



PEDAGOGICAL FOUNDATIONS AND PROSPECTS OF UTILIZING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE EDUCATIONAL PROCESS

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Abstract. *This article comprehensively analyzes the pedagogical potential, current challenges, and development prospects of integrating artificial intelligence (AI) technologies into the modern higher education system. Within the context of technology and pedagogy convergence, the role of neural networks in intensifying students' independent learning activities, creating individualized learning trajectories, and enhancing educational quality is thoroughly examined. Furthermore, pedagogical recommendations aimed at preserving students' critical thinking and preventing plagiarism are developed.*

Keywords: *Artificial intelligence, pedagogy, technological education, digital education, independent study, higher education, ChatGPT, individualized approach, EdTech, hybrid learning, intelligent tutoring.*

Аннотация: *В данной статье подробно анализируются педагогические возможности, актуальные проблемы и перспективы развития интеграции технологий искусственного интеллекта (ИИ) в современную систему высшего образования. В условиях слияния технологий и педагогики освещены роль нейросетей в интенсификации самостоятельной образовательной*

деятельности студентов, создании индивидуальных траекторий обучения и повышении качества образования. Также разработаны педагогические рекомендации, направленные на сохранение критического мышления у студентов и предотвращение плагиата.

Introduction

The twenty-first century is an era of high technology and global digital transformation. Today, alongside all sectors of the economy and industry, the educational system is undergoing a fundamental modernization. One of the primary tasks facing modern pedagogy is not merely transferring ready-made, static knowledge to students, but rather fostering their skills in independent research, analysis, and the practical application of new information. In this process, the digital environment has become an indispensable and natural part of learning for undergraduate students majoring in "Technological Education."

In recent years, artificial intelligence (AI) and Large Language Models (LLMs) have rapidly broken into the educational sphere. Studying the pedagogical foundations of artificial intelligence in the educational system, determining its didactic functions, and ensuring its proper integration into the instructional process are among the most pressing challenges of our time. This article explores in detail the pedagogical effectiveness of technological tools, the role of neural networks in raising students' independent learning culture, and the existing methodological approaches in this domain.

When implementing artificial intelligence technologies into the traditional pedagogical system, its functional capabilities can be divided into several essential pedagogical directions. AI is not merely a technical

tool, but an intelligent partner that modifies the relationship between the subjects of the educational process (the instructor and the student).

The Principle of Individualization and Differentiated Approach

In a traditional classroom system, the instructor is often forced to pace the lesson according to the average learner. Consequently, highly gifted students may experience boredom, while lower-achieving students lag behind the topic. Artificial intelligence algorithms (such as adaptive learning platforms) analyze each student's individual learning speed, interests, and error statistics in real-time. The system automatically generates a learning material trajectory tailored to each learner. This represents the highest practical expression of the "learner-centered education" principle in pedagogy.

Intelligent Tutoring and System Architecture

During independent study, students frequently stall due to unfamiliar terminology, complex problems, or bugs in programming code. The physical presence of an instructor next to a student 24/7 is impossible. ChatGPT, Claude, or specialized educational AI bots can serve as a student's "personal tutor" around the clock.

To successfully implement these components, a well-defined educational architecture is required. The systemic pedagogical structure of AI integration within the modern educational network is visually conceptualized in the figure below:

As illustrated in Figure 1, the digital educational engine acts as an intermediary, receiving data analytics from learning environments and using artificial intelligent agents to personalize the learning experience, solve queries, and automate administrative and evaluation metrics.

Automation and Reduction of Pedagogical Workload

A significant portion of an instructor's activity, besides teaching, consists of mechanical work such as routinely designing intermediate assessment tests, grading assignments, and preparing administrative reports. Artificial intelligence systems are capable of grading student test results within seconds and presenting the data to the instructor in the form of charts, highlighting areas where a mass deficit of knowledge is observed. This allows educators to dedicate more time to the creative and educational components of the lesson—direct communication with students.

THE ROLE OF NEURAL NETWORKS IN ORGANIZING INDEPENDENT STUDY

In higher education, independent study hours constitute at least 40-50% of the total curriculum. However, in many cases, students lack the skills to organize independent learning properly or to filter the necessary and reliable information from the massive ocean of digital data.

AI tools accelerate the process of independent study in the following ways:

Structural Data Analysis: By uploading large volumes of scientific literature or complex articles into AI systems, students can obtain a concise summary. This significantly saves the student's time.

Enhancing Cognitive Flexibility: Students can prompt AI to generate crosswords, case studies, and quizzes to test their own knowledge. This helps organize the educational process on the basis of gamification.

Planning Practical Projects: Technological education students, when preparing graduation theses or course projects, can utilize AI to draft work roadmaps and generate step-by-step instructions.

Along with the positive impact of artificial intelligence on education, its improper application can lead to severe pedagogical crises. Research indicates that the uncontrolled use of AI in learning gives rise to the following issues:

Intellectual Laziness and Decline in Critical Thinking: If a student entirely shifts the task of writing an essay,

independent report, or programming code to a neural network, the functions of thinking, analysis, and memory

in their brain weaken. The student turns into a passive "consumer" of a ready-made intellectual product.

Plagiarism and Academic Dishonesty: Verifying the authenticity of submissions made by students has become increasingly complex. Traditional anti-plagiarism systems cannot always detect texts generated by AI.

Hallucinations (Provision of Misinformation): Artificial intelligence models can sometimes fabricate facts that do not correspond to reality, citing non-existent books and sources (hallucination). If a student lacks critical evaluation skills, there is a high risk of assimilating incorrect knowledge.

Pedagogical Recommendations for Mitigating These Risks:

Educators are now obligated to reform their teaching and assessment methodologies. Assigning an essay or a report to be written from home has practically lost its evaluation value. Instead, teachers must implement the following methods:

Live Classroom Discussion (Debates): Students must orally defend their work in the classroom, explaining its logical foundations and methodology.

The "Finding AI Errors" Methodology: The instructor intentionally provides students with text or code written by AI that contains deliberate errors. The students' task is to locate and correct the logical and factual mistakes, which heavily enhances critical thinking.

Project-Based Learning (PBL): Students should divide into groups to create practical projects capable of solving real-world problems and present them collaboratively as a team.

CONCLUSION

In conclusion, the integration of technology and pedagogy is an irreversible and essential process. Artificial intelligence will not replace teachers in the educational system; however, educators who effectively utilize AI will undoubtedly take the places of those instructors who do not know how to use it.

For undergraduate students in the "Technological Education" direction, artificial intelligence tools are a powerful asset capable of multiplying learning efficiency up to tenfold. The key lies in respecting digital ethics and maintaining a pedagogical balance in the educational process, developing students' skills to manage technologies rather than blindly trusting them. The education of the future is a harmonious combination of human pedagogical craftsmanship and artificial intellectual potential.

6. REFERENCES

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