THE IMPACT OF ARTIFICIAL INTELLIGENCE ON EDUCATION

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Abstract: *This article examines the impact of artificial intelligence on education as a pedagogical, technological and ethical phenomenon. The main idea is that artificial intelligence should not be understood only as a set of digital tools that accelerate teaching or assessment. It is also a factor that changes the logic of educational interaction, the structure of learning content, the professional identity of teachers and the cognitive autonomy of students. The article analyses how AI-based systems support adaptive learning, automated feedback, learning analytics, inclusive education and individualized educational trajectories.*

Keywords: *artificial intelligence, education, digital pedagogy, adaptive learning, learning analytics, teacher professionalism, academic integrity, human-centred education.*

SUN'IY INTELLEKTNING TA'LIMGA TA'SIRI

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Annotatsiya*: Ushbu maqolada sun'iy intellektning ta'limga ta'siri pedagogik, texnologik va axloqiy hodisa sifatida tadqiq etiladi. Asosiy g'oya shundan iboratki, sun'iy intellekt faqat o'qitish yoki baholash jarayonini tezlashtiruvchi raqamli vositalar majmui sifatida tushunilmasligi kerak. U, shuningdek, ta'limiy muloqot mantiqini, o'quv mazmuni tuzilishini, o'qituvchilarning kasbiy identifikatsiyasini hamda talabalarning kognitiv mustaqilligini o'zgartiruvchi omil hisoblanadi. Maqolada sun'iy intellektga asoslangan tizimlarning adaptiv ta'lim, avtomatlashtirilgan teskari aloqa, ta'lim analitikasi, inklyuziv ta'lim va individuallashtirilgan ta'lim trayektoriyalarini qo'llab-quvvatlashdagi imkoniyatlari tahlil qilinadi.*

Kalit so'zlar*: sun'iy intellekt, ta'lim, raqamli pedagogika, adaptiv ta'lim, ta'lim analitikasi, o'qituvchi professionalligi, akademik halollik, insonga yo'naltirilgan ta'lim.*

ВЛИЯНИЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА НА ОБРАЗОВАНИЕ

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Аннотация: *В данной статье рассматривается влияние искусственного интеллекта на образование как педагогическое, технологическое и этическое явление. Основная идея заключается в том, что искусственный интеллект не следует понимать только как совокупность цифровых инструментов, ускоряющих процесс преподавания или оценивания. Он также является фактором, изменяющим логику образовательного взаимодействия, структуру учебного содержания, профессиональную идентичность преподавателей и когнитивную самостоятельность студентов. В статье анализируется, как системы, основанные на искусственном интеллекте, поддерживают адаптивное обучение, автоматизированную обратную связь, образовательную аналитику, инклюзивное образование и индивидуализированные образовательные траектории.*

Ключевые слова*: искусственный интеллект, образование, цифровая педагогика, адаптивное обучение, образовательная аналитика, профессионализм преподавателя, академическая честность, человекоориентированное образование.*

INTRODUCTION

Artificial intelligence has become one of the most influential forces reshaping contemporary education. Its impact is visible not only in intelligent tutoring systems, automated assessment platforms and generative language models, but also in the deeper transformation of pedagogical thinking. Earlier technologies mainly expanded access to information, while AI analyses data, predicts learner behaviour, generates educational content, recommends learning paths and participates in decision-making. Therefore, AI should be considered not simply as a technical instrument, but as a complex socio-pedagogical phenomenon that changes the relationship between learner, teacher, curriculum, assessment and institution[1].

In the modern educational environment, the value of artificial intelligence is often explained through personalization. Traditional classroom instruction usually depends on a common pace, unified materials and standardized evaluation. AI-based platforms can process learner data, identify gaps in understanding, recommend individualized tasks and provide immediate feedback. Such opportunities are important in large classes, distance education and inclusive learning contexts where teachers cannot monitor every student in real time[2]. When used responsibly, AI can support differentiated instruction, reduce mechanical workload and allow teachers to devote more attention to interpretation, mentoring and emotional support. Thus, the

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significance of AI is connected not only with efficiency, but also with the creation of flexible and responsive learning environments[3].

At the same time, the impact of AI cannot be reduced to technological optimism. AI systems operate through data, algorithms and design assumptions, and these elements are never completely neutral. They may reproduce social inequalities, privilege certain cultural or linguistic norms, classify students through narrow indicators and encourage excessive trust in automated recommendations. The danger is not that AI will immediately replace education, but that education may gradually adapt itself to the logic of algorithmic measurability[4]. If learning success is evaluated only through the data that machines can collect, then creativity, ethical judgement, civic responsibility and reflective thought may become secondary. For this reason, AI integration requires a strong pedagogical philosophy that protects the humanistic mission of education[5]

The teacher's role is also being redefined. In a superficial interpretation, AI seems to reduce the need for teachers by generating lesson plans, checking assignments or answering questions. In a more accurate interpretation, however, AI increases the importance of teacher professionalism because it requires mediation and critical control. Teachers must evaluate the reliability of AI-generated content, explain the limitations of automated feedback, protect students from misinformation, design tasks that develop independent thinking and cultivate responsible digital behaviour. The teacher becomes a curator of digital resources, an interpreter of learning analytics, a designer of meaningful educational situations and a guardian of ethical learning culture[6].

The learner's position is transformed as well. AI tools can expand access to explanations, translation, simulation, summarization and practice activities, yet they may also create the illusion of mastery. When students receive polished answers without engaging in questioning, comparing, reasoning and revising, learning may look successful but remain intellectually weak. Consequently, AI literacy must become a necessary component of modern education. Students should learn how to ask productive questions, verify generated information, recognize bias, cite AI

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assistance transparently and preserve their own authorship. AI literacy is inseparable from critical thinking, media literacy and academic integrity[7].

For countries undergoing digital transformation, including Uzbekistan, the topic has particular importance. Educational modernization requires not only platforms and equipment, but also methodological readiness, teacher training, local content, ethical regulation and research-based implementation. AI can contribute to school education, higher education and professional training, but its effectiveness depends on the alignment between technology and pedagogical purpose. If AI is introduced only as a fashionable innovation, it may remain external to the real needs of teachers and learners. If it is integrated into curriculum design, assessment culture, teacher development and educational management, it can become a meaningful factor in improving quality and accessibility[8]. The relevance of this article is determined by the need to analyse AI through a balanced scientific perspective. The central problem is how artificial intelligence can improve teaching and learning while preserving the human, ethical and developmental essence of education. The purpose is to identify major opportunities, methodological principles, risks and discussion points related to AI in education.

LITERATURE REVIEW

The scholarly discussion on artificial intelligence in education has developed rapidly, and Uzbek researchers have begun to connect this global agenda with national higher education, digital infrastructure and pedagogical modernization. Among Uzbek scholars whose works are visible in Google Scholar, Marat Rakhmatullaev occupies an important place because his research connects artificial intelligence with the transformation of higher education, scientific information systems and digital academic environments. In his work on artificial intelligence in higher education, Rakhmatullaev discusses the expansion of AI in universities, global trends, foreign experience, personnel training and the prospects for introducing AI into Uzbekistan's higher education system. His approach is significant because it interprets AI as part of a wider ecosystem that includes institutional strategy, information resources, research culture and educational services[9].

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Another relevant Uzbek researcher is Bekjan Akhmedov, whose Google Scholar profile includes studies on artificial intelligence, virtual learning environments and digital education in Uzbekistan. Akhmedov's work is useful for understanding the classroom-level pedagogical dimension of AI integration. His research on implementing artificial intelligence and virtual learning environments in elementary schools in Uzbekistan highlights the possibility of using AI in earlier stages of learning, where personalization, motivation, visual modelling and feedback are especially important. In this regard, Akhmedov's position complements Rakhmatullaev's institutional perspective. While Rakhmatullaev emphasizes higher education systems and strategic modernization, Akhmedov focuses on methodological adaptation, learner development and the educational potential of intelligent environments[10]. Together, these two Uzbek scholarly positions show that the national discourse on AI in education is gradually moving from general digitalization toward more specific questions of pedagogical design, teacher readiness and ethical responsibility. Their works also indicate that Uzbekistan's educational system cannot simply import foreign AI solutions without methodological localization. AI systems should be adapted to language, curriculum, cultural context, assessment traditions and the real digital competencies of teachers and students. Therefore, the literature suggests that the successful impact of AI depends on the balance between technological innovation and pedagogical relevance. Educational quality in the AI era should include accessibility, fairness, meaningful learning, teacher agency and the formation of independent thinking.

METHODOLOGICAL PART

This article used a qualitative, analytical and literature-based methodology aimed at revealing the pedagogical meaning of artificial intelligence in education through an interdisciplinary interpretation of scientific sources and contemporary educational tendencies. The methodological basis of the study was formed by comparative analysis, systems thinking, critical pedagogy and the principle of human-centred digital transformation. Comparative analysis was applied to distinguish between optimistic and critical interpretations of AI in education, especially between views that emphasize personalization, adaptive learning and

efficiency and views that warn against automation, inequality and the weakening of educational autonomy. Systems thinking was used because AI affects curriculum design, teacher work, assessment procedures, institutional management, student motivation, data governance and ethical regulation. The article also relied on content analysis of scholarly ideas, policy-oriented arguments and pedagogical concepts related to AI-based learning. Through this method, key thematic categories were identified: personalization, automated assessment, teacher professionalism, student agency, academic integrity, algorithmic bias, digital inequality and ethical governance. These categories were interpreted in relation to each other in order to avoid a fragmented description of AI technologies. The methodological logic of the article was based on the assumption that technology must be evaluated according to educational criteria. For this reason, the analysis focused not on the technical architecture of algorithms, but on their pedagogical consequences: how they change the learning process, what responsibilities they create for teachers and what risks they produce for learners.

An interpretive synthesis was used to integrate diverse scientific positions into a coherent conceptual argument. The views of Uzbek researchers were considered together with international scholarship in order to identify universal and context-specific dimensions of AI integration. The methodology combined descriptive, analytical and evaluative procedures that clarified areas of AI application, revealed their influence on educational relations and determined the conditions under which AI can be beneficial or problematic.

RESULTS

The results of the analysis show that artificial intelligence influences education in several interconnected directions, and its strongest impact appears where technological opportunities are combined with clear pedagogical aims. First, AI strengthens adaptive and personalized learning. Intelligent systems can identify typical errors, analyse the pace of learning, recommend additional exercises and provide feedback that corresponds to the learner's current level. This creates opportunities for supporting students who need additional explanation as well as those who require advanced tasks. However, personalization is positive only when it

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is not reduced to the isolation of each learner in an algorithmic path, but becomes a means of more responsive pedagogical support.

Second, AI changes assessment culture. Automated checking, plagiarism detection, learning analytics and generative feedback can reduce routine work and make formative assessment more continuous. Instead of waiting for final examinations, teachers may receive data about students' progress during the learning process. This supports timely intervention and makes assessment more diagnostic. At the same time, automated assessment is limited when tasks require creativity, argumentation, moral judgement or contextual interpretation. Therefore, AI-based assessment should be combined with teacher evaluation, oral defence, portfolio work, project activity and reflective assignments.

Third, AI affects the professional identity of teachers. It creates new demands for digital competence, data literacy, prompt design, ethical supervision and the ability to evaluate AI-generated materials. The teacher becomes a mediator between technology and meaning. Fourth, AI expands inclusive opportunities by supporting translation, speech-to-text tools, individualized explanations, accessible materials and assistive learning environments. Nevertheless, inclusion requires careful design because unequal access to devices, internet and digital skills may reproduce educational inequality. The general result is that AI is not automatically progressive or harmful. Its educational value depends on governance, teacher training, curriculum integration, transparent rules and a human-centred philosophy.

DISCUSSION

The international debate on artificial intelligence in education can be illustrated through the polemical relationship between Rose Luckin and Neil Selwyn. Luckin argues that AI can help education move beyond standardized and industrial models of instruction. From her perspective, artificial intelligence can support teachers by revealing hidden patterns in learning, enabling adaptive feedback and helping educational systems understand the complexity of human intelligence. Her position is pedagogically constructive because it sees AI as a partner in improving learning design and in developing more precise forms of support for individual students. Neil Selwyn offers a more critical sociological interpretation. He warns that

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discussions about AI are often dominated by commercial optimism, policy pressure and technological solutionism. In his view, education should slow down and examine questions of power, inequality, institutional control and the hidden interests behind AI systems. His critique is important because it reminds researchers and practitioners that educational technologies are never neutral. They are produced by organizations, shaped by economic models, trained on imperfect data and introduced into institutions that already contain inequalities. Therefore, Selwyn challenges the assumption that AI automatically improves education. The polemic between Luckin and Selwyn is productive because it reveals two necessary dimensions of the same problem. Luckin's argument protects the possibility of innovation: without such a perspective, education may ignore tools that can support personalization, inclusion and teacher decision-making. Selwyn's critique protects the ethical and political seriousness of education: without such a perspective, schools and universities may adopt AI uncritically and allow algorithmic systems to shape learning according to narrow metrics. A responsible approach must combine pedagogical optimism with critical caution. It should encourage experimentation while demanding transparency, fairness, privacy, teacher agency and democratic accountability. In practical terms, educational institutions should not introduce AI only because it is innovative. They should define the learning problem, evaluate evidence of effectiveness, train teachers, establish ethical rules, protect student data and design assessment tasks that require genuine thinking. The most balanced position is neither technological enthusiasm nor rejection, but critical human-centred integration.

CONCLUSION

The impact of artificial intelligence on education is profound, complex and contradictory. AI offers opportunities for personalization, adaptive learning, inclusive support, learning analytics, automated feedback and the modernization of educational management. It can help teachers identify learning difficulties, reduce routine tasks and design more flexible educational experiences. It can also help students access explanations, practise independently and receive support according to their individual needs. However, these advantages do not remove the need for critical regulation and pedagogical responsibility. AI can also produce risks related

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to bias, privacy, inequality, academic dishonesty, cognitive dependence and the reduction of education to algorithmically measurable performance. The article concludes that artificial intelligence should be integrated through a human-centred and pedagogically justified model.

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