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Artificial Intelligence in the Context of Global Technological Transformation: Epistemological and Educational Perspectives

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Annotation *The article is focused on the phenomenon of artificial intelligence in the context of global technological transformation from epistemological, philosophical, and pedagogical perspectives. Special attention is given to the analysis of artificial intelligence as a tool of cognition capable of modeling human cognitive and creative processes, as well as a factor that has a significant impact on the formation of the information society and the development of educational systems. The epistemological foundations of artificial intelligence are explored, including its relationship with natural human intelligence and its possibilities and limitations in reproducing thinking and cognitive mechanisms. It is emphasized that in contemporary conditions artificial intelligence functions not only as a technical tool but also as an essential element of the intellectual and educational environment. The importance of systematic modeling of the educational process is highlighted as a means of ensuring integrity, flexibility, and adaptability of learning in the context of digitalization.*

Keywords *Artificial intelligence, epistemology, information society, knowledge engineering, educational modeling, teacher training, digital technologies, innovation policy*

Искусственный интеллект в контексте глобальной технологической трансформации: эпистемологические и образовательные перспективы

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Аннотация *В статье рассматривается феномен искусственного интеллекта в контексте глобальной технологической трансформации с позиций эпистемологии, философии и педагогики. Особое внимание уделяется анализу искусственного интеллекта как инструмента познания, способного моделировать когнитивные и творческие процессы человека, а также как фактора, оказывающего существенное влияние на формирование информационного общества и развитие образовательных систем. Раскрываются эпистемологические основания искусственного интеллекта, его взаимосвязь с естественным человеческим интеллектом, возможности и ограничения в воспроизведении мыслительных и познавательных механизмов. В работе анализируются современные подходы к инженерии знаний, использованию нейронных сетей и интеллектуального анализа данных, которые обеспечивают эффективную обработку больших массивов*

информации и способствуют развитию научных исследований, инженерной деятельности и креативного мышления. Подчёркивается, что искусственный интеллект в современных условиях выступает не только как технический инструмент, но и как важный элемент интеллектуальной и образовательной среды. Отмечается значимость системного моделирования образовательного процесса, обеспечивающего целостность, гибкость и адаптацию обучения к условиям цифровизации. Рассматриваются педагогические модели профессионального обучения будущих учителей, ориентированные на формирование цифровой, информационной и медиакомпетентности, развитие критического мышления и способности к инновационной деятельности.

Ключевые слова *Искусственный интеллект, эпистемология, информационное общество, инженерия знаний, образовательное моделирование, подготовка учителей, цифровые технологии, инновационная политика*

Jahon texnologik transformatsiyasi kontekstida sun’iy intellekt: epistemologik va ta’limiy jihatlar

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Annotatsiya *Mazkur maqolada sun’iy intellekt fenomeni global texnologik transformatsiya sharoitida epistemologik, falsafiy va pedagogik nuqtai nazardan tahlil qilinadi. Sun’iy intellektning insonning kognitiv va ijodiy jarayonlarini modellashtira oladigan bilish vositasi sifatidagi o‘rni, shuningdek, axborot jamiyatining shakllanishi va ta’lim tizimlarining rivojlanishiga ko‘rsatayotgan ta’siri alohida e’tiborga olinadi. Sun’iy intellektning epistemologik asoslari, uning tabiiy inson intellekti bilan o‘zaro bog‘liqligi, tafakkur va bilish mexanizmlarini qayta yaratishdagi imkoniyatlari hamda cheklovlari yoritib beriladi. Ushbu texnologiyalar katta hajmdagi axborotni samarali qayta ishlash imkonini berib, ilmiy tadqiqotlar, muhandislik faoliyati va ijodiy fikrlash rivojiga xizmat qilishi ta’kidlanadi. Shuningdek, hozirgi sharoitda sun’iy intellekt faqat texnik vosita sifatida emas, balki intellektual va ta’limiy muhitning muhim tarkibiy qismi sifatida namoyon bo‘layotgani qayd etiladi. Ta’lim jarayonini tizimli modellashtirishning ahamiyati, uning yaxlitligi, moslashuvchanligi va raqamlashtirish sharoitida ta’limni samarali tashkil etishdagi roli alohida ko‘rsatib o‘tiladi. Maqolada kelajakdagi o‘qituvchilarni professional tayyorlashga qaratilgan pedagogik modellar ko‘rib chiqilib, ularning raqamli, axborot va mediakompetentligini shakllantirish, tanqidiy fikrlash hamda innovatsion faoliyatga tayyorlashdagi o‘rni yoritiladi.*

Kalit so‘zlar *Sun’iy intellekt, epistemologiya, axborot jamiyati, bilimlar injiniringi, ta’limiy modellashtirish, o‘qituvchilarni tayyorlash, raqamli texnologiyalar, innovatsion siyosat*

Introduction

Contemporary global technological transformations have a significant impact on the development of artificial intelligence (AI). In recent years, rapid progress has been observed in such areas as AI algorithm modeling (including decision-making and theoretical reasoning), natural language processing, neural networks, bio-inspired algorithms, image recognition, intelligent robotics, and the automation of industrial and service sectors. Alongside these developments, the efficient use of time and technological resources to enhance the cognitive capabilities of modern computing systems comparable to human intelligence has become an increasingly relevant research problem.

Currently, global scientific research actively explores various theoretical and applied aspects of information technologies and artificial intelligence. Of particular relevance are studies examining the relationship between artificial intelligence and human activity in the information society, the interaction between natural and artificial intelligence in social development, cybernetic modeling of intellectual processes, and data-processing mechanisms analogous to human cognition (Toshboboev, 2020). These studies contribute to the development of conceptual frameworks aimed at improving human life and enhancing intellectual productivity through AI-based tools.

Epistemological and Philosophical Perspectives

From an epistemological perspective, the study of artificial intelligence has become an objective necessity in modern information societies. AI is no longer viewed solely as a technical phenomenon but as a subject of interdisciplinary research that includes philosophy, cognitive science, and education. In this context, epistemological analysis focuses on the role of artificial intelligence in knowledge acquisition, information processing, and the modeling of human thinking. The philosophical foundations of AI reveal its logical structure, cognitive potential, and limitations in replicating human intellectual activity (Panjiyevich, 2024). In Uzbekistan, the expansion of scientific research in artificial intelligence and the institutional support of innovation in this field have become strategic priorities of state policy. Particular emphasis is placed on the development of laboratories in higher education institutions dedicated to the Internet of Things, robotics, and AI technologies; the attraction of foreign partners; the stimulation of research in digital technologies; and the organization of competitions and initiatives aimed at generating innovative ideas. These efforts reflect the growing recognition of artificial intelligence as a key driver of economic development and educational modernization. Educational research highlights the importance of integrating artificial intelligence into teacher training, especially in primary education. According to

A.K. Markova's pedagogical framework, the professional development of future teachers includes four core components: mastery of psychological and pedagogical knowledge, acquisition of professional teaching skills, development of psychological competencies, and cultivation of personal qualities (Khajieva, Khujaniyazova, Kenjaeva, Jumaniyozov, 2020). In modern educational contexts, modeling the professional training process is considered essential. Such modeling ensures systematic presentation of learning materials, timely identification and resolution of pedagogical challenges, recognition of learners as active subjects, and continuous integration of new knowledge into the educational process. The socio-pedagogical activity of a future teacher represents a purposeful process of professional interaction with learners and the social environment, aimed at their successful socialization and the

development of socially significant personal qualities. The structure of this activity includes cognitive, communicative, value-motivational, and reflective–activity components (Mardakhaev, 2020).

Opportunities of Artificial Intelligence in the Preparation of Future Teachers

In the system of higher pedagogical education, artificial intelligence serves as an innovative tool that provides the following opportunities:

- adaptation of educational content to the individual characteristics and needs of learners;
- diagnosis of the level of formation of socio-pedagogical competence in future teachers;
- modeling socio-pedagogical situations within a digital learning environment;
- support for students' reflective and project-based activities.

The application of artificial intelligence technologies contributes to increased motivation among future teachers and enhances the overall effectiveness of the educational process (Andreev, 2022).

Innovative Methodology of Socio-Pedagogical Activity

The innovative methodology of socio-pedagogical activity of future teachers based on the use of artificial intelligence includes the following components:

- *target component* – formation of socio-pedagogical competence;
- *content component* – integration of socio-pedagogical disciplines, language training, and digital technologies;
- *procedural component* – use of adaptive platforms, intelligent tutoring systems, case-based methods, and project-based learning;
- *assessment and results component* – monitoring and evaluation of outcomes using analytical tools of artificial intelligence.

Pedagogical Conditions for the Effectiveness of the Methodology

The effectiveness of improving the innovative methodology is ensured by the following pedagogical conditions:

- creation of a multilingual digital educational environment;
- readiness of teachers to use artificial intelligence technologies;
- formation of stable motivation among students for socio-pedagogical activity;
- integration of theoretical and practical training of future teachers.

Knowledge Engineering and AI-Driven Creativity

Knowledge engineering focuses on extracting, systematizing, and applying knowledge derived from data. Once primarily associated with expert systems, this field now leverages neural networks and intelligent data analysis, increasing AI effectiveness in scientific research, engineering, and creative problem-solving. AI-assisted creativity is conceptualized as the goal-oriented transformation of information to produce novel outcomes (Xuramov, 2022). It typically involves a search phase and a compositional phase, where AI generates solutions through programmed exploration of potential combinations. These mechanisms demonstrate that AI can exhibit creative capacities akin to human creativity, with no inherent obstacles to collaboration or competition between humans and intelligent systems. Knowledge engineering plays a crucial role in artificial intelligence research by addressing the extraction, systematization, and application of knowledge derived from data. Historically associated with expert systems, this field has evolved through the use of neural network technologies and intelligent data analysis methods. The ability of AI systems to process large volumes of structured and unstructured information significantly enhances their effectiveness in engineering, scientific research, and creative problem-solving (Khujaniyazova, 2016). From an epistemological standpoint, creativity within artificial intelligence systems is conceptualized as a goal-oriented

transformation of information leading to the generation of new products. AI-assisted creativity typically involves two stages: a search phase and a compositional phase. At the compositional stage, AI systems generate new solutions through programmed exploration of possible combinations. This demonstrates that artificial intelligence, under certain conditions, can exhibit creative capacities comparable to human creativity, and that there are no fundamental barriers to creative interaction or competition between humans and intelligent machines (Khujaniyazova, 2023).

Conclusion

In conclusion, the successful preparation of future educators and professionals requires the development of competencies in the rational use of modern digital technologies, particularly artificial intelligence tools. Educational reform, alongside industrial and societal development, must prioritize the integration of AI, data science, and mathematical literacy. The "Digital Uzbekistan – 2030" AI strategy emphasizes the restructuring of research and development systems as a foundation for the future and outlines the transformation of education in universities, colleges, and technical institutions. However, the lack of detailed quantitative indicators in policy documents may lead to ambiguous interpretations, highlighting the need for clearer evaluation criteria and implementation mechanisms.

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