

Reimagining Economics Education Through Artificial Intelligence: Opportunities, Challenges, and Human-Centered Innovation

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Abstract. *The growing use of Artificial Intelligence (AI) is increasingly influencing the development of contemporary education. The application of AI technologies in teaching and learning offers new opportunities to improve the quality of education, promote greater student engagement, and provide more individualized learning experiences. In economics education, where analytical reasoning, data interpretation, and problem-solving abilities are essential, AI can provide innovative methods to support educators and facilitate students' learning processes. This paper explores the role of Artificial Intelligence in transforming economics education by examining its potential applications, emerging opportunities, and associated challenges. The study discusses how AI-based tools can contribute to adaptive learning, intelligent tutoring, automated feedback, economic data analysis, and interactive learning environments. At the same time, the paper highlights important concerns related to academic integrity, ethical use of technology, data privacy, digital inequality, and the changing role of educators. The paper argues that the successful integration of AI into economics education requires a human-centered approach where technology functions as a complementary instrument rather than a substitute for educators. By combining technological innovation with effective pedagogical strategies, AI can contribute to the development of more flexible, inclusive, and future-oriented economics education systems.*

Keywords: *artificial intelligence, economics education, educational technology, digital transformation, personalized learning, human-centered innovation, AI ethics*

Introduction

The rapid development of digital technologies has significantly transformed the structure, objectives, and practices of contemporary education. Among these technologies, Artificial Intelligence (AI) has emerged as a particularly influential tool with the potential to reshape traditional approaches to teaching and learning. The increasing availability of AI-based systems has created new opportunities for personalized instruction, automated feedback, data-driven learning, and more flexible educational environments. In higher education, AI applications are increasingly being explored as instruments for supporting both educators and students and for improving the efficiency and quality of educational processes (Zawacki-Richter et al., 2019; Bond et al., 2024; Castillo-Martínez et al., 2024).

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Economics education is particularly relevant to the integration of AI because the discipline requires students to develop analytical thinking, data interpretation, quantitative reasoning, forecasting, and problem-solving skills. Economics students increasingly need to work with large datasets, interpret economic indicators, evaluate alternative scenarios, and make evidence-based decisions. In this context, AI-based technologies can provide opportunities for students to engage with economic data, explore complex relationships between variables, and apply theoretical concepts to practical situations. Intelligent tutoring systems, generative AI tools, adaptive learning platforms, and interactive simulations can therefore complement conventional approaches to economics education (Holmes & Tuomi, 2022; Kasneci et al., 2023).

Previous research on AI in higher education has emphasized its potential to personalize learning, improve student support, facilitate feedback, and assist educators with routine academic tasks. At the same time, the literature identifies significant challenges related to academic integrity, ethical responsibility, data privacy, technological dependence, and unequal access to digital resources. (Kasneci et al., 2023; Miao & Holmes, 2023; Bond et al., 2024). These challenges suggest that the educational value of AI cannot be determined solely by its technological capabilities. Rather, its effectiveness depends on the pedagogical context in which it is implemented and on the ability of institutions and educators to use AI responsibly.

Despite the growing body of research on AI in higher education, further attention is needed to the specific implications of AI for economics education. Economics has distinctive characteristics because of its strong reliance on quantitative analysis, economic modeling, forecasting, data interpretation, and evidence-based decision-making. Consequently, the opportunities provided by AI in economics education may extend beyond general personalization and automated support to include new forms of analytical and simulation-based learning. At the same time, the increasing use of AI raises questions about how students can develop independent analytical judgment while using technologies capable of generating information, analyses, and solutions. (Kasneci et al., 2023; Miao & Holmes, 2023; Bond et al., 2024).

This issue creates an important pedagogical challenge. AI should not simply be introduced as a technological replacement for existing educational practices. Instead, its integration should be guided by a human-centered approach that preserves the essential role of educators in developing students' critical thinking, creativity, ethical awareness, and independent judgment. In this perspective, AI functions as a supportive instrument that can expand educational opportunities while human expertise remains central to interpretation, guidance, evaluation, and meaningful interaction. (Holmes & Tuomi, 2022; Miao & Holmes, 2023). Against this background, this study aims to examine the opportunities and challenges arising from the integration of Artificial Intelligence into economics education and to explore the implications of a human-centered approach to AI-supported teaching and learning. The study focuses on three interconnected dimensions: the educational applications of AI, the potential benefits and risks of its integration, and the changing role of educators in AI-supported economics education.

The study addresses the following research questions:

1. What are the main opportunities for applying Artificial Intelligence in economics education?
2. What pedagogical, ethical, and technological challenges are associated with the integration of AI into economics education?
3. How can a human-centered approach contribute to the effective and responsible use of AI in economics education?

By addressing these questions, the study contributes to the discussion of AI in education by focusing specifically on economics education and by emphasizing the need to balance technological innovation

with pedagogical principles and human expertise. Economics students increasingly need to work with large datasets, interpret economic indicators, evaluate alternative scenarios, and make evidence-based decisions (Aliyeva et al., 2026).

Methods

Research Design

This study employs a qualitative thematic review of the existing literature to critically examine the opportunities, challenges, and broader implications of Artificial Intelligence (AI) in economics education. This methodological approach is appropriate because the study seeks to synthesize and interpret insights from existing academic and institutional literature rather than collect and statistically analyze primary data. The thematic approach facilitates the identification of recurring patterns, emerging perspectives, and key areas of scholarly discussion concerning the application of AI in economics education, including its potential benefits, associated risks and challenges, and the evolving role of educators in AI-supported learning environments.

Literature Selection

The literature examined in this study consists of peer-reviewed academic publications, literature and systematic reviews, and relevant reports published by recognized international organizations. The selected sources address AI in education and higher education, with particular attention to its relevance to economics education. Sources were considered relevant when they addressed one or more of the following areas: personalized learning, intelligent tutoring systems, generative AI, automated feedback, data-driven learning, simulation-based education, academic integrity, AI ethics, data privacy, digital inequality, and the changing role of educators. Priority was given to recent publications reflecting the rapid development of AI and generative AI in educational contexts. Earlier influential studies were also included when they provided important conceptual or theoretical foundations for understanding AI applications in education. The selection of sources was guided primarily by their relevance to the research questions and their contribution to the study objectives.

Data Analysis

The selected literature was analyzed using thematic analysis. The analysis involved three main stages. First, the selected sources were reviewed to identify their main arguments, findings, and areas of focus. Second, recurring concepts and issues were identified and grouped into related categories. Third, these categories were organized into broader themes corresponding to the research questions of the study. The thematic analysis identified four interconnected areas. The first focused on the opportunities offered by AI within economics education, particularly personalized learning and intelligent tutoring systems. The second examined AI-supported analytical and practical learning, including data-driven learning approaches and simulation-based activities. The third explored the pedagogical, ethical, and technological challenges associated with integrating AI into economics education, with particular attention to academic integrity, data privacy, digital inequality, and the reliability of AI-generated information. The fourth considered the evolving role of educators and emphasized the importance of maintaining a human-centered approach to AI-supported economics education.

Methodological Scope and Limitations

This study is based exclusively on secondary sources and does not involve primary data collection from students, educators, or educational institutions. Therefore, the findings represent a thematic synthesis and interpretation of the existing literature rather than empirical evidence of the effectiveness of specific AI tools in economics education. The qualitative nature of the review also means that the interpretation of the literature involves a degree of researcher judgment. Nevertheless, organizing the reviewed literature according to clearly defined thematic areas and research questions

provides a structured basis for identifying major opportunities, challenges, and implications of AI integration into economics education. The limitations of the literature-based approach are considered when interpreting the findings and formulating directions for future empirical research.

Statement on the Use of Artificial Intelligence

Artificial Intelligence tools were used during the preparation of this manuscript for language editing, grammatical improvement, structural organization, and refinement of academic expression. The author independently reviewed and verified the AI-assisted content and remains fully responsible for the accuracy, originality, interpretation, and final version of the manuscript. All AI-assisted content was critically evaluated and revised by the author to ensure its academic integrity and alignment with the objectives of the study.

Results

The thematic analysis of the selected literature identified four major areas concerning the integration of Artificial Intelligence into economics education: personalized and adaptive learning, AI-supported analytical and practical learning, pedagogical and ethical challenges, and the changing role of educators. These themes correspond to the research questions of the study and demonstrate that AI creates both new educational opportunities and significant implementation challenges. (Zawacki-Richter et al., 2019; Bond et al., 2024).

Personalized and Adaptive Learning

The reviewed literature indicates that one of the most significant opportunities associated with AI in education is the development of personalized and adaptive learning environments. AI-based systems can analyze students' learning progress, identify areas of difficulty, and provide individualized learning materials and feedback. Such systems may allow students to receive additional explanations or practice activities according to their learning needs and progress. For economics education, personalized learning is particularly relevant because students may differ considerably in their levels of mathematical, statistical, and analytical preparation. AI-supported systems can provide differentiated learning activities and assist students in working with economic concepts at different levels of complexity. The literature therefore suggests that AI can contribute to a more flexible learning environment in which students receive support according to their individual learning requirements (Crompton & Burke, 2023; Holmes & Tuomi, 2022). AI-based systems can support personalized learning by adapting educational content, learning activities, and feedback according to individual learning requirements (Crompton & Burke, 2023; Holmes & Tuomi, 2022; Teymurova, 2026).

AI-Supported Analytical and Practical Learning

A second major finding concerns the use of AI to strengthen analytical and practical learning. Economics education requires students to interpret quantitative information, analyze economic indicators, understand relationships between variables, and apply theoretical concepts to practical situations. AI-based technologies can support these activities by assisting learners with data analysis, pattern recognition, forecasting exercises, and scenario-based learning (Holmes & Tuomi, 2022). The reviewed literature also indicates that interactive simulations and AI-supported learning environments can help students connect theoretical knowledge with practical applications. Economic scenarios can be explored through digital environments in which students examine alternative conditions and observe potential outcomes. Such approaches may strengthen students' ability to interpret economic information and apply theoretical knowledge to practical problems (Kasneci et al., 2023).

Generative AI tools can additionally provide explanations, examples, and immediate responses to students' questions. However, the literature emphasizes that AI-generated information should be

critically evaluated because such systems may produce inaccurate, incomplete, or misleading information (Kasneci et al., 2023). Consequently, AI-supported analytical learning requires students to develop skills in verification, interpretation, and critical evaluation.

Pedagogical, Ethical, and Technological Challenges

The thematic analysis identified several challenges that may limit the effective integration of AI into economics education. Academic integrity represents one of the most frequently discussed concerns, particularly following the rapid development of generative AI systems. Students may use AI-generated content in assignments without adequately demonstrating their own analytical abilities, creating challenges for traditional assessment practices (Kasneci et al., 2023; McDonald et al., 2024). Another important challenge concerns data privacy and security. AI-supported educational systems may require the collection and processing of information about students' learning activities and performance. This creates a need for transparency, informed use of data, and appropriate institutional safeguards (Miao & Holmes, 2023; Bond et al., 2024).

The literature also identifies unequal access to digital technologies and differences in digital competence as important barriers to effective AI adoption. Students and educational institutions may have different levels of access to reliable digital infrastructure, AI tools, and the knowledge required to use them effectively. Therefore, the implementation of AI may potentially reinforce existing educational inequalities if access and digital literacy are not addressed (Williamson & Eynon, 2020; Castillo-Martínez et al., 2024).

Changing Role of Educators and Human-Centered Integration

The fourth major finding concerns the changing role of educators. The literature does not support the view that AI should simply replace teachers. Instead, AI is increasingly described as a tool that can complement educators by supporting routine activities, providing learning assistance, and facilitating feedback (Zawacki-Richter et al., 2019; Bond et al., 2024; Tuomi et al., 2022). At the same time, educators remain essential for developing students' critical thinking, independent judgment, ethical awareness, and ability to interpret information. Human-centered approaches to AI in education emphasize the importance of maintaining human agency, meaningful interaction, transparency, and educator involvement in AI-supported learning environments (Alfredo et al., 2024; Bond et al., 2024). For economics education, this finding is particularly important because economic learning involves not only technical analysis but also interpretation, judgment, and evaluation of economic and policy-related consequences. AI can support the processing of information and exploration of scenarios, while educators continue to provide intellectual guidance and contextual interpretation.

Summary of the Results

Overall, the results indicate that AI integration into economics education can be organized around two complementary dimensions. The first is the educational potential of AI, including personalized learning, analytical support, interactive learning, and automated feedback. The second is the conditions required for responsible implementation, including academic integrity, ethical use, data protection, equitable access, digital competence, and continued human involvement. These findings provide the basis for the subsequent discussion of how AI can be integrated into economics education while maintaining a balance between technological innovation and human-centered pedagogy.

Discussion

The findings of this study indicate that Artificial Intelligence has considerable potential to transform economics education, particularly through personalized learning, intelligent tutoring, automated feedback, data-driven learning, and interactive learning environments. However, the findings also demonstrate that the educational value of AI depends on the conditions under which it is

implemented. This supports the broader literature on AI in higher education, which emphasizes that technological capabilities alone do not guarantee improved educational outcomes (Zawacki-Richter et al., 2019; Bond et al., 2024; Castillo-Martínez et al., 2024).

The first major implication concerns personalized and adaptive learning. AI-based systems can provide learners with individualized support based on their learning progress and identified knowledge gaps. For economics education, this opportunity is particularly relevant because students may have different levels of mathematical, statistical, and analytical preparation. AI-supported learning environments may therefore provide additional explanations, examples, and practice opportunities according to individual needs. At the same time, personalization should not result in excessive automation of the learning process. Students still need opportunities to formulate questions, evaluate evidence, and develop independent economic reasoning (Crompton & Burke, 2023; Holmes & Tuomi, 2022).

The findings also highlight the importance of AI for data-driven and practice-oriented economics education. Economics increasingly depends on the analysis and interpretation of large amounts of quantitative information. AI can support students in identifying patterns, examining economic scenarios, and interpreting data. This can strengthen the connection between theoretical concepts and practical economic problems. However, the use of AI-generated analysis also creates a need for stronger verification and critical evaluation skills. Students should not treat AI-generated explanations or interpretations as inherently accurate. Instead, AI-supported analysis should be accompanied by source verification, comparison of alternative explanations, and critical examination of assumptions (Kasneci et al., 2023; Holmes & Tuomi, 2022).

The findings concerning academic integrity are consistent with the wider literature on generative AI in education. The increasing accessibility of AI-generated text and solutions challenges traditional approaches to assessment and raises questions about whether submitted work accurately reflects students' own knowledge and abilities (Kasneci et al., 2023; McDonald et al., 2024). For economics education, this issue is particularly important because assignments frequently require analytical reasoning, interpretation of economic evidence, and problem-solving. Consequently, assessment practices may need to place greater emphasis on students' reasoning processes, application of concepts, oral explanation, and reflection on how conclusions were reached rather than relying exclusively on final written outputs.

Another important implication concerns data privacy, transparency, and responsible use of AI. The collection and processing of student data can support personalization and learning analytics, but it can also create risks related to privacy, security, and user autonomy. Research on human-centered AI in education emphasizes the importance of balancing automation with human control, involving educational stakeholders in system design, and ensuring safety, reliability, and trustworthiness (Alfredo et al., 2024; Bond et al., 2024). Similarly, international guidance on generative AI in education emphasizes human agency, responsible use, and appropriate safeguards (Miao & Holmes, 2023; UNESCO, 2024).

The findings further suggest that digital inequality should be considered an important part of AI adoption strategies. Although AI can potentially expand access to educational support, unequal access to reliable internet connections, appropriate devices, digital skills, and AI-enabled educational services may produce new forms of inequality. Therefore, institutions should consider infrastructure and digital literacy alongside the introduction of AI-based educational technologies. AI integration should be accompanied by measures that ensure students have meaningful and equitable opportunities to use these technologies (Williamson & Eynon, 2020; Bond et al., 2024).

The changing role of educators is another central issue identified by this study. AI can reduce some routine tasks and provide students with additional learning support, but it does not eliminate the need for educators. Instead, the teacher's role may increasingly involve facilitating critical thinking, evaluating AI-generated information, designing meaningful learning activities, providing ethical guidance, and supporting students' intellectual development. Recent research on AI in education similarly emphasizes the importance of maintaining human agency and meaningful involvement of educators and students in AI-supported educational systems (Alfredo et al., 2024; Tuomi et al., 2022).

For economics education specifically, this human-centered perspective is particularly significant. Economics involves not only technical analysis but also interpretation, judgment, policy evaluation, and consideration of social and ethical consequences. AI can assist students in processing information and exploring alternative scenarios, but the interpretation of economic evidence and the evaluation of policy implications require human judgment. Therefore, AI should be positioned as a cognitive and educational support tool rather than as an autonomous substitute for the educator or the learner (Holmes & Tuomi, 2022).

The findings also have important implications for institutional policy and teacher development. Universities should provide educators with opportunities to develop AI literacy and pedagogical competencies that enable them to integrate AI into their courses in a responsible and effective manner. Institutional guidelines should clearly address appropriate AI use, academic integrity, data privacy, transparency, and assessment practices. At the same time, students should develop the ability to use AI tools responsibly while also critically questioning, verifying, and evaluating the accuracy and reliability of AI-generated information (Miao & Holmes, 2023; UNESCO, 2024).

Overall, the discussion suggests that the central issue is not whether AI should be introduced into economics education, but how it should be integrated. A sustainable approach requires alignment between technological capabilities, pedagogical objectives, ethical principles, and human expertise. The human-centered model proposed in this study therefore places educators and learners at the center of AI-supported educational innovation while using AI to expand opportunities for personalization, analytical learning, and practical application.

Conclusion

Artificial Intelligence is increasingly influencing the development of contemporary education and has significant potential to transform economics education. This study examined the main opportunities and challenges associated with the integration of AI into economics education and explored the importance of a human-centered approach to its implementation.

The findings indicate that AI can support personalized learning, intelligent tutoring, automated feedback, data-driven learning, and simulation-based educational activities. These applications can help students engage more effectively with economic concepts, quantitative information, and practical problem-solving tasks. AI can also support educators by reducing certain routine activities and creating additional opportunities for individualized student support.

At the same time, the integration of AI presents important challenges. Academic integrity, ethical responsibility, data privacy, unequal access to digital technologies, and the reliability of AI-generated information require careful consideration. The findings therefore suggest that technological adoption alone cannot ensure meaningful improvements in economics education. Effective implementation requires appropriate pedagogical strategies, institutional support, digital competencies, and clear ethical principles.

The study further emphasizes that educators should remain central to AI-supported economics education. AI should be used as a complementary educational instrument rather than as a substitute for human expertise. Educators play an essential role in developing students' critical thinking, independent judgment, ethical awareness, and ability to evaluate information. A human-centered approach can therefore combine the analytical capabilities of AI with the pedagogical and interpersonal capabilities of educators.

From a practical perspective, higher education institutions should invest in AI literacy, professional development for educators, responsible-use guidelines, and equitable access to digital technologies. Assessment practices should also be adapted to encourage independent reasoning, critical evaluation, and responsible use of AI-generated information.

Finally, this study is based on a thematic analysis of existing literature and therefore does not provide primary empirical evidence concerning the effectiveness of specific AI tools in economics education. Future research should examine AI-supported economics education through empirical studies involving students and educators and should investigate the effects of specific AI applications on learning outcomes, analytical skills, and student engagement.

Overall, the future of economics education should not be determined by whether Artificial Intelligence replaces traditional teaching, but by how effectively it can be integrated into educational practices while preserving human judgment, critical thinking, ethical responsibility, and meaningful interaction. A balanced human-centered approach can enable AI to serve as a strategic instrument for developing more flexible, inclusive, and future-oriented economics education.

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