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THE USE OF ARTIFICIAL INTELLIGENCE-BASED EDUCATIONAL TOOLS IN DEVELOPING LOGICAL THINKING AMONG PRIMARY SCHOOL STUDENTS

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Abstract

This article examines the potential of applying educational tools based on artificial intelligence technologies in the process of forming logical thinking among primary school students. The study analyzes approaches to developing children's skills of analysis, comparison, generalization, and drawing conclusions through intelligent learning platforms. The pedagogical conditions for using such tools, as well as their influence on students' cognitive activity, are discussed. The obtained results indicate that integrating modern digital tools with traditional teaching methods contributes to improving the quality of education.

Keywords: artificial intelligence, logical thinking, primary education, intelligent learning platforms, digital educational tools, individualized instruction.

Introduction

In today's information society, the education system is undergoing fundamental transformation. The widespread penetration of digital technologies into everyday life, and especially the rapid development of tools based on artificial intelligence, has created the need to organize the teaching process in new ways. The stage of primary education is the period during which the intellectual foundations of a child's personality are formed, and instilling logical thinking skills precisely at this age serves as a foundation for successful learning in the future.

The relevance of the topic lies in the fact that traditional teaching methods often cannot fully account for each student's individual abilities and pace of learning. Artificial intelligence technologies, by contrast, make it possible to provide tasks that adapt to a student's level of knowledge, to analyze their mistakes, and to offer the teacher specific recommendations. This factor opens broad opportunities for the gradual development of independent thinking and problem-solving ability in children.

The aim of the research is to identify and substantiate effective ways of using artificial intelligence-based educational tools in developing logical thinking among primary school students. To achieve this aim, the following tasks have been defined: studying the didactic possibilities of intelligent learning tools, determining the pedagogical conditions for their application, and evaluating their impact on students' activity.

Literature Review and Methodology

The problem of developing logical thinking in younger schoolchildren has long occupied a central place in pedagogy and developmental psychology. Researchers emphasize that the formation of mental operations such as analysis, synthesis, and generalization is most effective when learning is built on active, exploratory activity rather than on the passive memorization of ready-made information. The emergence of artificial intelligence has added a new dimension to this discussion, since adaptive systems are now able to respond to a learner's actions in real time and to adjust the difficulty of tasks accordingly.

In the context of primary education, scholarly works distinguish several categories of intelligent tools: adaptive learning platforms that personalize the sequence of exercises; intelligent tutoring systems that imitate the support of a teacher; educational games with elements of machine learning; and diagnostic tools that automatically assess the level of skill acquisition. A common feature of these tools is their reliance on data about the learner, which allows them to construct an individual educational trajectory for each child.

The methodological basis of the present study comprises theoretical analysis of pedagogical and psychological literature, the comparison and generalization of existing approaches, and the systematization of practical experience in applying intelligent tools in the primary classroom. The qualitative analysis of these sources made it possible to identify the conditions under which artificial intelligence contributes most effectively to the development of logical thinking.

Results and Discussion

The analysis demonstrates that artificial intelligence-based tools influence the development of logical thinking through several mechanisms. First, the adaptive presentation of tasks ensures that each child works within the zone of optimal difficulty, where exercises are neither too easy nor discouragingly hard. This balance sustains the student's interest and encourages persistent reasoning. Second, immediate feedback on errors prompts the child to reconsider the steps of a solution, thereby strengthening self-monitoring and reflective thinking.

A further result concerns the role of the teacher. Rather than replacing the educator, intelligent systems function as an assistant that frees the teacher from routine checking and supplies detailed information about each student's progress. On the basis of these data, the teacher can organize differentiated work, give targeted explanations, and design group activities that consolidate logical operations. Consequently, the most productive model is not the autonomous use of technology but its purposeful combination with the teacher's guidance.

At the same time, the study reveals certain conditions that must be observed for these tools to be effective. The content of digital exercises should correspond to the age characteristics of younger schoolchildren; the duration of work with screens must be reasonably limited; and the tasks should require genuine reasoning rather than mechanical selection of answers. When these conditions are met, the integration of intelligent tools with traditional methods noticeably increases students' cognitive activity and their motivation to learn.

Conclusion

The conducted analysis allows us to conclude that artificial intelligence-based educational tools possess significant didactic potential for developing logical thinking among primary school students. Owing to their adaptivity, immediate feedback, and capacity for individualization, such tools help children acquire the operations of analysis, comparison, and generalization more consciously and actively. However, their effectiveness is achieved only when they are used as a complement to the teacher's work and in accordance with the age-related and hygienic requirements of primary education.

Further research may focus on the experimental verification of specific intelligent platforms in real classroom conditions, as well as on the development of methodological recommendations that would help teachers integrate these tools into the educational process in a balanced and pedagogically sound manner.

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