JOURNAL OF INTERNATIONAL SCIENTIFIC RESEARCH
Volume 3, Issue 1, June, 2025 Online ISSN: 3030-3508
https://spaceknowladge.com

CREATION OF A PERSONALIZED LEARNING ENVIRONMENT FOR STUDENTS USING ARTIFICIAL INTELLIGENCE

Sirojiddinov Odiljon Ilxomjonovich [1]
[1] *Chirchiq state pedagogical university*
Pedagogical faculty

ARTICLE INFO

ARTICLE HISTORY:
Received:24.06.2025
Revised: 25.06.2025
Accepted:26.06.2025

KEYWORDS:
Personalized Learning, Artificial Intelligence, Educational Technology, Machine Learning, Adaptive Learning Systems, Natural Language Processing

ABSTRACT:

In education, artificial intelligence (AI) has become a disruptive force, especially in the development of personalized learning environments (PLEs). By adjusting instructional materials, tempo, and evaluation techniques to each student's particular requirements, these systems raise student engagement and academic performance. In this study, the design, implementation, and assessment of an AI-powered PLE that dynamically adapts learning pathways through the use of machine learning (ML) and natural language processing (NLP) techniques are investigated. Over the course of eight weeks, 120 secondary school students participated in a pilot program that compared the AI-based system with a conventional e-learning platform. The results show that the AI-supported group significantly improved in terms of academic performance, learner engagement, and student satisfaction. The paper concludes that AI-driven personalization holds great promise in addressing learning diversity and enhancing educational effectiveness.

INTRODUCTION. Traditional educational systems face a serious challenge from the increasing diversity of student populations and learning requirements. Traditional classroom models frequently take a uniform approach to teaching, ignoring individual differences in cognitive styles, learning speeds, and prior knowledge. Many students consequently lose interest in their studies, lag behind, or fall short of their full potential.

The educational community has increasingly resorted to personalized learning—an instructional strategy that aims to tailor learning experiences to each student's unique needs

and preferences—to overcome these constraints. Giving students more authority over what, how, and how quickly they learn is meant to empower them.

New tools for large-scale personalized learning implementation are provided by recent developments in artificial intelligence (AI). Large volumes of educational data can be analyzed by AI systems, which can also spot trends in student behavior and modify lessons in real time. Real-time feedback generators, adaptive learning platforms, and intelligent tutoring systems have all been made possible by technologies like machine learning (ML), natural language processing (NLP), and recommender systems.

The purpose of this study is to investigate the creation and application of a personalized learning environment driven by AI and evaluate how well it improves student outcomes. In particular, we look into how AI technologies can be combined to build a system that can adjust to each learner in real time and assess how it affects user satisfaction, student engagement, and academic performance.

Methods

Three main elements made up the AI-powered personalized learning environment created for this study:

Learner Profiling Engine: Information about students' past knowledge, preferred methods of learning, accuracy of responses, and interaction style was gathered by this module. A thorough learner profile was created using diagnostic tests and learning analytics, and it was updated often as the student advanced.

Module for Content Adaptation: This module dynamically modified the order, level of difficulty, and presentation of the instructional content according to the learner profile. In order to maximize student satisfaction and knowledge retention, reinforcement learning algorithms were used to optimize the learning path.

Feedback and Assessment System: The system featured an NLP-driven feature that could provide customized feedback in order to promote metacognitive development. This module offered scaffolded explanations and guidance after analyzing students' answers to open-ended questions.

The TensorFlow framework for ML model training was integrated into the Python-based platform. Based on student input, the natural language feedback component produced human-like feedback using OpenAI's GPT-3.5 model. Both computers and tablets could access the web-based user interface.

A total of 120 students aged 13 to 16 from three urban secondary schools were recruited for the study. The participants were randomly assigned to two groups:

Experimental group (n = 60): Students used the AI-powered personalized learning platform.

Control group (n = 60): Students used a standard e-learning system with fixed content and no personalization features.

All participants were exposed to the same curriculum content over an 8-week intervention period, focusing on mathematics and science subjects.

Data were collected through a combination of pre- and post-tests, system usage logs, and student satisfaction surveys. The following metrics were used for evaluation:

Academic Performance: Measured by comparing pre- and post-intervention standardized test scores.

Engagement: Assessed through platform log data, including time spent, content completion rate, and frequency of interactions.

Student Satisfaction: Measured using a 5-point Likert-scale survey that evaluated perceived effectiveness, motivation, and ease of use.

Results

An examination of the experimental group's pre- and post-test results showed a statistically significant improvement. In contrast to the control group, which saw a 7% improvement in test scores, students who used the AI-powered platform saw an average improvement of 17%. The difference between the groups was statistically significant ($p < 0.05$), according to a two-tailed t-test, indicating that the individualized learning environment led to higher academic gains.

Higher levels of engagement were shown by the experimental group's students. According to platform usage logs, students engaged with the content for an average of 38% longer than their counterparts in the control group. Additionally, on average, the experimental group finished 25% more learning modules. These results imply that learner fatigue was decreased and motivation was raised by personalized content.

According to survey results, students in the experimental group were more satisfied. About 87% of students said the AI-powered platform improved their comprehension of the subject matter, compared to 61% of students in the control group. Furthermore, when content was tailored to their needs, 79% of the experimental group reported feeling more motivated to learn.

Discussion

The results of this study demonstrate that AI-powered personalized learning environments can significantly enhance student learning outcomes, engagement, and fulfillment. The adaptive nature of the system allowed students to proceed at their own pace, receive targeted feedback, and engage with content suited to their individual learning paths. The AI system's capacity to deliver context-sensitive, real-time feedback was one of its main advantages. The platform was able to replicate one-on-one tutoring—a method frequently associated with better educational outcomes—by utilizing natural language processing (NLP) algorithms.

But there are also a number of issues with the use of AI in education. It is necessary to address the ethical issues of data privacy, algorithmic decision-making transparency, and

equitable access. For educators to successfully incorporate AI tools into their teaching practices, professional development is also necessary.

Long-term research is also required to evaluate the sustainability of AI-assisted learning and its wider effects on academic paths, even though this study concentrated on short-term learning gains.

Conclusion

Through customized learning environments, this study demonstrates how artificial intelligence has the potential to revolutionize educational practice. We developed a system that can modify instruction in real time to accommodate each student's needs by utilizing machine learning and natural language processing. The efficacy of this strategy is supported by the favorable results in user satisfaction, engagement, and academic performance.

The incorporation of AI into education presents exciting prospects for enhancing student outcomes as the technology develops. The practical and ethical difficulties in scaling these technologies, however, must be carefully considered. Expanding subject coverage, incorporating teacher input, and assessing long-term effects should be the main goals of future research.

References:

1. Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*. Boston, MA: Center for Curriculum Redesign.
2. Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16(1), 1–27.
3. Woolf, B. P. (2020). *AI in Education: An Overview*. In Spector, J. M. (Ed.), *The SAGE Encyclopedia of Educational Technology* (pp. 34–42). Sage.
4. Chen, C. M., & Li, Y. L. (2010). Personalised context-aware ubiquitous learning system for supporting effective English vocabulary learning. *Interactive Learning Environments*, 18(4), 341–364.
5. Baker, R. S. J. d., & Inventado, P. S. (2014). Educational data mining and learning analytics. In *Learning Analytics* (pp. 61–75). Springer.