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ARTIFICIAL INTELLIGENCE IN EDUCATION: POSSIBILITIES FOR PERSONALIZING LEARNING

***Abstract:** This article examines the impact of artificial intelligence technologies on modern education, in particular, their potential for personalizing learning. It describes the benefits of using AI to adapt the learning process to the individual needs of students, such as increasing the effectiveness of learning, motivation, and accessibility of education. An overview of the most popular adaptive educational platforms and tools based on AI is provided. The main advantages and disadvantages of using AI in education are identified, as well as moral and ethical aspects that should be taken into account when implementing AI in the educational process.*

***Keywords:** education, artificial intelligence, machine learning, personalized learning, adaptive learning, educational platforms, ethics in education.*

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ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ В ОБРАЗОВАНИИ: ВОЗМОЖНОСТИ ПЕРСОНАЛИЗАЦИИ ОБУЧЕНИЯ

***Аннотация:** В данной статье рассматривается влияние технологий искусственного интеллекта на современное образование, в частности, их потенциал в области персонализации обучения. Описываются преимущества использования ИИ для адаптации учебного процесса к индивидуальным потребностям учащихся, такие как повышение эффективности обучения, мотивации и доступности образования. Приводится обзор наиболее популярных адаптивных образовательных платформ и инструментов на основе ИИ. Выявляются основные преимущества и недостатки применения ИИ в образовании, а также морально-этические аспекты, которые следует учитывать при внедрении ИИ в учебный процесс.*

***Ключевые слова:** образование, искусственный интеллект, машинное обучение, персонализированное обучение, адаптивное обучение, образовательные платформы, этика в образовании.*

In the modern information society, where the volume of knowledge is constantly increasing, and access to information is becoming almost unlimited, traditional educational approaches based on standardization and unification are increasingly being questioned. The focus is on the individual needs of each student, their abilities, style and pace of knowledge acquisition. In this regard, personalization of learning, which involves adapting the educational process to the unique characteristics of each person, is becoming especially relevant [1].

Artificial intelligence (AI), due to its ability to analyze large amounts of data, identify patterns and provide personalized recommendations, opens up new opportunities for creating adaptive educational systems. The use of AI in education can not only improve the efficiency of the educational process and student motivation [2], but also make education more accessible and inclusive.

Currently, personalized learning using AI is a flexible and dynamic system where the content, methods and pace of learning are adapted to the individual characteristics of each student [3]. This approach allows you to maximize the potential of each person and ensure the successful achievement of educational goals [4]. In this study, we will consider the effectiveness of using AI to personalize learning, analyze the advantages, disadvantages and prospects for using this technology in the educational sphere.

To achieve the objectives of the study, a comprehensive approach was used, including the analysis of educational platforms and tools with AI to assess their effectiveness, content analysis of scientific publications to study the impact of AI on educational processes, as well as a comparative analysis of the collected data to identify trends, advantages and disadvantages of personalizing learning using AI, which made it possible to form a holistic view of the current state and prospects for the development of AI in the educational sphere.

As part of the study, five popular platforms with adaptive learning technologies were analyzed: Coursera, edX, Khan Academy, Duolingo and Moodle with the integration of an AI plugin. Coursera and edX stand out for their most advanced personalization features, including changing the content and pace of learning using machine learning algorithms. Khan Academy effectively uses AI to identify gaps in students' knowledge and select individual assignments. Duolingo focuses on gamification of the learning process, using AI to increase user motivation. Moodle with an AI plugin gives teachers the ability to develop adaptive assignments and tests. Century Tech uses AI to analyze student performance data and create personalized learning plans tailored to their strengths and weaknesses. Carnegie Learning uses AI to analyze learning data and provide individualized support and feedback to each student.

While popular mass online learning platforms offer courses to a wide audience and use AI primarily to analyze general student activity, there is a new class of platforms that focus on deep analytics and personalized learning.

Unlike the first type of platforms, which are usually limited to collecting basic information about course completion, assignment time, and grades, new platforms provide more detailed data and advanced analytics.

For example, IntelliBoard integrates with learning management systems (LMS) such as Moodle and provides teachers and administrators with access to detailed reports and visualization of learning activity [5]. This allows them to effectively track student progress, identify problem areas, and provide timely support. Knewton, in turn, uses AI algorithms to create personalized learning paths [6]. The platform analyzes data on each student, identifies knowledge gaps, and offers individual learning recommendations.

Modern research is actively exploring the possibilities of using artificial intelligence to create adaptive learning systems that adapt to the individual needs of each student [7]. Particular attention is paid to the development of

personalized systems for the formation of STEM competencies, where AI plays a key role in adapting the educational process [8]. Platforms such as Intelliboard and Knewton collect and analyze a variety of data on student behavior, tracking their successes, difficulties, and preferences [9]. This information is used to promptly adjust the complexity of the educational material and select tasks that match the individual characteristics of each student.

As the comparative analysis (Table 1) shows, the joint use of these tools with platforms for mass online education allows for increased flexibility and adaptability of the educational process, making it more effective and focused on the individual needs of students.

Table 1.

Comparison of educational platforms with AI

Platform	Main Purpose	Level of Personalization	Data Analytics	Examples of Use	Key Features
IntelliBoard	Analytics for educational platforms (mainly Moodle)	Low level: focus on analytics for instructors	In-depth analytics on student performance and activity	Tracking student progress, reporting for administrators and instructors	Integration with LMS, data visualization, identification of risk zones
Knewton	Creation of adaptive courses with personalized content	High level: individual learning paths	Basic analytics integrated into the adaptive learning process	Individualization of course content to improve learning effectiveness	Adaptive algorithms, personalized recommendations
Coursera	Massive Open Online Course	Basic level: course	Basic analytics:	Mass online learning with	Wide selection of

	(MOOC) platform with a wide selection of courses	recommendations based on interests	performance, time spent on tasks	course recommendations	courses, certificates, mobile app
edX	Online course platform partnered with universities	Basic level: course recommendations	Basic analytics, similar to Coursera	University online courses, certificates	Courses from leading universities, mobile app
Khan Academy	Free educational platform with interactive courses and exercises	Limited adaptation of learning pace based on results	Basic analytics: performance by topic	Self-study in the format of video lessons and tests	Free access, wide range of subjects
Duolingo	Language learning platform with adaptive elements	Medium level: adaptation of exercises to the level of knowledge	Basic analytics: task completion and progress	Language learning using gamification	Game-based approach, mobile app
Moodle with AI plugins	Learning Management System (LMS) with additional AI modules for content adaptation	Medium level: AI plugins offer individual tasks	Basic analytics on activity and attendance	Internal use by educational institutions to create courses	Flexibility, integration with various plugins
Century Tech	Platform based on neurobiology and AI for personalized learning	High level: adaptation of content, pace, and feedback	Detailed analytics of progress and cognitive functions	Used in schools for personalized learning in core subjects	Neural network approach, interactive lessons, games

Carnegie Learning	Interactive textbooks and learning platform using AI	High level: personalized support and feedback	Analytics of individual errors and difficulties	Used in schools and universities for teaching math, science, and humanities	Interactive textbooks, simulations, games
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In modern pedagogical science, the possibilities of using artificial intelligence to create interactive and socially-oriented educational platforms are actively studied. [10] Of particular interest are studies devoted to the formation of self-regulation skills for learning using AI within the framework of the social constructivist approach. [11] This approach emphasizes social interaction and joint activities as key factors in knowledge acquisition.

Analysis of the effectiveness of various approaches to personalizing learning using AI shows a predominantly positive impact of this technology on student performance and motivation. [12] For example, adaptive systems created on the basis of AI allow the formation of individualized educational routes that take into account the educational preferences and goals of students. This helps to increase the effectiveness of learning, maintains interest in learning and has a positive effect on academic performance.

However, the introduction of AI in education is associated with a number of challenges. The quality of the data used, the correctness of their interpretation and the variability of algorithms play an important role. [13] There are also technological limitations and difficulties in adapting content for different types of students. [14]

Advantages of personalized learning using AI:

- Adaptation of the learning process to the individual needs.
- Taking into account the interests and goals of students.

- Identification of knowledge gaps and provision of individual feedback.

- Increasing the accessibility of education.

Disadvantages and potential threats:

- Limited data and the risk of inaccurate recommendations.

- Complexity of implementation and the need for investment in technology. [15]

- Ethical issues related to data privacy and transparency of algorithms.

Prospects for development:

- Improvement of AI technologies.

- Integration of AI with technologies VR/AR, blockchain, IoT.

- Creation of adaptive learning environments.

- Development of ethical standards and guidelines.

Thus, it should be noted that personalized learning using AI has great potential to improve the efficiency and accessibility of education. However, the successful implementation of this technology requires careful consideration of ethical aspects and the development of appropriate standards. Further development of AI technologies and their integration with other technologies will open up new opportunities for creating adaptive learning environments focused on the individual needs of each student.

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