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Technology For Integrating Ai-Based Digital Platforms Into The Training Of Future Computer Science Teachers

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Abstract

The rapid advancement of Artificial Intelligence (AI) is fundamentally transforming the educational landscape, requiring future computer science teachers to possess high levels of digital literacy and technological competence. This paper explores the technology and methodology of utilizing AI-powered digital platforms in the professional preparation of informatics educators. The research focuses on how these platforms—ranging from adaptive learning systems and automated grading tools to AI-driven content generators—can be effectively integrated into the teaching process. The study analyzes the current state of digital platform implementation in higher pedagogical education and identifies the specific skills future teachers need to master to facilitate AI-driven instruction. The proposed technology emphasizes a transition from traditional teaching methods to a more personalized, data-driven approach where AI acts as a co-facilitator. Key components of this technology include the selection of appropriate AI tools, the development of pedagogical scenarios for their use, and the ethical considerations surrounding AI in the classroom. The findings suggest that the structured use of digital platforms not only enhances the technical proficiency of future computer science teachers but also prepares them to create innovative, interactive, and efficient learning environments for the next generation of students.

Keywords: Future computer science teachers, Artificial Intelligence (AI), digital platforms, educational technology, informatics teaching methodology, AI literacy, adaptive learning, pedagogical innovation, ICT competence, digital transformation in education.

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1. Introduction

The global educational landscape is currently undergoing a profound transformation driven by the rapid evolution of digital technologies. At the heart of this revolution is Artificial Intelligence (AI), which is no longer a futuristic concept but a functional reality reshaping how knowledge is produced, shared, and evaluated. In the context of 21st-century education, the role of the teacher is shifting from being the sole provider of information to becoming a facilitator of digital learning. This shift is particularly critical for future computer science (informatics) teachers, who are expected to be the pioneers and primary implementers of these technological advancements in schools.

As educational institutions increasingly adopt digital transformation strategies, the integration of AI-based digital platforms into pedagogical processes has become a necessity. These platforms—including adaptive learning systems, intelligent tutoring systems (ITS), and AI-driven analytics tools—offer unprecedented

opportunities for personalizing education. For future computer science teachers, mastering these tools is not just about technical proficiency; it is about developing a new "pedagogical-technological" mindset. They must understand not only how AI works but also how to ethically and effectively use it to enhance student engagement, automate administrative burdens like grading, and provide real-time feedback to diverse learners.

Despite the clear benefits of AI in education (AIEd), there remains a significant gap in the structured training of future informatics teachers. Many current teacher-training programs still rely on traditional ICT methodologies that do not fully encompass the nuances of machine learning, neural networks, or AI-integrated digital platforms. There is a pressing need for a specialized "technology"—a systematic set of methods and tools—that guides how these future educators should be trained to use AI-powered platforms in their future classrooms. Without a clear framework, there is a risk that AI will be used merely as a substitute for traditional tools rather than a transformative force for learning.

The digital platforms available today, such as AI-integrated Learning Management Systems (LMS), automated coding assistants (like GitHub Copilot), and generative AI models (like GPT-4), provide a laboratory for future teachers to experiment with innovative teaching models. For instance, these platforms can simulate classroom environments, generate diverse lesson plans, or even model student behavior to help trainee teachers practice classroom management. However, the successful use of these platforms requires a defined technology of implementation that balances technical skill with pedagogical theory.

This research aims to address these challenges by exploring the technology of using AI-based digital platforms in the professional training of future computer science teachers. It seeks to identify the most effective types of platforms, the necessary competencies that future teachers must acquire, and the methodological approaches required to integrate AI into their vocational training. By establishing a clear technological framework, this study intends to contribute to the modernization of pedagogical education, ensuring that the next generation of informatics teachers is equipped to lead the AI revolution in education effectively and ethically.

2. Methods

Research Design

This study utilized a mixed-methods approach, combining quantitative data from pedagogical experiments with qualitative insights from surveys and observation. The research was conducted in three distinct phases: the diagnostic phase (pre-test), the implementation phase (experimental technology), and the evaluation phase (post-test).

Participants

Experimental Group (EG): Received training based on the proposed technology of integrating AI-based digital platforms.

Control Group (CG): Received traditional ICT training without specific emphasis on AI-driven platforms.

Materials and Digital Platforms

The "Materials" in this research consisted of several types of AI-integrated digital platforms and software tools used to build the pedagogical technology:

Generative AI Platforms: ChatGPT (OpenAI), Google ChatGPT, and Claude for lesson planning and content generation.

Adaptive Learning Systems: Khan Academy (with Khanmigo AI) and specialized Learning Management Systems (LMS) like Moodle with AI plugins.

AI Coding Assistants: GitHub Copilot and Replit AI for teaching programming logic and automated debugging.

AI Assessment Tools: Gradescope and automated feedback systems for evaluating student performance.

Curriculum Materials: Syllabi and instructional modules specifically designed to teach AI ethics, prompt engineering, and digital platform management.

The Experimental Technology (Procedure)

The proposed technology was implemented through a structured four-step algorithm:

Step 1: AI Literacy Training. Students were introduced to the theoretical foundations of AI and the architecture of modern digital platforms.

Step 2: Practical Integration. Students practiced using AI platforms to design interactive informatics lessons, focusing on subject areas like algorithms, data structures, and computer graphics.

Step 3: Micro-teaching Sessions. EG students conducted "micro-teaching" sessions where they acted as facilitators, using AI platforms to provide personalized feedback to their peers.

Step 4: Ethics and Security Analysis. A module dedicated to the ethical use of AI, data privacy on digital platforms, and the prevention of academic dishonesty.

Data Collection and Instruments

To measure the effectiveness of the technology, the following instruments were used:

Pre-test and Post-test: To assess students' theoretical knowledge of AI and their ability to solve informatics-related pedagogical tasks.

ICT Competence Rubric: An observation-based rubric used during practical sessions to evaluate students' technical proficiency with AI tools.

Survey/Questionnaire: A Likert-scale questionnaire to measure students' confidence levels and attitudes toward using AI in their future careers.

Data Analysis

The quantitative data obtained from the tests were analyzed using statistical methods. The Student's t-test was employed to determine the significance of the difference between the pre-test and post-test scores of the experimental group, as well as the difference between the Experimental and Control groups. Qualitative data from the surveys were analyzed through thematic coding to identify common perceptions of AI integration.

3. Conclusion

The integration of Artificial Intelligence (AI) into the educational process is no longer an elective trend but a fundamental necessity for the modernization of pedagogical systems. This research focused on developing and implementing a technology for training future computer science teachers to utilize AI-based digital platforms effectively. The results of the study lead to several significant conclusions regarding the future of informatics teacher training.

Firstly, the research demonstrates that a structured, technological approach to using AI-based platforms—rather than a fragmented or purely technical one—significantly enhances the professional competence of future educators. By moving beyond basic ICT literacy and focusing on AI-specific skills such as prompt engineering, the management of adaptive learning systems, and AI-driven data analytics, students in the experimental group showed a marked improvement in their pedagogical-technological synergy. These future teachers proved more capable of designing interactive and personalized learning environments than those trained under traditional methodologies.

Secondly, the study highlights that AI-based digital platforms serve as a powerful catalyst for personalizing the learning process. For informatics teachers, these tools provide a means to bridge the gap between complex theoretical concepts (such as algorithms or machine learning) and practical application. The technology allows teachers to delegate routine administrative and assessment tasks to AI, thereby focusing more on cognitive support, creative problem-solving, and the individual needs of their students.

Thirdly, the ethical dimension of AI remains a critical component of professional training. The research concludes that a robust pedagogical technology must include modules on data privacy, the bias of algorithms, and the responsible use of generative AI. Preparing future computer science teachers to be ethical leaders in the classroom ensures that the digital transformation of schools remains human-centered and secure.

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