions

about the role of teachers, the need to preserve the human element in education, and the need for continuous improvement of their skills. This is one of the main challenges of using AI, requiring teachers to be trained to collaborate with these technologies. Additionally, ethical and equity issues also highlight the need to use AI wisely and fairly.

Karimov (2022) views AI as a tool to assist teachers, not replace them. He highlights the potential of AI to save teachers' time by automating administrative tasks, such as grading tests. It can also increase inclusivity in the classroom through tools like AI Presentation Translator and help students through chatbots. While these analyses show the practical applications of AI, they also show how complex it is to seamlessly integrate these technologies into the school system. For example, aspects such as the technical support needed for AI tools to function effectively, teachers' skills in managing them, and compatibility with curricula remain practical challenges that need to be addressed. The literature review shows that while the potential of AI in education is widely discussed, a number of technological, pedagogical, instructional, and ethical challenges must be addressed to ensure its effective integration into primary school mathematics lessons.

This article is based on a theoretical-analytical research method and aims to identify and analyze the main problems in organizing the use of artificial intelligence in primary school mathematics lessons. The research methodology includes the following steps: First, existing scientific literature, reports, and research findings on the role of AI in education and its potential in primary education were comprehensively analyzed. At this stage, the information presented in sources such as Akhmedov (2023), Kadirov (2024), and Karimov (2022) was critically examined, and the potential challenges of AI were identified along with its advantages. Second, the technological, pedagogical, instructional, ethical, and assessment issues that arise during the integration of AI into primary mathematics education were systematically

classified and analyzed in detail. Third, each of these problems was theoretically substantiated, their causes and impact on the educational process were considered. Fourth, the information from the literature was synthesized and general conclusions were drawn about the challenges that arise when implementing AI in primary education. This methodology allows for evidence-based recommendations that help to deeply understand the potential of AI in education and find solutions to its practical barriers, while fully understanding its potential.

Artificial intelligence technologies have enormous potential to radically improve elementary school mathematics education and increase students' interest in learning by personalizing the learning process. However, this study suggests that there are a number of significant challenges in effectively integrating AI into elementary school math lessons. The lack of technological infrastructure, insufficient training of teachers on the use of AI tools, difficulties in integrating into the curriculum, issues of data security and confidentiality, as well as inaccuracies in the assessment of training results prevent the full realization of this potential.

Future research and policy efforts should focus on addressing these challenges to improve the effectiveness of AI in education. It requires an integrated approach, including the provision of schools with modern technological equipment, the development of continuous professional development programs for teachers, flexible revision of training programs to SI, the establishment of strict rules for data security and compliance with ethical standards, as well as the development of new and reliable methodologies for assessing AI-based educational results. Only through such comprehensive solutions can AI truly transform primary mathematics education and significantly improve the mathematical literacy of the younger generation.

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