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Optimizing economics education evaluation through a balance of real-time feedback and artificial intelligence

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ABSTRACT

This study examines the optimization of educational evaluation through the integration of real-time feedback and artificial intelligence (AI). A descriptive-analytical literature review was conducted by analyzing recent and relevant scholarly publications. The novelty of this study lies in proposing a balanced approach that integrates AI-driven automated evaluation with the pedagogical role of educators in delivering meaningful feedback. The findings indicate that AI enables adaptive, personalized, and real-time feedback, enhancing student engagement and learning responsiveness. However, its effectiveness depends on integration with human-centered pedagogical practices that promote reflection, critical thinking, and adaptive learning. The study further demonstrates that feedback quality, students' adaptive learning capacity, and learning outcomes are dynamically interconnected and mutually reinforcing. Based on these findings, the study proposes a conceptual framework for balancing AI-based assessment with human feedback in educational evaluation. The framework highlights the complementary roles of technological efficiency and pedagogical judgment in supporting meaningful learning. Practically, the findings underscore the importance of adopting blended assessment approaches and strengthening educators' assessment literacy. Future research should empirically validate the proposed framework across diverse educational contexts and authentic learning environments.

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Introduction

Evaluation plays a crucial role in economics education, not only as a tool for measuring students' conceptual understanding but also as a mechanism for assessing their analytical skills and ability to apply economic principles in real-world contexts (Putri, 2025). In preparing students to face the challenges of the global economy, it is essential for educators to ensure that the evaluation methods employed are both effective and aligned with curriculum objectives. Effective evaluation enables educators to identify students' learning difficulties, thereby creating opportunities to adjust instructional strategies and curriculum implementation according to students' needs and learning backgrounds.

Within the implementation of Indonesia's Merdeka Curriculum, formative and summative assessments play complementary roles in ensuring the achievement of expected competencies (Malikah et al., 2024). Formative assessment, conducted throughout the learning process, enables educators to identify learning difficulties at an early stage and provide timely interventions. In contrast, summative assessment, typically administered at the end of a learning period, measures students' overall achievement of the intended learning outcomes. Together, these forms of assessment contribute to a comprehensive evaluation system that supports learning quality and prepares students to meet the demands of an increasingly complex global economy.

Feedback is an integral component of an effective learning process, serving as a bridge between educators and students in a continuous cycle of improvement (Seo et al., 2025). Constructive and timely feedback not only informs students about their academic performance but also encourages them to reflect on their progress and identify areas requiring further improvement (Putri et al., 2025). In economics education, effective feedback helps students understand complex concepts and develop essential problem-solving skills (Rusdi & Cahyani, 2025). Through meaningful feedback, students not only recognize their mistakes but also learn strategies to correct them, which is fundamental to applied learning. This process enhances students' self-confidence and increases their engagement with the learning materials. Consequently, feedback should be viewed not merely as an evaluative tool but as an essential component of an active and dynamic learning process that positively influences students' academic performance (Putri & Yulhendri, 2025).

Artificial Intelligence (AI) has emerged as an innovative solution in modern education, offering significant potential to transform both assessment practices and the delivery of feedback to students (Harefa & Harefa, 2025). Through advanced data analysis, AI can provide personalized, adaptive, and real-time feedback while adjusting instructional materials to meet individual learning needs (Fauziddin et al., 2025). In today's digital era, technological competence has become an essential educational outcome that should be cultivated among students.

The integration of AI not only improves instructional efficiency but also equips students with digital competencies required for future careers (Wardah et al., 2025). By leveraging AI technologies, educators can create more inclusive, responsive, and learner-centered educational environments that support students' academic development in a rapidly evolving labor market. In economics education, AI provides opportunities for students to better understand dynamic economic concepts and adapt to changing economic conditions (Nurcahyani et al., 2024). Furthermore, AI facilitates the analysis of complex economic issues through personalized learning

experiences, enabling students to develop higher-order thinking skills.

Despite its considerable potential, the implementation of AI in educational assessment also raises important ethical concerns that require careful consideration (Ansya & Salsabilla, 2025). Data privacy and fairness in the use of student information are among the key issues that must be addressed. The use of student data for AI-based analysis requires robust policies and governance frameworks to protect personal information, ensure ethical data practices, and minimize potential bias in algorithmic decision-making (Hanila & Alghaffaru, 2023).

This article aims to examine how educational evaluation in economics education can be optimized by achieving an appropriate balance between real-time feedback and Artificial Intelligence. By integrating adaptive feedback with AI-supported assessment, economics education is expected to become more effective, responsive, and relevant in preparing students to face the challenges of the global economy and the rapidly changing world of work. Ultimately, this study seeks to contribute to the development of more effective and sustainable teaching and assessment practices in economics education.

Method

This study employed a literature review as its research method. A literature review is a qualitative research approach that focuses on collecting and analyzing data from published sources available in libraries and digital databases. These sources include books, scholarly journals, scientific articles, and other relevant documents used to obtain research data and information. All data analyzed in this study were secondary data that had previously been published by other researchers or institutions (Snyder, 2019). The primary objective of a literature review is to provide a comprehensive understanding of the phenomenon under investigation through systematic analysis and interpretation of existing knowledge (Abdurrahman, 2024).

The selection of the literature review method was based on the objective of this study, namely to conceptually examine how the balance between real-time feedback and Artificial Intelligence (AI) can optimize assessment in economics education. This research method is consistent with the literature review guidelines proposed by Sari and Asmendri for educational research (Sari & Asmendri, 2020), as well as subsequent recommendations regarding effective and systematic literature review procedures (Jaya et al., 2023).

The study began by defining the research topic, namely "Optimizing Assessment in Economics Education Through a Balance of Real-Time Feedback and Artificial Intelligence." Relevant literature was then collected from Google Scholar, Scopus, ScienceDirect, Garuda, and other academic journal databases. The search was limited to publications published between 2017 and 2026 in order to ensure the relevance and novelty of the reviewed literature.

The initial collection of articles was screened according to the following inclusion criteria: (1) the study addressed topics relevant to the research objectives; (2) the full text was accessible; and (3) the article was published in a reputable academic journal. The selected literature was subsequently analyzed critically by identifying the main concepts, key findings, and relationships among the variables discussed in previous studies. The analysis employed a descriptive analytical approach, followed by the synthesis of the findings to develop a conceptual framework describing how the integration of real-time feedback and Artificial Intelligence can optimize

assessment practices in economics education. This systematic procedure enabled the researchers to develop a comprehensive understanding of the topic while providing relevant conceptual recommendations for educational practice.

Results and Discussion

The concept of evaluation in economics education

Evaluation in economics education is a systematic process for measuring students' understanding of economic concepts and assessing the effectiveness of instructional practices. This process enables educators to evaluate not only students' learning outcomes but also the effectiveness of the teaching strategies employed (Wijaya et al., 2025).

A holistic evaluation approach provides comprehensive insights into students' strengths and weaknesses while fostering the development of analytical skills that are essential in economics. When designed and implemented effectively, evaluation serves as a valuable tool for preparing students to address real-world economic challenges and meet the demands of the contemporary labor market (Slamet, 2020).

Feedback theory in learning

Feedback theory serves as a bridge between teaching and learning by providing students with the information they need to identify their strengths and address their weaknesses. Positive feedback motivates students to continue improving, whereas corrective feedback helps them recognize errors and identify appropriate strategies for improvement (Oktavia & Suseno, 2024). Feedback is an essential component of the learning process because it enhances students' learning experiences and helps reduce the gap between their current performance and desired learning outcomes. Effective feedback promotes good learning practices and encourages students to achieve higher levels of academic performance. Nevertheless, many students report that the feedback they receive is either infrequent or insufficient to support meaningful learning (Burgess et al., 2020). In the context of economics education, effective feedback strengthens students' understanding of complex economic concepts while simultaneously improving their problem-solving abilities (Resnandari et al., 2024).

Several learning theories further emphasize the importance of feedback in the educational process. According to the constructivist perspective, knowledge is actively constructed through interactions with peers, the community, and the surrounding environment (Harasim, 2017). Consequently, feedback plays a fundamental role by encouraging students to reflect on their learning experiences and reconstruct their understanding through continuous interaction and reflection.

Bandura's social learning theory (Warini et al., 2023) highlights the importance of observation and social interaction, suggesting that feedback provided by teachers and peers can enhance students' motivation, engagement, and learning performance. Social Learning Theory (SLT) is widely regarded as a bridge between traditional behaviorist learning theories and cognitive learning theories. While cognitive learning theory explains learning through internal mental processes, behaviorism emphasizes observable behavioral changes resulting from reinforcement and repetition. By integrating these perspectives, SLT provides a comprehensive framework for understanding how feedback influences both cognitive development and observable learning behaviors.

Similarly, Zimmerman's theory of self-regulated learning (Theobald & Brod, 2025) suggests that feedback enables students to monitor their learning progress, regulate their learning strategies, and make necessary adjustments throughout the learning process. Feedback also enhances students' self-confidence and improves their ability to evaluate their own performance accurately. Students who receive timely and meaningful feedback tend to demonstrate greater accuracy in self-assessment than those who receive little or no feedback. Collectively, these theoretical perspectives underscore the central role of feedback in effective educational evaluation.

Real-time feedback in economics education

Real-time feedback plays a crucial role in economics education by enabling students to identify correct responses and recognize areas requiring improvement immediately, thereby preventing misconceptions from developing. Previous studies have shown that immediate feedback increases students' motivation and engagement because it provides continuous guidance and reinforces their learning progress. Consequently, students become more active in solving problems, more willing to explore alternative solutions, and better able to understand complex economic concepts, ultimately leading to improved learning outcomes (Wardani & Amala, 2025).

The integration of digital learning platforms has further enhanced the implementation of real-time feedback by facilitating direct interaction between educators and students while reducing learning gaps. Technology also improves the accuracy and consistency of assessment by applying standardized evaluation criteria and enabling the digital administration of assignments and examinations, thereby reducing teachers' administrative workload. Furthermore, technology enables rapid and personalized feedback that helps students recognize their strengths and weaknesses more effectively. Online assessment systems can be designed to generate individualized feedback and provide targeted guidance as students progress through the learning process (Saba, 2024).

Despite these advantages, several challenges remain in implementing real-time feedback effectively. Limited access to digital technology and varying levels of digital literacy among both teachers and students continue to hinder the optimal use of technology-supported feedback systems. Although information literacy enables students to manage and utilize diverse information resources more effectively, implementation challenges persist. These include the need for additional professional development to strengthen teachers' pedagogical competence and digital technology skills, as well as technical issues that may disrupt the teaching and learning process (Setiawan, 2024).

AI-based evaluation system transformation

Artificial Intelligence (AI) plays a strategic role in transforming educational evaluation systems from conventional, outcome-oriented approaches into formative, continuous, and data-driven assessment models. In modern educational evaluation, AI enables automated assessment processes while maintaining accuracy, objectivity, and consistency, thereby reducing assessor subjectivity and teachers' administrative workload (Resnandari et al., 2024). Through the analysis of large-scale educational data, AI can identify students' error patterns, levels of competency mastery, and both individual and collective learning progress, which are often difficult to detect through conventional

assessment methods. Furthermore, AI supports the implementation of assessment for learning, in which evaluation results are used not only to assign grades but also to inform pedagogical decisions, such as adapting instructional strategies, providing remedial instruction, and designing enrichment activities.

Research conducted by (Resnandari et al., 2024) demonstrates that AI-based feedback systems significantly improve students' learning outcomes by providing immediate and specific corrective information. As a result, conceptual misunderstandings can be addressed promptly without requiring direct intervention from educators. These findings indicate that AI should not be viewed merely as a technological tool but as a pedagogical instrument capable of simultaneously enhancing the quality of both educational assessment and learning.

Technology and algorithms in ai-based feedback

AI technologies used in educational assessment primarily incorporate Machine Learning (ML) and Natural Language Processing (NLP), enabling systems to understand, analyze, and interpret students' responses, including written text and answer patterns (Seo et al., 2025).

Data collection and analysis

AI systems collect various forms of student learning data, including response times, patterns of errors, learning behaviors, and individual learning preferences. These data are subsequently analyzed using machine learning techniques to generate personalized feedback and identify students' learning needs.

Personalized feedback

Based on individual learner characteristics, AI can provide targeted recommendations for improvement. For example, AI may identify sections of an essay requiring revision, highlight concepts that students have not yet mastered, or recommend appropriate learning resources. Such individualized feedback is considerably more effective than conventional generalized assessment.

Core algorithms

Machine Learning (ML) is employed to identify learning patterns from large educational datasets and continuously improve prediction accuracy through experience. Natural Language Processing (NLP) enables AI systems to understand students' written responses and generate context-sensitive feedback. Deep Learning utilizes multilayer neural networks to model complex relationships among learning variables, thereby improving the accuracy andsophistication ofeducational assessment.

Implementation of AI in economics education

The adoption of Artificial Intelligence (AI) in education has increased substantially in Indonesia as a result of rapid technological advancement. AI has transformed educational practices by improving the efficiency and accuracy of educational assessment while contributing to the modernization of Indonesia's education system (Seo et al., 2025). In economics education, AI has introduced a significant paradigm shift from traditional evaluation toward more adaptive, data-driven, and inclusive assessment practices, particularly following the acceleration of digital learning after the COVID-19 pandemic.

Conceptually, AI utilizes Machine Learning, Deep Learning, and Generative AI algorithms to analyze large volumes of educational data obtained from multiple learning sources, including adaptive tests, gamified quizzes, virtual economic simulations, and records of students' interactions within digital learning environments. These technologies generate accurate, real-time, and predictive assessments that support personalized learning experiences. For example, AI-based Intelligent Tutoring Systems (ITS) can dynamically adjust the difficulty level of assessment questions according to students' responses on contemporary economics topics, such as the circular economy, the impact of AI on the labor market, and crypto-assets, thereby facilitating individualized learning pathways (Kadek et al., 2025).

Natural Language Processing (NLP) and Large Language Models (LLMs), such as GPT-4, further enable the automated evaluation of students' essays on fiscal policy analysis or reports concerning the impact of climate change on the MSME sector. These technologies achieve high levels of assessment accuracy while also supporting plagiarism detection and evaluating the originality of students' economic reasoning (Erlansyah et al., 2024). Furthermore, in vocational and higher education, AI facilitates assessment through Augmented Reality (AR) and blockchain technologies for credential verification. Students can participate in simulations of international trade or investment portfolio management, while AI evaluates their decision-making based on rationality, risk management, and business ethics. Evidence from Southeast Asia indicates that AI-driven feedback contributes to average improvements of 18–25% in students' academic performance in economics courses (Geraldina et al., 2024).

Overall, the integration of AI into economics education assessment not only enriches students' learning experiences but also equips future graduates with the competencies required to respond to global economic disruption, including developments related to Web3 technologies and the Sustainable Development Goals (SDGs) (Trisnani et al., 2025).

AI-powered conversational agents, particularly ChatGPT, also demonstrate considerable potential for supporting the teaching of economics and mathematical economics in higher education. These technologies provide interactive, real-time assistance, facilitate guided problem-solving, and deliver personalized learning experiences. ChatGPT can explain abstract concepts, guide students through mathematical procedures such as supply-and-demand equilibrium analysis and systems of linear equations, and simulate authentic economic scenarios. Consequently, AI enables students to become more actively engaged in the learning process while helping them connect theoretical knowledge with practical economic applications (Choustoulakis, 2024).

The application of AI in economics education

The application of Artificial Intelligence (AI) in economics education demonstrates significant potential for improving the quality of assessment while enhancing students' analytical and argumentative thinking skills (Nurcahyani et al., 2024). The study examined the use of Large Language Models (LLMs) as automated feedback tools for economics essay assignments in higher education. AI-generated feedback based on standardized assessment rubrics was subsequently evaluated by teaching assistants. The findings indicate that AI-

generated feedback is relevant, consistent, and effective in identifying the strengths and weaknesses of students' economic arguments, particularly in terms of causal reasoning, the application of economic concepts, and analytical coherence.

Importantly, the study emphasizes that AI should not replace the role of educators but instead function as an evaluative assistant that accelerates the assessment process, allowing instructors to focus on conceptual understanding and reflective learning. In secondary school economics education, a similar approach can be implemented to assess higher-order thinking skills (HOTS), case analyses, and project-based assignments, thereby encouraging students to develop critical and reflective thinking rather than merely memorizing theoretical concepts (Yulianti et al., 2023).

Balance between real-time feedback and AI

Blended assessment strategy

Achieving an effective balance between educational technology, feedback provision, and students' active participation requires carefully designed pedagogical strategies that are aligned with instructional objectives. One of the most effective approaches is blended assessment, which combines technology-supported automated assessment with qualitative evaluation conducted by educators. This approach enables the efficient processing of learning data while preserving the humanistic dimensions of education, including empathy, contextual understanding, and the evaluation of critical thinking skills (Yulianti et al., 2023). Furthermore, self-directed learning provides an important theoretical foundation for implementing learning strategies that encourage deeper learning and contribute to improved academic achievement.

A balanced assessment system can also be achieved by clearly defining the role of technology. Digital assessment systems should function as decision-support tools rather than as the sole determinants of students' learning outcomes. Equally important is strengthening assessment literacy among both educators and students so that feedback is understood as a mechanism for reflection and continuous improvement rather than merely as a means of identifying errors. Consequently, an effective balance is established when technology, pedagogy, and students' active participation complement one another within an integrated learning ecosystem (Saba, 2024).

The implementation of blended assessment should be accompanied by a humanized learning approach to ensure that the integration of AI into educational evaluation does not diminish the reflective, social, and humanistic dimensions of learning. In economics education, AI can manage repetitive and analytical tasks, such as content personalization and automated assessment, while educators remain responsible for facilitating group discussions, providing emotional support, and encouraging ethical reflection. This combination promotes students' holistic development, particularly in understanding economic issues that involve complex human behavior, such as irrational consumer decision-making and ethical dilemmas in business (Topali et al., 2025).

Students can also benefit from flexible learning environments through AI-integrated digital platforms, such as Zoom or Moodle equipped with intelligent chatbots, combined with face-to-face learning sessions. In these settings, AI can provide real-time market simulations using data from institutions such as Statistics Indonesia (BPS) or the World Bank, while teachers facilitate classroom discussions on topics including

income distribution, economic inequality, and fuel subsidy policies (Hediansah & Surjono, 2020).

The implementation of AI-supported learning environments involves several key components. First, adaptive learning systems, such as DreamBox and Century Tech, provide immediate feedback whenever students make conceptual errors. For example, when students incorrectly calculate the price elasticity of demand, the system instantly displays visual explanations and corrective suggestions, thereby improving conceptual mastery by up to 35% (Deng et al., 2023). Second, human-centered learning is enhanced through AI-assisted feedback systems capable of analyzing voice sentiment or facial expressions via webcams to detect frustration or confusion. These signals enable teachers to provide timely emotional support, particularly when students are discussing sensitive economic topics such as poverty or corruption.

Third, within hybrid learning environments, Internet of Things (IoT)-enabled technologies, including smart whiteboards, facilitate real-time collaboration by allowing AI to evaluate group participation in sustainable economic projects and provide immediate team-based assessments, while teachers guide reflective classroom discussions. In Indonesia, educational platforms such as Ruangguru and Zenius have begun implementing these features to support the Merdeka Curriculum by providing real-time feedback on topics such as the digital economy, MSMEs, and the impact of AI on employment, with the goal of supporting the majority of hybrid economics classrooms by 2025 (Wibowo et al., 2023).

Real-time AI-generated feedback accelerates the learning cycle by enabling students to experiment with economic and econometric models without fear of failure, while human-centered instructional practices continue to foster resilience, ethical decision-making, and responsible problem-solving in complex financial scenarios (Holmes & Miao, 2023). UNESCO research (2023) reported a 40% increase in student engagement and a 28% improvement in long-term knowledge retention in hybrid learning environments that incorporated immediate feedback.

In addition, AI-supported feedback contributes to more inclusive education through multilingual feedback and improved accessibility for students with disabilities, thereby reducing educational disparities in remote and underdeveloped regions. Nevertheless, several challenges remain, including technological latency caused by limited internet connectivity, the risk of information overload, and ethical concerns such as algorithmic bias in economic assessment. Addressing these issues requires comprehensive policy frameworks, including AI ethics guidelines and continuous professional development for teachers responsible for facilitating hybrid learning environments (Zawacki-Richter et al., 2025).

Looking ahead, the integration of edge computing, zero-latency feedback systems, and collaborative metaverse technologies is expected to further transform economics education into a more immersive, personalized, and data-driven learning experience, as envisioned in the National Digital Education Strategy 2025–2029 (Zakariah et al., 2026).

Relationship between feedback, adaptation, and learning outcomes

Feedback, students' adaptation, and learning outcomes are closely interconnected in a continuous cause-and-effect relationship throughout the learning process. High-quality feedback that is clear, specific, and delivered in a timely manner serves as a key stimulus for students to adapt their learning

strategies, strengthen their conceptual understanding, and refine their patterns of thinking. When students are able to interpret feedback reflectively, they develop metacognitive awareness that promotes self-regulated learning and continuous improvement.

This adaptive process subsequently contributes to improved learning outcomes, not only in cognitive achievement but also in affective development and higher-order thinking skills. Conversely, feedback that is general, delayed, or irrelevant tends to be ineffective in stimulating meaningful student adaptation (Tristianto et al., 2025). Therefore, the relationship among these three elements demonstrates that meaningful learning outcomes are determined not only by instructional materials or teaching methods but also by the quality of the reflective interaction between the feedback students receive and their adaptive responses.

Implementation challenges

Although real-time feedback has considerable potential to improve learning outcomes, its implementation faces a number of multidimensional challenges. From a pedagogical perspective, disparities remain in both teachers' and students' readiness to utilize feedback effectively. Not all students possess sufficient metacognitive skills to interpret and apply feedback independently, making continuous guidance from educators essential. Furthermore, teachers' workload in designing and delivering high-quality feedback presents an additional challenge, particularly in large classes where providing individualized feedback is time-consuming (Rohmah, 2020).

From the perspective of learning culture, many students continue to focus primarily on final grades rather than the learning process itself. As a result, feedback is often overlooked instead of being used as a tool for reflection and improvement. Without systematic planning and alignment with learning objectives, feedback may become passive information that has little impact on students' academic development (Rohmah, 2020).

From a technological perspective, particularly regarding the use of Artificial Intelligence (AI), the effectiveness of AI-generated feedback depends heavily on the quality of the technology and the availability of reliable data used to train and operate AI systems. AI systems developed using incomplete, biased, or unrepresentative datasets may generate inaccurate or inappropriate feedback (Abar et al., 2025). In addition, excessive reliance on AI has the potential to hinder the development of students' critical thinking and problem-solving abilities if technology replaces rather than complements active learning processes (Choustoulakis, 2024). Therefore, the integration of AI into educational assessment should be carefully balanced with pedagogical approaches that emphasize meaningful learning processes rather than focusing exclusively on final learning outcomes.

Practical implications

The practical implications of this study suggest that educators should maximize the use of feedback as an integral component of the learning process to promote students' adaptation and improve learning outcomes. Feedback that is specific, timely, and improvement-oriented enables students to recognize conceptual weaknesses and independently adjust their learning strategies. In the context of educational technology, educators can utilize technology-assisted assessment systems and Artificial Intelligence to improve the efficiency of evaluation while maintaining their essential

role as pedagogical decision-makers who ensure that assessment outcomes remain aligned with instructional objectives.

Educational technology developers should design adaptive, user-friendly, and pedagogically relevant assessment systems that meet diverse learning needs while ensuring ethical standards, data privacy, and information security. At the policy level, supportive regulations are required to encourage the implementation of formative assessment and continuous feedback, accompanied by professional development programs that strengthen educators' assessment competencies and promote equitable access to educational technology. The effective integration of technology-based assessment systems has the potential to make a substantial contribution to the continuous improvement of educational quality.

Conclusion

This study confirms that optimizing assessment in economics education depends not only on technological sophistication but also on achieving an appropriate balance between AI-based feedback and human pedagogical intervention. The novelty of this study lies in proposing a conceptual framework of "balanced assessment," in which Artificial Intelligence functions as a provider of adaptive, real-time feedback, while educators serve as facilitators of reflection, critical thinking, and meaningful learning.

The main implication of this study is that the implementation of blended assessment can enhance the effectiveness of educational evaluation while preserving the humanistic dimensions of learning. In addition, strengthening assessment literacy and the effective utilization of educational technology are essential for improving students' learning outcomes and supporting more meaningful assessment practices.

Nevertheless, this study has several limitations because it is based solely on a literature review and does not include direct empirical validation. Therefore, future research is recommended to develop and empirically test models that integrate real-time feedback with Artificial Intelligence in authentic learning environments using experimental, quantitative, or mixed-methods approaches. Future studies should also examine ethical considerations, technological readiness, and inequalities in access to digital technologies to ensure that AI-supported assessment is implemented fairly, responsibly, and sustainably.

Declaration of Ownership

This article is our original work.

Conflict of Interest

There is no conflict of interest to declare in this article.

Ethical Clearance

This study was approved by the institution.

References

Abar, R., Pong, M., & Som, R. (2025). AI-driven feedback systems for formative assessment: Toward personalized and real-time pedagogy. *Al-Hijr: Journal of Adulearn World, 4*(2), 87–100. https://doi.org/10.55849/alhijr.v4i2.984

Abdurrahman. (2024). Metode penelitian kepustakaan dalam pendidikan Islam. *Adabuna: Jurnal Pendidikan dan Pemikiran, 3*(2), 102–113. https://doi.org/10.38073/adabuna.v3i2.1563

Ansya, Y. A., & Salsabilla, T. (2025). Keterampilan guru abad 21 dalam

pembelajaran IPA di sekolah dasar. *Jurnal Dunia Pendidikan, 6*(2). https://doi.org/10.55081/jurdip.v6i2.4579

Burgess, A., van Diggele, C., Roberts, C., & Mellis, C. (2020). Feedback in the clinical setting. *BMC Medical Education, 20*(Suppl. 2), 460. https://doi.org/10.1186/s12909-020-02280-5

Choustoulakis, E. (2024). Integrating artificial intelligence (AI) tools into teaching mathematical economics in tertiary education. *European Journal of Open Education and E-Learning Studies, 9*(1), 45-66. https://doi.org/10.46827/ejoe.v9i1.5683

Deng, W. H., Yildirim, N., Chang, M., Eslami, M., Holstein, K., & Madaio, M. (2023). Investigating practices and opportunities for cross-functional collaboration around AI fairness in industry practice. *Proceedings of the 2023 CHI Conference on human factors in computing systems*. https://doi.org/10.1145/3593013.3594037

Erlansyah, D., Mukminin, A., Julian, D., Negara, E. S., Aditya, F., & Syaputra, R. (2024). Large language model (LLM) comparison between GPT-3 and PaLM-2 to produce Indonesian cultural content. *Eastern-European Journal of Enterprise Technologies, 4*(2), 19–29. https://doi.org/10.15587/1729-4061.2024.309972

Fauziddin, M., Adha, T. R., Arifiyanti, N., Indriyani, F., Rizki, L. M., Wulandary, V., & Reddy, V. S. V. (2025). The impact of AI on the future of education in Indonesia. *Educative: Jurnal Ilmiah Pendidikan, 3*(1), 11–16. https://doi.org/10.70437/educative.v3i1.828

Geraldina,I.,Sihotang,S.V.,&Korespondensi, P. (2024). Mengintegrasikan teknologi blockchain dalam pendidikan tinggi: Meningkatkan transparansi dan keamanan dalam kredensial akademik. *ADI Pengabdian Kepada Masyarakat*, *5*(1), 72–79. https://doi.org/10.34306/adimas.v5i1.1148

Hanila, S., & Alghaffaru, M. (2023). Pelatihan penggunaan artificial intelligence (AI) terhadap perkembangan teknologi pada pembelajaran siswa SMA 10 Sukarami Kota Bengkulu. *Jurnal Dehasen Mengabdi, 2*(2). https://doi.org/10.37676/jdm.v2i2.4890

Harasim, L., Whittemore, R. H., Taylor, & Francis Group. (2017). *Learning theory and online technologies to edu sustainable forestry*. SFI Program.

Harefa, E. F., & Harefa, E. G. (2025). Artificial intelligence (AI) terhadap dunia pendidikan. *Jurnal Ilmu Ekonomi, Pendidikan dan Teknik, 2*(6), 25–30.

Hediansah, D., & Surjono, H. D. (2020). Hybrid learning development to improve teacher learning management. *JKTP: Jurnal Kajian Teknologi Pendidikan, 3*(1), 1–9. https://doi.org/10.17977/um038v3i12019p001

Holmes, W., & Miao, F. (2023). *Guidance for generative AI in education and research*. UNESCO. https://doi.org/10.54675/EWZM9535

Jaya, G. P., Warsah, I., & Istan, M. (2023). Kiat penelitian dengan model pendekatan telaah kepustakaan. *Tik Ilmeu: Jurnal Ilmu Perpustakaan dan Informasi, 7*(1), 117-128. https://doi.org/10.29240/tik.v7i1.6494

Kadek, I., Arsana, S., Hutahaean, L. A. M. D., Afnita, V., Dolonseda, H. P., Otoluwa, Y., & Windasari, M. D. (2025). Model struktural SEM-PLS: Intelligent tutoring systems dan adaptive learning systems dalam kaitannya dengan kreativitas belajar mahasiswa. *Jurnal Administrasi, Manajemen Sumber Daya Manusia dan Ilmu Sosial (JAEIS), 4*(1), 1–14. https://doi.org/10.37606/jaeis.v4i1.298

Malikah, N., Khasanah, H. R., Putri, I. M., Saniyah, I. R., Faradisi, I. S., Azizah, A., & Muslimah, I. (2024). Implementasi evaluasi formatif dan sumatif dalam pembelajaran fikih di MTs Al-Mukarrom Ponorogo. *Muaddib, 2*(2). https://

ejournal.insuriponorogo.ac.id/index.php/muaddib

Nurcahyani, A., Rahmatillah, F., Waruwu, S. Y., & Amelia, N. (2024). Pemanfaatan AI sebagai media pembelajaran dalam pendidikan ekonomi. *Jurnal Disrupsi Bisnis, 7*(6), 823–830. https://doi.org/10.32493/drb.v7i6.46279

Seo, M. R., Tanaem, E., Bia, O., Amung, H. E., & Bara Pa, H. D. (2025). Teknologi artificial intelligence dalam evaluasi pendidikan: Masa depan penilaian pembelajaran. *Sabar: Jurnal Pendidikan Agama Kristen dan Katolik, 2*(3), 79–95. https://doi.org/10.61132/sabar.v2i3.1058

Tristianto, M. R., Nugraha, A. S., Ramdani, A., & Nababan, A. S. (2025). Pengaruh artificial intelligence (AI) dalam evaluasi pembelajaran bahasa Indonesia pada kalangan mahasiswa. *Jurnal Nakula: Pusat Ilmu Pendidikan, Bahasa dan Ilmu Sosial, 3*(3), 47–65. https://doi.org/10.61132/nakula.v3i3.1766

Oktavia, D. H., & Suseno, G. (2024). Pemanfaatan kecerdasan buatan dalam pendidikan di Indonesia: Potensi dan tantangan. *Indo-MathEdu Intellectuals Journal, 5*(2), 1680.

Putri, L. T. (2025). Pengaruh penggunaan teknologi informasi dan artificial intelligence (AI) dalam pembelajaran terhadap hasil belajar mahasiswa pendidikan ekonomi Universitas Jambi angkatan 2021. *Jurnal Inovasi Ekonomi Kreatif, 6*(2), 35-48.

Putri, R. D., & Yulhendri, Y. (2025). Pengaruh umpan balik positif dan negatif terhadap engagement cognitive dan hasil belajar pada mata pelajaran ekonomi kelas XI. *Jurnal Pembelajaran, Bimbingan, dan Pengelolaan Pendidikan, 5*(12), 4-27. https://doi.org/10.17977/um065.v5.i12.2025.4

Putri, Y. K., Muhammad, R. R., Nirwana, F., & Azzahra, A. (2025). Analisis efektivitas artificial intelligence (AI) terhadap pembelajaran matematika mahasiswa. *Indiktika: Jurnal Inovasi Pendidikan Matematika, 7*(2), 466–476. https://doi.org/10.31851/indiktika.v7i2.17469

Resnandari, E., Astuti, P., & Baysha, H. (2024). Evaluasi efektivitas sistem umpan balik berbasis AI dalam meningkatkan hasil belajar mahasiswa. *EDUTECH: Jurnal Inovasi Pendidikan Berbantuan Teknologi, 4*(3), 122–136. https://doi.org/10.51878/edutech.v4i3.3142

Rohmah, M. (2020). Evaluasi pendidikan ekonomi pada Kurikulum 2013 di tingkat sekolah menengah atas (SMA). *UTILITY: Jurnal Ilmiah Pendidikan dan Ekonomi, 4*(1), 56–70.

Rusdi, F. M., & Cahyani, A. D. (2025). Peran ekonomi pendidikan dalam meningkatkan kesejahteraan melalui pendidikan dan pelatihan digital: Tinjauan literatur. *Afeksi: Jurnal Penelitian dan Evaluasi Pendidikan, 6*(2), 287–300. https://afeksi.id/jurnal/index.php/afeksi/article/view/451

Saba, S. S. (2024). Optimalisasi penggunaan teknologi dalam proses pembelajaran untuk meningkatkan efektivitas siswa. *JME Jurnal Management Education, 2*(2), 57–63. https://www.journal.sabajayapublisher.com/index.php/jme/article/view/358

Sari, M., & Asmendri, A. (2020). Penelitian kepustakaan (library research) dalam penelitian pendidikan IPA. *Natural Science: Jurnal Penelitian Bidang IPA dan Pendidikan IPA, 6*(1), 41–53.

Setiawan, A. (2024). Memodifikasi sistem pendidikan di sekolah menengah dengan pemberdayaan media digital dan keterampilan informasi dalam Kurikulum Merdeka. *Jurnal Manajemen dan Pendidikan Agama Islam, 2*(6), 23–38. https://doi.org/10.61132/jmpai.v2i6.587

Slamet, S. (2020). Hubungan strategi umpan balik (feedback), motivasi berprestasi dan hasil belajar dalam pembelajaran PPKn di SMK. *PINUS: Jurnal Penelitian*

Inovasi Pembelajaran, 5(2), 56-66. https://doi.org/10.29407/pn.v5i2.14539

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Theobald, M., & Brod, G. (2025). The role of feedback and working memory for goal-related monitoring and goal revision. *Learning and Instruction, 97*, 102108. https://doi.org/10.1016/j.learninstruc.2025.102108

Tobing, A. W. L., Safitri, D., & Sujarwo. (2025). Dampak implementasi teknologi AI terhadap efektivitas pembelajaran di perguruan tinggi. Indonesian Journal on Education (IJoEd), 1(4), 385–389. https://doi.org/10.70437/ijoed.v1i4.174

Topali, P., Ortega-Arranz, A., Rodríguez-Triana, M. J., Er, E., Khalil, M., & Akçapınar, G. (2025). Designing human-centered learning analytics and artificial intelligence in education solutions: A systematic literature review. *Behaviour & Information Technology, 44*(5), 1071–1098. https://doi.org/10.1080/0144929X.2024.2345295

Trisnani, N., Bander, S. E., Susanti, S., Nasar, A., Supartin, S., Dhari, P. W., Utami, R., Noviani, J., Rusmiati, R., Effendi, H., Rakhmyta, Y. A., Gradini, E., Nurjani, N., Ingki, I., Ramli, A., Hardian, H., Nurmalina, N., Wulandari, S., Priyanto, P., & Demulawa, M. (2025). *Desain pembelajaran inovatif untuk pendidikan modern*. Mifandi Mandiri Digital. https://jurnal.mifandimandiri.com/index.php/penerbitmmd/article/view/492

Wardah, T. F., Putri, N., & Absharina, E. D. (2025). Pengaruh kecerdasan buatan (AI) terhadap masa depan: Peluang, tantangan, dan implikasi sosial-ekonomi. *Jurnal Multidisiplin Inovatif, 9*(6), 76-82.

Wardani, V., & Ahsanu Amala, I. (2025). Evaluasi pendidikan ekonomi informal dalam keluarga: Dampak sosial ekonomi terhadap metode dan nilai yang ditanamkan. *Jurnal Pendidikan Ekonomi (JUPE), 13*(1), 57–67. https://doi.org/10.26740/jupe.v13n1.p57-67

Warini, S., Hidayat, Y. N., Ilmi, D., Islam, P. A., Tarbiyah, F., Keguruan, D., Islam, U., Sjech, N., Djamil, M., Bukittinggi, D., & Kunci, K. (2023). Teori belajar sosial dalam pembelajaran. *ANTHOR: Education and Learning Journal, 2*(4), 566–576. https://doi.org/10.31004/anthor.v2i4.181

Wibowo, A. (2023). *Internet of Things (IoT) dalam ekonomi dan bisnis digital*. Yayasan Prima Agus Teknik

Yulianti, G., Bernardi, B., Permana, N., & Wijayanti, F. A. K. W. (2023). Transformasi pendidikan Indonesia: Menerapkan potensi kecerdasan buatan (AI). *Journal of Information Systems and Management (JISMA), 2*(6), 102–106.

Zakariah, F. H. A., Hasunah, U., & Tinus, A. (2026). Perencanaan dan pengembangan sistem pendidikan. *J-SES: Journal of Science, Education and Studies, 5*(1), 77-93. https://doi.org/10.30651/jses.v5i1.31234

Zawacki-Richter, O., Cefa, B., & Bai, J. Y. H. (2025). Towards reproducible systematic reviews in Open, Distance, and Digital Education—An umbrella mapping review. *Review of Education, 13*(1), e70031. https://doi.org/10.1002/rev3.70031