



PEDAGOGICAL OPPORTUNITIES FOR USING ARTIFICIAL INTELLIGENCE IN PRIMARY EDUCATION

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Abstract: This article analyzes the pedagogical possibilities of using artificial intelligence technologies in the process of primary education. The advantages of artificial intelligence in supporting teacher activities, automating assessment processes, and monitoring student performance levels are also examined. The article presents scientific conclusions on the pedagogical conditions and promising directions for the effective use of artificial intelligence in primary education.

Keywords: artificial intelligence, primary education, digital education, pedagogical opportunities, adaptive education, individual approach, quality of education, automated assessment.

Introduction

Today's globalization and digital transformation processes place new demands on the education system. In particular, the primary education stage is of particular importance as it serves as the foundation for the child's subsequent intellectual, social, and spiritual development. At this stage, the student's attitude toward learning, independent thinking, interest in acquiring knowledge, and information skills are formed. Therefore, organizing the primary education process based on modern pedagogical technologies, digital tools, and innovative approaches is one of the most pressing issues today.

In recent years, artificial intelligence technologies have been actively penetrating various areas of human activity, including the education system. Artificial intelligence is emerging not only as a tool for technically streamlining the educational process but also as an important innovative factor that allows for the individualization of educational content, adaptation to student needs, and increasing the efficiency of the pedagogical process. Especially in working with primary school students, programs based on artificial intelligence, interactive platforms, adaptive learning systems, and intelligent assessment tools serve to organize the educational process more interesting, understandable, and effective.

In primary education, the pace of knowledge acquisition, interests, abilities, and psychological characteristics of each student vary. In the process of traditional education, it is not always easy for a teacher to fully address the individual needs of all students simultaneously. Artificial intelligence has broad





pedagogical opportunities in this regard. It analyzes the student's errors during the task completion process, determines their level of knowledge, proposes appropriate tasks, and helps eliminate gaps in academic performance. As a result, an individual approach to the educational process is strengthened, and the student's independent work skills are developed.

Artificial intelligence also plays an important role in facilitating teacher work, saving time, and improving the quality of education. For example, processes such as automatic assessment of students' knowledge, monitoring their activity, analyzing learning outcomes, and recommending additional exercises can be effectively organized using artificial intelligence. This allows the teacher to focus more on a creative approach, educational work, and individual pedagogical communication.

However, the issue of using artificial intelligence in primary education is not limited to technological capabilities. In this process, pedagogical expediency, consideration of students' age and psychological characteristics, digital security, ethical criteria, and the teacher's methodological training play an important role. Artificial intelligence should be viewed not as a substitute for the teacher, but as a pedagogical assistant that supports their activities, enriches the educational process, and expands students' learning opportunities. The scientific study of the pedagogical possibilities of using artificial intelligence in primary education is of great theoretical and practical importance. This topic is directly related to the digital development trends of modern education, the formation of 21st-century skills in students, the improvement of teacher activities on an innovative basis, and the need to improve the quality of education. Therefore, analyzing the role, capabilities, advantages, and conditions for using artificial intelligence technologies in primary education is one of the current directions of modern pedagogical science.

Discussion

The issue of using artificial intelligence in primary education is emerging as one of the most pressing directions of today's pedagogical process. This is because the primary education stage serves as an important foundation for the student's further educational activity, independent thinking, attitude toward knowledge, and personal development. It is during this period that primary knowledge and skills such as reading, writing, calculating, observing, comparing, analyzing, asking questions, and drawing conclusions are formed in the student. Therefore, any pedagogical technology used at this stage must correspond to the age





characteristics, interests, level of psychological development, and educational needs of the children.

The introduction of artificial intelligence technologies into the educational process does not negate traditional forms of teaching; on the contrary, it serves to enrich and organize them more effectively. For primary school students, the educational process is not limited to imparting knowledge; it also involves awakening their curiosity, directing them toward independent inquiry, and fostering a positive attitude toward learning activities. Interactive programs based on artificial intelligence, adaptive platforms, voice assistants, virtual training systems, and automated assessment tools allow for the revitalization of this process.

One of the important aspects of the topic under discussion is that artificial intelligence allows for the strengthening of an individualized approach in primary education. Every child acquires knowledge at a different rate. Some learners grasp the topic quickly, while others need more repetition, additional explanations, and practical exercises. In a traditional lesson process, it is difficult for the teacher to fully address the individual needs of all students at once. Artificial intelligence analyzes the student's level of knowledge based on their answers, errors, completed tasks, and activity, and recommends appropriate tasks. This allows the student to learn at a pace corresponding to their capabilities and to gradually eliminate gaps in knowledge.

In addition, artificial intelligence can be an effective tool in increasing the cognitive activity of students. Primary school students acquire knowledge better through more visual, playful, and interactive activities. Educational games based on artificial intelligence, electronic exercises, platforms enriched with voice tasks, pictures and animations make the lesson process interesting. As a result, the student becomes an active participant in the lesson rather than a passive listener. This strengthens motivation in the educational process and develops students' skills in independent thinking and problem-solving.

Another important pedagogical opportunity of artificial intelligence is related to improving the assessment process. In traditional assessment, the student's final score is often taken as the primary criterion. Artificial intelligence can analyze not only the final answer but also the student's progress in completing the task, the type of errors, repeated attempts, and development dynamics. This allows the teacher to determine which topic the student is struggling with, provide appropriate pedagogical assistance, and re-plan the





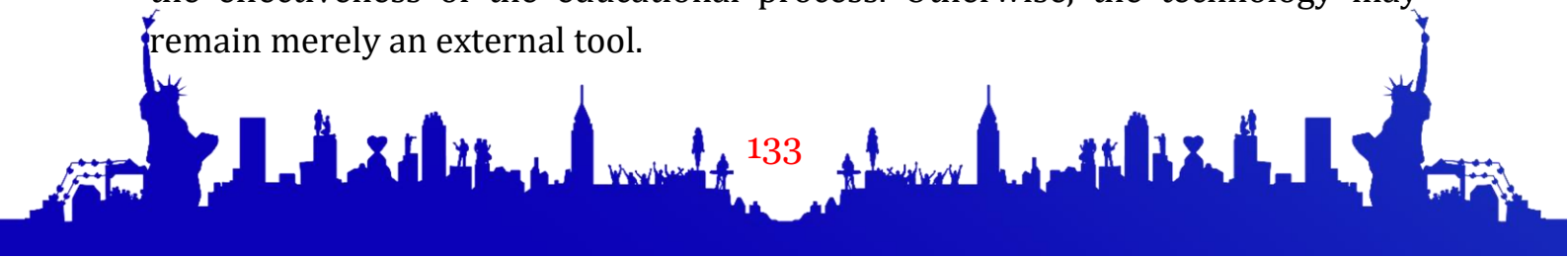
educational process. In this regard, artificial intelligence is important as a diagnostic, analytical and methodological assistant.

Artificial intelligence also plays an important role in facilitating the work of teachers. The teacher performs many tasks, such as preparing for the lesson, compiling assignments, checking student work, analyzing results, and establishing communication with parents. Certain technical and repetitive processes can be automated using artificial intelligence. For example, analyzing test results, creating individual exercises, preparing student activity reports, and adapting lesson materials save the teacher's time. This allows the educator to focus more on the educational, creative, and communicative aspects of the lesson.

However, in the process of using artificial intelligence, it is necessary to take into account certain problems and precautions. First of all, primary school students are not yet fully aware of all the opportunities and risks of the digital environment in terms of age. Therefore, when using artificial intelligence tools, issues such as digital security, personal data protection, and preventing children from spending excessive time in front of screens and becoming overly dependent on technology require special attention. In the educational process, artificial intelligence tools should be used appropriately, based on regulatory and pedagogical control.

Another important aspect is that artificial intelligence will never fully replace a teacher's personal influence, love, educational approach, and live communication. In primary education, a teacher is not only a teacher but also an educator, a guide, a motivator, and a psychological support for the child. Artificial intelligence can quickly analyze information, adapt tasks, and streamline the process, but tasks such as deeply understanding a child's emotions, inspiring them, and preparing them for social relationships are directly linked to the educator's human qualities. Therefore, artificial intelligence should be viewed not as a substitute for the teacher, but as an auxiliary tool that supports their activities.

Developing teachers' digital competence is also important for the effective use of artificial intelligence in primary education. Technology itself does not automatically improve the quality of education. Its effectiveness depends on the purpose for which the teacher uses it, on what methodological basis, and in what pedagogical situation. If artificial intelligence tools are combined with the lesson goal, student age, topic content, and educational tasks, it will significantly increase the effectiveness of the educational process. Otherwise, the technology may remain merely an external tool.





During the discussion, it is necessary to pay attention to another issue: the use of artificial intelligence can expand equal opportunities in education. For example, adapted educational resources are of great importance for students with varying levels of proficiency, children with speech or reading difficulties, and students who require additional assistance. Thanks to spoken texts, automatic explanations, interactive exercises, and individual recommendations, favorable conditions are created for every student to actively participate in the educational process. This demonstrates the significant potential of artificial intelligence in implementing the principles of inclusive education. When using artificial intelligence, the content of national education, the mother tongue, cultural values, and educational goals must also be taken into account. Since primary education is an important stage in the formation of a student's personality, technological tools must be harmonious with national and universal human values. Programs based on artificial intelligence should not only provide knowledge but also serve to develop qualities such as etiquette, communication culture, cooperation, responsibility, and creativity in students.

Theoretical basis

The theoretical foundations of using artificial intelligence in primary education are primarily directly linked to changes in the modern educational paradigm. Today's educational process is not limited to conveying ready-made knowledge to students, but is also aimed at fostering independent thinking, creativity, the ability to find solutions in problem situations, and the competence to operate effectively in a digital environment. In this regard, artificial intelligence technologies are considered an important pedagogical tool that serves to individualize, adapt, and increase the effectiveness of the educational process.

The concept of artificial intelligence refers to the implementation of certain processes characteristic of human thinking, namely intellectual activities such as analysis, data processing, decision-making, learning, and responding to a specific situation using technical systems. In the educational process, artificial intelligence allows for determining students' knowledge levels, monitoring their progress, assigning individual tasks, analyzing errors, and providing methodological assistance to the teacher. Especially at the primary education stage, these opportunities are of great importance in ensuring an approach that corresponds to the age, psychological, and cognitive characteristics of students.

From a theoretical perspective, the use of artificial intelligence is closely linked to the principle of student-centered education. In student-centered education, the abilities, needs, interests, and level of mastery of each student are





taken into account. In primary grades, students do not acquire knowledge at the same rate: some grasp the topic quickly, while others need repetition, visual material, and additional exercises. Adaptive learning systems based on artificial intelligence identify these differences and recommend appropriate educational materials and tasks for each student. This ensures the practical expression of an individual approach in the educational process.

The use of artificial intelligence in primary education is also explained by the constructivist theory of education. According to the constructivist approach, the student does not receive knowledge in a ready-made state, but forms it themselves through active research, experience, question-and-answer, and practical activity. Interactive platforms based on artificial intelligence, game programs, virtual exercises, and problem-based tasks enhance the student's active participation. In this case, the student becomes not only a listener but also an active subject of the educational process. As a result, the opportunity to independently acquire knowledge, work on mistakes, and link new knowledge with previous experience expands.

The use of artificial intelligence is also important from the perspective of an activity-based approach. In primary education, a student's knowledge is formed through their practical actions, exercises, observation, comparison, and conclusions. Artificial intelligence tools track student activity, analyze completed tasks, and guide subsequent learning activities. In this process, education is organized based on control, analysis, and feedback. In particular, rapid feedback helps the student immediately realize their mistake, correct it, and master the topic more deeply.

In pedagogical theory, feedback is regarded as a crucial factor in increasing educational efficiency. In the process of a traditional lesson, the teacher may not always have the opportunity to provide quick and detailed feedback to each student at the same time. Artificial intelligence, on the other hand, can immediately analyze a student's answer and provide appropriate recommendations or comments. This condition forms a sense of self-study, self-control, and responsibility in the student. Therefore, artificial intelligence is of theoretical importance as a diagnostic, guiding, and developmental tool in the educational process.

The use of artificial intelligence in primary education is also linked to a motivational approach. For primary school students, it is important that the educational process is engaging, visual, and rich in game elements. Educational games based on artificial intelligence, interactive questions, voice tasks, visual





materials, and incentive systems increase children's interest in the lesson. The student sees their success, corrects their mistakes, and strives to move to the next level. This strengthens internal motivation and ensures active participation in the educational process.

Another important aspect of the theoretical foundations is defined by the concept of digital competence. In modern society, a person's ability to work with information, use digital tools rationally, critically analyze data, and operate in a secure digital environment is considered one of the most important competencies. Utilizing artificial intelligence in primary education helps foster elementary digital literacy in students. In this process, the student learns to use technology not only as a means of entertainment but also as a source of knowledge, research, and creative activity.

At the same time, the use of artificial intelligence is closely linked to the professional competence of a teacher. In pedagogical theory, the teacher is regarded as the primary organizer, guide, and subject of educational influence within the educational process. Artificial intelligence does not replace the teacher, but supports their methodological activities. The teacher must use artificial intelligence tools in accordance with the lesson objectives, adapt them to the age characteristics of students, and integrate them into the educational process. Thus, a teacher's digital and pedagogical competence is an important condition for the effective use of artificial intelligence.

The theoretical foundations of using artificial intelligence in primary education are also linked to the ideas of inclusive education. Taking into account the right, opportunities, and needs of every student to receive an education is one of the priority principles of modern pedagogy. Personalized AI-based programs can provide additional support for students with learning difficulties, speech, hearing, vision, or other needs. For example, by converting text into sound, receiving voice responses, providing visual instructions, and offering simple and step-by-step tasks, the educational process becomes more convenient for more students.

However, theoretically, it is also necessary to define ethical and pedagogical boundaries in the use of artificial intelligence. Primary school students may not fully realize the risks in the digital environment at an early age. Therefore, when using artificial intelligence tools, it is important to protect personal data, ensure the psychological safety of children, prevent excessive technological addiction, and maintain the priority of human communication. The use of artificial intelligence in education should serve a pedagogical purpose, have a positive





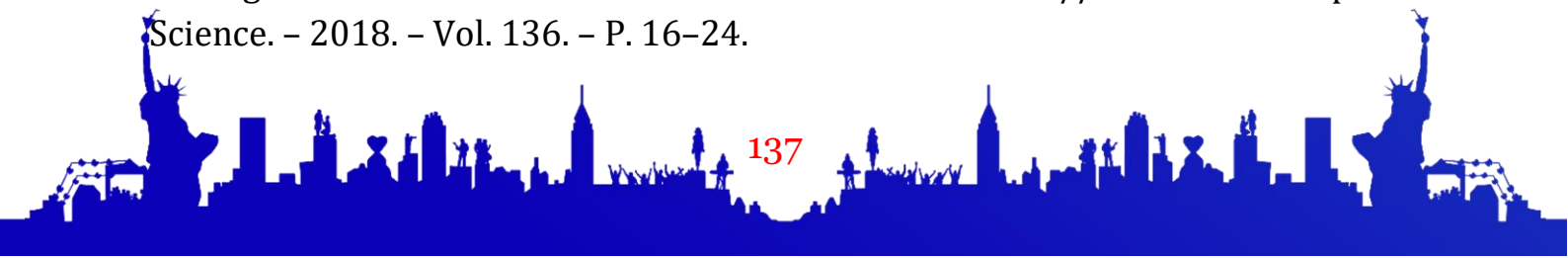
impact on student development, and be carried out under the supervision of a teacher.

Furthermore, the use of artificial intelligence must be aligned with the content of national education and educational goals. Primary education is not only a stage of education but also a stage of forming a culture of morality, responsibility, diligence, patriotism, cooperation, and communication in children. Therefore, artificial intelligence tools should serve not only the intellectual development of students but also their spiritual and moral education. True effectiveness in the educational process can only be achieved when technology is harmonized with pedagogical values.

Overall, the theoretical foundations of using artificial intelligence in primary education rely on the principles of student-centered learning, a constructivist approach, activity-based learning, adaptive learning, feedback, digital competence, and inclusive education. Artificial intelligence allows for the individualization of the educational process, the activation of students' learning activities, the provision of methodological assistance to the teacher, and the improvement of educational quality. At the same time, its effective application is inextricably linked to the pedagogical goal, methodological training, moral responsibility, and human approach.

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