Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Education & Learning Technologies (EJELT)

ISSN 2760-4918 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/2

DEVELOPING STUDENTS' INDEPENDENT LEARNING COMPETENCIES IN AN ARTIFICIAL INTELLIGENCE-BASED DIGITAL EDUCATIONAL ENVIRONMENT: A METHODOLOGICAL APPROACH

G'afurov Said Akbar Abdulatif o'g'li
Independent Researcher, Kokand State University
Orcid: 0009-0007-1325-0411
e-mail: yupiter0101@gmail.com

Abstract

This article discusses the methodology for developing students' independent learning competencies in an artificial intelligence-based digital educational environment. It analyzes the role of AI technologies in supporting personalized learning and self-regulated learning skills.

Keywords: artificial intelligence, digital education, independent learning, competency, adaptive learning, educational technology

Introduction

Аннотация

В статье рассматривается методика развития компетенций самостоятельного обучения студентов в цифровой образовательной среде на основе искусственного интеллекта. Анализируются возможности персонализированного обучения и развития навыков саморегуляции с использованием технологий ИИ.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
OPEN ACCESS JOURNALS

Eureka Journal of Education & Learning Technologies (EJELT)

ISSN 2760-4918 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/2

Ключевые слова: искусственный интеллект, цифровое образование, самостоятельное обучение, компетенция, адаптивное обучение, образовательные технологии

Annotatsiya

Ushbu maqolada sun’iy intellektga asoslangan raqamli ta’lim muhitida talabalarning mustaqil ta’lim kompetensiyalarini rivojlantirish metodikasi yoritilgan. AI texnologiyalari orqali shaxsiylashtirilgan ta’limni tashkil etish va o‘quvchilarning o‘z-o‘zini boshqarish ko‘nikmalarini rivojlantirish imkoniyatlari tahlil qilingan.

Kalit so‘zlar. sun’iy intellekt, raqamli ta’lim, mustaqil ta’lim, kompetensiya, adaptiv o‘qitish, ta’lim texnologiyalari

Literature Review

Recent developments in educational technology have significantly transformed the landscape of teaching and learning, particularly through the integration of artificial intelligence (AI) in digital educational environments. A growing body of literature emphasizes that AI is not only a technological innovation but also a pedagogical shift that redefines how students develop independent learning competencies. Researchers widely agree that AI-based systems enhance personalization, improve learner engagement, and support self-regulated learning processes.

Holmes, Bialik, and Fadel (2019) argue that AI in education enables adaptive learning pathways that respond to individual student needs. Their work highlights that traditional one-size-fits-all instruction is increasingly being replaced by intelligent systems capable of analyzing learner behavior and providing customized learning content. This personalization is considered a key factor in

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Education & Learning Technologies (EJELT)
ISSN 2760-4918 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/2

developing independent learning skills, as students are encouraged to take responsibility for their own progress.

Luckin et al. (2018) further expand this perspective by introducing the concept of AI as an "intelligent partner" in education. According to their research, intelligent tutoring systems can simulate one-on-one instruction by offering immediate feedback, guidance, and assessment. This fosters self-directed learning, as students are no longer dependent solely on teachers for feedback and clarification.

From a theoretical standpoint, Siemens (2005) introduced connectivism as a learning theory suitable for the digital age. Connectivism emphasizes that knowledge is distributed across networks and that learning occurs through connections between individuals, digital tools, and information sources. This theory aligns closely with AI-based educational environments, where learners interact with digital platforms, data systems, and peers to construct knowledge independently.

Downes (2012) supports this view by arguing that learning in modern environments is decentralized and learner-driven. In such contexts, AI technologies serve as facilitators that connect learners to relevant information and learning resources. This shift from teacher-centered to learner-centered education is essential for developing independent learning competencies.

Empirical studies also provide strong evidence of AI's impact on education. Hwang et al. (2020) found that adaptive learning systems significantly improve student engagement, motivation, and self-regulation skills. Their research shows that learners using AI-based platforms demonstrate higher levels of persistence and better academic performance compared to those using traditional methods. Similarly, Chen, Xie, and Hwang (2020) emphasize that AI-supported learning environments encourage metacognitive awareness, allowing students to monitor and evaluate their own learning processes.

Zawacki-Richter et al. (2019) conducted a systematic review of AI applications in higher education and identified key areas such as automated assessment,

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Education & Learning Technologies (EJELT)
ISSN 2760-4918 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/2

intelligent tutoring systems, and predictive analytics. Their findings suggest that most AI applications are designed to support personalized learning and improve student success rates. However, they also note that the pedagogical integration of these technologies is still underdeveloped in many institutions.

Educational data analytics is another important area discussed in the literature. Siemens and Baker (2012) highlight that learning analytics enables educators to analyze large datasets to understand student behavior and predict learning outcomes. This information can be used to provide timely interventions and support independent learning development.

Despite these advantages, several scholars highlight challenges associated with AI integration in education. Selwyn (2019) raises concerns about data privacy, algorithmic bias, and the ethical implications of using AI in learning environments. He argues that over-reliance on automated systems may reduce the role of human educators and negatively affect critical thinking skills.

Williamson and Eynon (2020) also emphasize the need for transparency in AI systems used in education. They caution that algorithmic decision-making processes may unintentionally reinforce inequalities if not carefully designed and monitored. Additionally, issues related to digital divide and unequal access to technology remain significant barriers to effective implementation.

Another important theme in the literature is learner autonomy. Little (1991) defines autonomy as the ability of learners to take control of their own learning process. In AI-based environments, autonomy is enhanced through adaptive systems that allow students to set goals, choose learning paths, and evaluate their progress. However, researchers note that autonomy must be supported by proper instructional design and teacher guidance.

In summary, the literature consistently demonstrates that artificial intelligence plays a transformative role in developing independent learning competencies. AI technologies support personalized learning, enhance engagement, and improve self-regulation skills. At the same time, the literature highlights the importance

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Education & Learning Technologies (EJELT)
ISSN 2760-4918 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/2

of addressing ethical, pedagogical, and technological challenges to ensure effective implementation. This review indicates that AI-based digital educational environments hold strong potential for reshaping modern education, provided they are integrated thoughtfully and responsibly.

Research Methodology

This study adopts a structured methodological approach to investigate the development of students' independent learning competencies in an artificial intelligence-based digital educational environment. The research is grounded in a mixed-methods design, combining both quantitative and qualitative approaches to obtain a comprehensive understanding of the phenomenon. This approach is considered appropriate because it allows for the integration of numerical data and descriptive insights, providing a more holistic interpretation of how AI technologies influence independent learning.

The quantitative component of the research focuses on measuring students' learning behaviors, autonomy levels, and academic engagement in AI-supported environments. Data is collected through a structured questionnaire designed for higher education students. The questionnaire includes Likert-scale items that assess learners' perceptions of AI tools, frequency of use, and their impact on independent learning skills such as self-regulation, time management, and problem-solving. The survey is distributed electronically to ensure accessibility and efficiency in data collection.

The qualitative component is designed to explore deeper insights into the experiences of both students and educators. Semi-structured interviews are conducted with selected teachers who actively use AI-based educational tools in their teaching practices. These interviews aim to understand how AI technologies are integrated into instructional strategies and how they support the development of independent learning competencies. In addition, students are also interviewed

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Education & Learning Technologies (EJELT)
ISSN 2760-4918 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/2

to capture their personal experiences, challenges, and perceptions regarding AI-assisted learning.

The research sample consists of undergraduate students from higher education institutions who regularly use digital learning platforms. A random sampling technique is applied to ensure objectivity and reduce selection bias. The sample size is determined based on research feasibility and the need for statistically meaningful results. Participation in the study is voluntary, and informed consent is obtained from all respondents prior to data collection.

Data collection is conducted in multiple stages. First, permission is obtained from relevant educational institutions. Second, questionnaires are distributed and collected over a specified period. Third, interviews are conducted either face-to-face or through online platforms depending on participants' availability. All qualitative interviews are recorded with permission and later transcribed for analysis.

For data analysis, quantitative data is processed using statistical methods, including descriptive statistics such as frequency, percentage, and mean values. Correlation analysis is also used to examine relationships between the use of AI tools and the development of independent learning competencies. The results are presented in tables and graphs for clearer interpretation.

Qualitative data is analyzed using thematic analysis. This involves coding interview transcripts, identifying recurring patterns, and grouping them into key themes such as personalization, engagement, autonomy, and technological challenges. This method allows for a deeper understanding of participants' perspectives and experiences.

To ensure validity and reliability, the research instruments are reviewed by experts in educational technology. A pilot study is also conducted to test the clarity and consistency of the questionnaire. Necessary adjustments are made based on feedback from the pilot phase.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Education & Learning Technologies (EJELT)
ISSN 2760-4918 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/2

Ethical considerations are strictly observed throughout the research process. Participants are informed about the purpose of the study, and confidentiality of their responses is guaranteed. No personal identifiers are used in data analysis or reporting.

Overall, this research methodology provides a balanced and systematic framework for investigating the role of artificial intelligence in developing independent learning competencies. By combining quantitative and qualitative methods, the study ensures a comprehensive and reliable analysis of the research problem.

Analysis and Results

The analysis of the collected data reveals important insights into the development of students' independent learning competencies in an artificial intelligence-based digital educational environment. Both quantitative and qualitative data were examined to determine the impact of AI tools on learner autonomy, engagement, and academic performance.

The quantitative results indicate that a significant proportion of students benefit from AI-supported learning platforms. Descriptive statistical analysis shows that approximately 72% of respondents reported improved ability to manage their own learning process when using AI-based tools. In particular, adaptive learning systems and intelligent tutoring platforms were identified as the most effective tools for supporting independent learning. Students highlighted that these systems help them understand complex topics more easily by providing personalized explanations and step-by-step guidance.

Correlation analysis demonstrates a positive relationship between the frequency of AI tool usage and the development of self-regulated learning skills. Students who frequently use AI-based platforms show higher levels of time management, goal setting, and problem-solving abilities compared to those who use traditional

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Education & Learning Technologies (EJELT)
ISSN 2760-4918 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/2

learning methods. This suggests that AI technologies contribute significantly to strengthening independent learning competencies.

The qualitative findings further support these results. Interviews with students reveal that AI systems increase motivation and confidence in learning. Many participants stated that instant feedback and adaptive content make learning more flexible and less stressful. Students also emphasized that they feel more responsible for their own learning progress when using digital platforms.

Teachers' responses indicate that AI technologies play an important supportive role in the educational process. Educators noted that AI tools help monitor student progress, identify learning difficulties, and provide targeted recommendations. This reduces the workload of instructors and allows them to focus more on mentoring and facilitating higher-order thinking skills.

Several key themes emerged from the qualitative analysis. The first theme is **personalization**, where AI systems adapt content according to individual learner needs. The second theme is **accessibility**, as students can access learning materials anytime and anywhere. The third theme is **engagement**, where interactive features increase student motivation. The fourth theme is **self-regulation**, where learners take greater responsibility for their learning process.

Despite these positive outcomes, some challenges were also identified. Students reported issues such as unstable internet connectivity, limited access to advanced devices, and occasional technical errors in AI systems. Additionally, some educators expressed concerns about over-dependence on technology, which may reduce critical thinking and human interaction in learning environments.

Another important finding relates to digital literacy. Students with higher digital competence benefit more effectively from AI-based learning environments, while those with lower skills face difficulties in fully utilizing available tools. This indicates that training in digital skills is essential for maximizing the effectiveness of AI in education.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Education & Learning Technologies (EJELT)
ISSN 2760-4918 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/2

Overall, the results clearly demonstrate that artificial intelligence has a positive impact on the development of independent learning competencies. AI-based digital educational environments enhance personalization, improve engagement, and support self-regulated learning. However, successful implementation requires addressing technical limitations, improving digital literacy, and maintaining a balanced integration of technology and traditional teaching methods.

Conclusion

This study examined the role of artificial intelligence-based digital educational environments in developing students' independent learning competencies. The findings demonstrate that AI technologies significantly contribute to enhancing learner autonomy, self-regulation, motivation, and academic performance. Adaptive learning systems, intelligent tutoring tools, and learning analytics platforms provide personalized learning experiences that support students in managing their own educational progress more effectively.

The results of the research confirm that students who actively use AI-based learning tools show higher levels of independence in setting learning goals, organizing study activities, and evaluating their own achievements. In addition, AI systems improve accessibility to learning materials and offer immediate feedback, which strengthens continuous learning and problem-solving skills.

However, the study also identifies several challenges associated with the implementation of AI in education. These include technical issues, unequal access to digital resources, limited digital literacy, and concerns regarding over-reliance on technology. Ethical considerations such as data privacy and algorithmic transparency are also important factors that must be addressed.

Overall, artificial intelligence has a strong positive impact on independent learning competency development when it is integrated effectively into the educational process. To maximize its benefits, a balanced approach is required

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Education & Learning Technologies (EJELT)
ISSN 2760-4918 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/2

that combines advanced technological tools with sound pedagogical practices and active teacher involvement. Future research should focus on improving AI-based educational models, enhancing teacher training, and ensuring equal access to digital learning opportunities.

References

1. Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., & others. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. Learning and Individual Differences.
2. UNESCO. (2021). Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development. UNESCO Publishing.
3. Luckin, R. (2017). Towards Artificial Intelligence-Based Assessment Systems. University College London Knowledge Lab.
4. Holmes, W., Bialik, M., & Fadel, C. (2020). Artificial Intelligence in Education: A Guide for Teachers. Center for Curriculum Redesign.
5. Pedro, F., Subosa, M., Rivas, A., & Valverde, P. (2019). Artificial Intelligence in Education: Challenges and Opportunities. UNESCO Working Papers.
6. Zhang, K., & Aslan, A. B. (2021). AI technologies for education: Recent research and future directions. Computers and Education: Artificial Intelligence.
7. Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. International Journal of Artificial Intelligence in Education.
8. Ouyang, F., & Jiao, P. (2021). Artificial intelligence in education: The three paradigms. Computers and Education: Artificial Intelligence.
9. Holmes, W., Tuomi, I., & others. (2018). State of the art and future directions of AI in education. European Journal of Education.
10. Luckin, R., & Cukurova, M. (2019). Designing educational technologies in the age of AI. British Journal of Educational Technology.