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Dilemma of Artificial Intelligence Adoption in Educational Settings

Fellyanus Haba Ora[1], Morrison Hendrik Riwu Kore[2], Jefirstson R Riwu Kore[3]

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AFFILIATION
1. Agrotechnology Study Program, Nusa Lontar Rote University, Rote Ndao, Indonesia
2. Management Study Program, Nusa Lontar Rote University, Rote Ndao, Indonesia
3. Master's Program in Management, Indo Global Mandiri University, Palembang, Indonesia

CONTACT
Fellyanus Haba Ora, Program Studi Agroteknologi, Universitas Nusa Lontar Rote, Rote Ndao, Indonesia
Email: iho180285@gmail.com

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ABSTRACT

Introduction: The rapid integration of artificial intelligence (AI) in education presents both opportunities and challenges. AI offers personalized learning pathways, automated assessments, and enhanced accessibility, yet its unregulated adoption raises concerns regarding human cognitive dependence, academic integrity, data privacy, and ethical use. This research aims to examine the dilemmas surrounding artificial intelligence use in education by considering its implications for human intelligence, ethics, and regulation to encourage responsible AI adoption.

Method: This study employs a qualitative literature review. The literature search was conducted on peer-reviewed journal articles, policy documents, and global survey reports published between 2021 and 2025, retrieved from reputable academic databases and institutional publications. The collected sources were analyzed using thematic and narrative analysis to identify recurring patterns related to the benefits, risks, ethical issues, and regulatory dimensions of AI adoption in education. Secondary data from global surveys, policy reports, and scholarly studies were synthesized to explore the benefits and risks of AI adoption.

Results: Findings reveal that AI can augment human intelligence and learning efficiency, but overreliance may undermine critical thinking, creativity, and moral development. Effective integration requires AI literacy, institutional guidelines, and regulatory frameworks to ensure ethical, responsible, and equitable use.

Conclusion: Educational stakeholders must therefore balance technological advantages with human-centered ethics and regulatory compliance to foster sustainable AI adoption.

ABSTRAK

Pendahuluan: Penerapan kecerdasan buatan (AI) yang cepat dalam pendidikan menghadirkan peluang dan tantangan. AI menawarkan jalur pembelajaran yang dipersonalisasi, penilaian otomatis, dan aksesibilitas yang ditingkatkan, namun adopsi yang tidak teratur menimbulkan kekhawatiran terkait ketergantungan kognitif manusia, integritas akademik, privasi data, dan penggunaan etis. Penelitian ini bertujuan untuk mengkaji dilema seputar penggunaan kecerdasan buatan dalam pendidikan dengan mempertimbangkan implikasinya terhadap kecerdasan manusia, etika, dan regulasi guna mendorong adopsi AI yang bertanggung jawab.

Metode: Studi ini menggunakan tinjauan literatur kualitatif. Penelusuran literatur dilakukan pada artikel jurnal yang direview oleh rekan sejawat, dokumen kebijakan, dan laporan survei global yang diterbitkan antara tahun 2021 dan 2025, yang diperoleh dari basis data akademik terkemuka dan publikasi institusional. Sumber-sumber yang dikumpulkan dianalisis menggunakan analisis tematik dan naratif untuk mengidentifikasi pola berulang terkait manfaat, risiko, isu etika, dan dimensi regulasi dari adopsi AI dalam pendidikan. Data sekunder dari survei global, laporan kebijakan, dan studi ilmiah disintesis untuk mengeksplorasi manfaat dan risiko adopsi AI.

Hasil: Temuan menunjukkan bahwa kecerdasan buatan (AI) dapat meningkatkan kecerdasan manusia dan efisiensi belajar, namun ketergantungan yang berlebihan dapat

mengganggu pemikiran kritis, kreativitas, dan perkembangan moral. Integrasi yang efektif memerlukan literasi AI, pedoman institusional, dan kerangka regulasi untuk memastikan penggunaan yang etis, bertanggung jawab, dan adil.

Kesimpulan: Pemangku kepentingan pendidikan harus menyeimbangkan keunggulan teknologi dengan etika berorientasi manusia dan kepatuhan regulasi untuk mendorong adopsi AI yang berkelanjutan.

1. INTRODUCTION

Artificial intelligence (AI) broadly refers to computer-based systems designed to simulate and augment human cognitive functions, particularly in tasks involving data processing, pattern recognition, and decision-making, through algorithms and machine learning techniques. Rather than fully replacing human intelligence, AI functions as a complementary tool that enhances efficiency and analytical capacity across multiple sectors, including education. In educational settings, AI is increasingly utilized to support personalized learning, adaptive assessment, intelligent tutoring systems, and administrative automation, enabling learning experiences to be tailored to individual student needs and learning trajectories (Pedró et al., 2019; Vincent-Lancrin & van der Vlies, 2020). AI-driven learning analytics can assist educators in identifying learning gaps, predicting student performance, and improving instructional decision-making, thereby contributing to more inclusive and data-informed education systems (Ilma & Rohma, 2025; Russell & Norvig, 2021). These challenges highlight that AI should be positioned as a supportive technology rather than a substitute for educators, underscoring the continued importance of human oversight and pedagogical expertise in educational practice.

Artificial intelligence (AI) has been increasingly implemented in education through concrete technological innovations that support adaptive learning and digital transformation at both instructional and systemic levels. These implementations include intelligent tutoring systems that adjust learning content based on real-time learner performance, AI-driven learning analytics that identify learning patterns and predict academic outcomes, automated assessment tools that provide timely and personalized feedback, and recommendation systems that tailor learning pathways to individual needs. Empirical studies indicate that such AI-based innovations enhance learning efficiency, improve student engagement, and facilitate differentiated instruction, particularly in large-scale and digitally mediated learning environments (Al Harrasi et al., 2025; Rao & Suhasini, 2025). From a policy perspective, these applications are also recognized as strategic instruments for strengthening flexibility, inclusivity, and responsiveness in education systems undergoing digitalization, while supporting data informed decision making at institutional and systemic levels (UNESCO, 2022; Vincent-Lancrin & van der Vlies, 2020). Collectively, this evidence underscores that AI functions as an enabling innovation that enhances learning adaptability and educational effectiveness, provided it is integrated with sound pedagogical practices and appropriate human oversight.

The utilization of AI technology in education or academia makes teaching and learning challenges easier. A survey of 1,223 students released by Intelligent (2023) found that 30% of respondents admitted to completing school or university assignments using AI technologies such as ChatGPT. Similarly, a survey by Best Colleges (2023) of 1,000 university students reported that 53% of respondents used AI technology (ChatGPT) for their academic tasks. Furthermore, a study by Song & Wang (2024) among 487 students from top universities in China revealed that 60% of respondents considered AI technology essential for completing university assignments.

However, such use of AI, if not accompanied by proper digital literacy, may lead to a decline in human intellectual capabilities.

The use of AI technology by humans, which can potentially eliminate the exercise of human intelligence, raises concerns about a decline in human intellectual quality. Afandi & Kurnia (2023) and Jie & Kamrozzaman (2024) explain that the challenges in the educational sector when utilizing AI technology include over-reliance, even though AI can enhance the quality of learning. These challenges encompass data privacy and security, lack of understanding and awareness, excessive reliance on AI, and ethical considerations.

The use of AI technology, with both positive and negative implications, requires thorough understanding within the educational sector. This will ultimately create a utility dilemma: whether AI use balances the pursuit of technological advancement with ethical considerations. Both aspects represent a significant barrier that separates the adoption from the implications of AI technology. The utility dilemma of AI adoption requires comprehensive examination, as it forms the basis for developing ethical and regulatory limitations for AI implementation. Manung (2024), similarly defines ethics as actions considered good according to norms, rules, and traditional behavioral standards, recognized as avoiding harmful acts.

Regulation is a set of documents resulting from agreements or rules intended to organize matters in an orderly and proper manner. Riwu Kore et al. (2020), regulation refers to statutory laws, while Al'afghani & Bisariyadi (2021) explains that regulation also encompasses the volatile and systemic risks arising from violations of ethics and rules; this perspective is based on transparency, openness, and public involvement in risk assessment and ranking.

In recent years, the adoption of artificial intelligence (AI) in Indonesian education has gained traction but remains uneven, with implementation largely concentrated in urban and high-resource settings while many schools still struggle with limited infrastructure, low digital literacy among teachers, and substantial regional disparities (Aminah et al., 2025; Jumsir et al., 2025). The urgency of integrating AI into Indonesian education is underscored by its potential to support personalized and data-driven learning, adaptive assessment, and more effective educational management in line with 21st-century competencies (Lowell et al., 2025; Najmudin et al., 2025). Despite global scholarly attention to AI-enhanced pedagogies and ethical challenges (Chen et al., 2023; Karki et al., 2023; Mouta et al., 2023), there is a notable research gap in context-specific empirical studies that evaluate the outcomes of AI interventions in diverse Indonesian educational contexts and address culturally relevant ethical and governance issues. Most existing studies are descriptive or conceptual, with limited longitudinal or mixed-methods research that integrates national policy imperatives, teacher readiness, and student learning outcomes. The present study offers novel contributions by systematically synthesizing recent empirical evidence on AI adoption in Indonesian settings, highlighting implementation barriers and facilitators, and proposing an integrated framework that situates ethical, pedagogical, and regulatory dimensions for sustainable AI utilization, thus addressing both theoretical and practical gaps in the literature.

The dilemmas arising from the advancement of science and technology, particularly regarding the ethical consequences of scientific knowledge, ultimately result in uncertainties in AI technology adoption (Nordström, 2022; Saetra & Fosch-Villaronga, 2021). There is a need for a balanced approach that considers both benefits and risks, so that in the educational sector, the use of technology does not lead to disruption or maladaptation, but rather to a responsible adoption of AI. Based on the background and problem formulation discussed, the objective of this

study is to examine and address the dilemmas associated with the use of artificial intelligence in education. Thus, this study aims to examine the dilemmas surrounding the use of artificial intelligence in education by analyzing its implications for human intelligence, ethics, and regulatory frameworks to encourage responsible AI adoption.

2. METHODS

This study is categorized as a qualitative review because it is oriented toward a literature-based analysis aimed at examining the alignment or gaps between theoretical pragmatism and empirical evidence. As synthesized by Riwu Kore et al. (2021), the advantage of literature studies lies in their ability to combine knowledge through both technical literacy (theoretical and philosophical research reviews) and non-technical sources (biographies, diaries, notes, catalogs, and similar sources).

The type of data analyzed in this study is secondary data obtained from the internet, which is then analyzed descriptively and narratively to support the research objectives (see Figure 1). Based on this approach, the output of the study is intended to create a synergy in addressing issues through the collection of relevant knowledge references, comparing theory with empirical evidence, and presenting the findings descriptively.

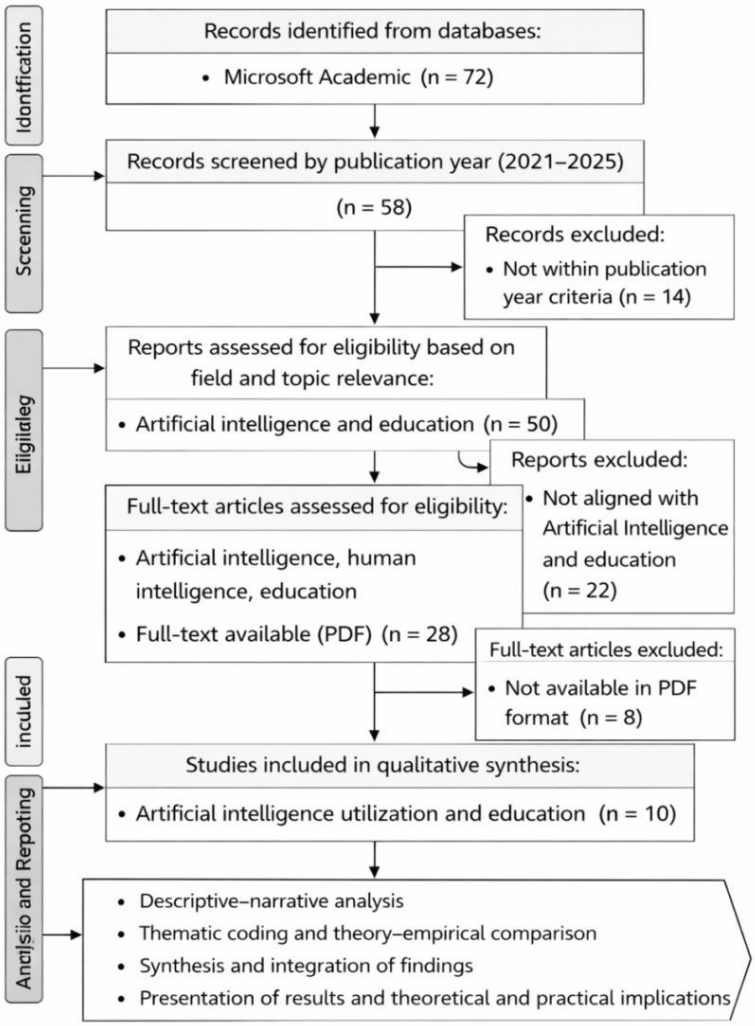

FIGURE 1
Preferred Reporting Item for Systematic and Meta Analyis (PRISMA)

Literature was selected from the last 5–10 years to ensure relevance to the latest developments in AI in education, both in terms of technology, policy, and methodology, so that research findings remain contextual and valid.

3. RESULTS AND DISCUSSION

3.1 Human Intelligence in Education

Based on the qualitative review of 10 selected studies included in the final synthesis stage of screening, human intelligence is closely related to individual performance in utilizing cognitive resources for reasoning, planning, problem-solving, abstract thinking, generating ideas from complex situations, learning quickly and from experience (Gignac & Szodorai, 2024). Meanwhile, Professor Howard Gardner explains that each individual possesses multiple intelligences, including linguistic intelligence, logical-mathematical intelligence, visual-spatial intelligence, bodily-kinesthetic intelligence, musical intelligence, interpersonal intelligence, intrapersonal intelligence, naturalistic intelligence, and existential intelligence (Al-Qatawneh et al., 2021).

Linguistic intelligence refers to an individual's ability to communicate effectively through spoken and written language. Logical-mathematical intelligence involves an individual's capacity to simplify problems and generate solutions logically and rationally. Visual-spatial intelligence is the ability to accurately perceive and interpret visual and spatial information. Bodily-kinesthetic intelligence refers to an individual's skill in using the body to express ideas, thoughts, and emotions. Musical intelligence involves sensitivity to and expression through music, including listening, observing, creating, and arranging music. Interpersonal intelligence is the ability to understand and empathize with the feelings, intentions, motivations, character, temperament, and body language of others. Intrapersonal intelligence is the capacity for self-awareness regarding values, ethics, and morality, along with consistent reflection on one's own ideas, and self-recognition. Naturalistic intelligence refers to the ability to identify, categorize, explain, and interpret phenomena in nature and the environment, such as plants, animals. Finally, existential intelligence is the ability to situate oneself in relation to existential aspects of human life, including the meaning of life, the reality of death, the continuity of the physical world, and other profound experiences (Cichocki & Kuleshov, 2021; Hertanti et al., 2024; Mycka & Mańdziuk, 2025; Poltz et al., 2026; Putra et al., 2024).

Contemporary studies summarize these eight intelligences into three primary variants of human intelligence: Intelligence Quotient (IQ), introduced by William Stern; Emotional Quotient (EQ), introduced by Peter Salovey and John Mayer; and Spiritual Quotient (SQ), comprehensively introduced by Danah Zohar and Ian Marshall. Academic intelligence (IQ) is oriented toward logical and rational thinking, objectivity, empirical reasoning, and pre-personal analysis. The output of this intelligence is realistic and systematic, as exemplified in linguistic and logical-mathematical intelligences (Riwu Kore et al., 2022).

Emotional intelligence (EQ) comprises social intelligence that is associative, emotional, ethical, and empathetic. Emotional intelligence is associated with right hemisphere brain activity and fosters self-awareness and interpersonal relationships (Agustina, 2025). It is categorized under interpersonal and intrapersonal intelligences (Santa et al., 2023). Boyatzis (Riwu Kore et al., 2025) refers to emotional intelligence as a set of competencies, including emotional self-control and self-awareness, while Marlowe (Martin et al., 2024) describes social intelligence as the ability to understand feelings, thoughts, and behaviors of oneself and others in interpersonal situations.

Spiritual intelligence (SQ) is the capacity to confront and resolve questions of meaning and values, situating one's behavior and life within a broader and richer context of significance. SQ effectively integrates and utilizes both IQ and EQ and is considered the highest form of human intelligence (Musli & Subhi, 2022). As such, SQ enables individuals to think unitarily, integrally, and holistically, encompassing spiritual, transcendent, and transpersonal dimensions, allowing them to attain deep meaning and values in the course of life (Baykal, 2024). Spiritual intelligence empowers individuals to manage and transform their life orientation towards a life full of purpose and meaning (Tanveer, 2025).

3.2 Artificial Intelligence in Education

Artificial intelligence (AI) is considered intelligent because it can apply knowledge, learn human behavioral patterns, and record various human feedback or responses for further self-improvement (Pohan et al., 2023). The historical development of artificial intelligence began in the 1950s, when scientists such as Alan Turing and John McCarthy introduced the concepts of intelligent machines and artificial intelligence. Over time, significant advances in computing and algorithms have enabled the development of more sophisticated and efficient AI systems (Sharma, 2024).

There are several types of artificial intelligence used in education. Machine learning is a technique in which computer systems learn from data and experience to improve their performance automatically. Deep learning, a branch of machine learning, employs multi-layered artificial neural networks to understand and analyze complex data. Natural language processing (NLP) refers to the ability of computers to understand, process, and generate human language (Rifky, 2024).

The functions of AI are widely applied across various educational technologies, particularly those based on Android or online platforms, such as visual mentors or AI-based teachers. Additionally, there is a technology called Netex Learning, which provides a cloud-based platform that can be customized for virtual training, workshops, and other features. Netex Learning recommends books, videos, and virtual training sessions based on the specific needs of students (Manongga et al., 2022).

Based on the qualitative review of 10 selected studies included in the final synthesis stage of screening process, human intelligence is consistently linked to individual performance in reasoning, planning, problem-solving, abstract thinking, idea generation, and learning from experience (Gignac & Szodorai, 2024). The reviewed studies also reflect the multidimensional view of intelligence proposed by Howard Gardner, which emphasizes that learning performance is shaped by diverse forms of intelligence rather than a single cognitive ability (Al-Qatawneh et al., 2021). In response to this diversity of human intelligence, the reviewed literature indicates that the most frequently applied types of artificial intelligence in educational settings include intelligent tutoring systems, adaptive learning systems, learning analytics and predictive analytics, automated assessment and feedback systems, natural language processing–based conversational agents, and recommendation systems for personalized learning content. These AI applications are predominantly used to support personalized instruction, monitor learning progress, provide timely feedback, and enhance learning adaptability in digital learning environments. Overall, the synthesis of findings suggests that current AI utilization in education primarily functions to augment and complement human intelligence, rather than replace the

complex cognitive and pedagogical roles of educators and learners identified across the reviewed studies.

3.3 Human Intelligence vs Artificial Intelligence

Artificial intelligence (AI) has a fundamental impact on human activity, as human intelligence itself has some constraints that are easier to overcome through AI. Griffiths (2020) notes that AI in human life helps to mitigate human limitations with respect to time, exhaustive computation, and limited communication. These are the three ingredients that make AI so important in human activities. In contrast, humans need to have the ability to learn fast from few examples, to solve problems by decomposing them, and to build on solutions developed by others.

The use of AI technology poses ethical and legal challenges, such as with Generative AI (GenAI), including: (1) Unreliability and misinformation: GenAI may produce false information and is rarely able to disclose its sources. Certain strategies, such as retrieval-augmented generation, may contribute to mitigating this problem (Corrêa & Mönig, 2024); (2) bias: To identify and replicate patterns, GenAI is educated on massive amounts of data. This may be a cause of some bias that the model absorbs in training data. Closed models such as ChatGPT, on the other hand, are much harder to rigorously test for potential biases and misinformation; and (3) privacy and security: GenAI gathers conversation and interaction information from everyone who uses it, and such information can be retained by the service provider even if a user account is deleted (Chen et al., 2023).

Afandi & Kurnia (2023) describes several consequences of AI technology development, especially on labor and the economy. With the existence of artificial intelligence new jobs are being created which never existed before (Liang et al., 2025). In line with this, society needs to be ready to adjust and learn new capabilities or skills to develop themselves in accordance with the changing needs of the workforce.

The AI revolution also greatly influenced the healthcare industry. Armed with artificial intelligence (AI) and machine learning (ML), medical data can now be analyzed at lightning speed to detect patterns invisible to the human eye, enabling earlier diagnosis of diseases and better treatment. AI may also contribute to patient care management, minimize medical mistakes, and enhance hospital workflow. Nevertheless, AI's capacity to gather and process personal information at scale may pose privacy issues.

A survey of 700 students at Universitas Soedirman held on September 11–17, 2023 showed 60.4% of students used AI for writing, 36.3% indicated strong AI influence on their writing, and 22% recognized a loss in creativity (Universitas Soedirman, 2023). Tirto collaborated with Jakpat (Hartanto & Rohma, 2024) to conduct a survey of 1,501 reader responses about school and university assignments from May 21–27, 2024, and 86.21% of the respondents confessed to using AI help. In addition, a report from WriterBuddy, an AI-driven content service provider, revealed there were 1.4 billion visits to AI sites from Indonesia from September 2022 to August 2023. These results make Indonesia the third largest country for visits to AI sites worldwide after the US (5.5 billion) and India (2.1 billion).

Among the several policy for humanized of AI in education (Ajeng, 2024) were the following: applying a human-based principle in the use of AI, designing a curriculum that is aware of AI evolution, employing AI as a means to expedite personalized learning, closing the gap in technology accessibility and infrastructure, creating ethical and policy frameworks for the use of AI, promoting international cooperation to aid sustainable development via AI, maintaining

readiness and risk management for AI use, cultivating AI competencie s and literacy for teachers and students, and advancing global digital citizenship and AI education.

UNESCO (2022), the eight controversies use AI: (1) Deepening digital poverty: Since GenAI is based on large datasets and intensive computing, the population that can use it has further segmented from those who do not have access to quality equipment as well as good internet under them; which ultimately results in widening of the gap between digital rich and poor individuals, deepening digital inequities; (2) Speeding up of GenAI development: The pace at which functional tools are generated for rapid application exceeds how fast national legal systems repair themselves. Using insufficient regulation can lead to the misuse of technology, such as data security problems and biased usage; (3) Copyright issues: GenAI frequently uses material without the permission of the copyright owner, creating legal and ethical problems and exposing the company to copyright infringement lawsuits; (4) “Black box” issues: It is often difficult to explain the mechanisms of output generation in various GenAI models, which generates opacity and lack of accountability and makes detecting and fixing biases or errors in the outputs of GenAI more difficult; (5) Information Quality: The ease with which people can access and disseminate content created by GenAI will result in a proliferation of low-quality content and lead people to lose trust in the availability and quality of digital content and lead to more false and/or misleading content circulating in the digital environment; (6) Contextual ignorance: As a result of GenAI's failure to grasp real-world situations, it risks generating inappropriate and unreasonable responses. Reliance on GenAI to answer queries increases the likelihood of misleading users and spreading misinformation; (7) Perspectives: GenAI may lead to a reduction in the diversity of views. The result is less representation of minority voices, which increases bias and inequity in the public discourse and decision-making processes; (8) Increase in Deep fakes: Generative AI (GenAI) creates sophisticated deep fakes. This creates risks of disinformation, deception, manipulation, and damage to information and public trust.

Generative AI (GenAI) Policy Challenges in Leading Universities (UNESCO, 2024): (1) Academic dishonesty: students may plagiarize. Students may claim that AI-generated content (e.g., ChatGPT) is their work, but passing AI-generated content off as one's own is academically dishonest and is subject to disciplinary action by the university; (2) Policies and guidelines: there are insufficient policies, expectations, and instruction from faculty regarding the use of GenAI by students in the course. Faculty need to be clear and consistent about the use of GenAI in a course and assignments, and the expectations of academic dishonesty; (3) The design of evaluations and assignments needs to be rethought in light of the issues that GenAI creates. Evaluations and assignments need to focus on outcomes related to the application of advanced thinking, such as critical thinking and synthesis of ideas, which are not possible with GenAI and should be rephrased frequently; (4) Technological limitations – accuracy: GenAI can produce false or biased information. Despite outputs sometimes looking plausible and well-written, AI tools are frequently wrong and not factually accurate; (5) Tech shortcomings — detection: GenAI detection & monitoring tools are unreliable. Thus, because these tools can be biased themselves, even if effective in identifying content (which they're not), they are viewed as inefficient detection methods for GenAI. Faculty are generally discouraged to use these tools; (6) Technology limitations – data security and privacy: the openness of GenAI raises questions in terms of data security and privacy. Systems, applications, and software that process, analyze, or transfer sensitive data require a security review before adoption, even if the software is free; (7) Training and support: Both faculty and students require relevant training. Introducing training for students is necessary

to inform them about the key features of AI content generation tools and, importantly, their limitations; (8) Equity: Issues of fairness and equity arise in GenAI-enabled assessments. If assignments allow the use of GenAI, measures must be taken to ensure equitable access for all students.

3.4 Ethics of Artificial Intelligence Utilization

The key actors related to generative AI within the education system include students, educators, educational institutions, government agencies, and opinion leaders. These actors are interconnected and must collaborate to maximize the positive impacts of innovation adoption. Interpersonal communication among the network of actors within the education system is a critical factor that can accelerate the innovation adoption process (Liu & Zhong, 2025).

UNESCO conducted a global survey of over 450 schools and universities across Africa, the Middle East, Asia, the Pacific, Europe, North America, and Latin America. The survey, conducted between May 4–19, 2023, found that fewer than 10% of educational institutions have formal institutional policies or guidelines regarding the use of AI-based technologies. “The survey results show that we are still very uncertain about the implementation of AI in education,” stated Sobhi Tawil, Director for the Future of Learning and Innovation at UNESCO (REFO, 2023).

Shiyan Jiang, Assistant Professor of Learning, Design, and Technology at North Carolina State College of Education, conducted research on the empowerment of AI in education, focusing on AI for student assessment, AI for personalization, AI ethics, and potential biases, including protecting student privacy, ensuring fairness, and fostering responsible digital citizenship (REFO, 2023).

The University of North Carolina at Charlotte outlines two strategic principles in this context: ethical principles and cognitive principles. The ethical principle emphasizes that students’ use of AI must be transparent and aligned with institutional policies to uphold academic integrity. Therefore, it is important for educational institutions to establish clear guidelines and policies on AI use at the institutional level. The cognitive principle highlights that students should understand that working with AI is intended to support and facilitate learning, rather than serve as a barrier or excuse to avoid learning (REFO, 2023).

Technology has advanced quickly and changed many parts of our lives, especially education. Employing artificial intelligence in teaching and learning brings clear benefits and makes things more convenient. That said, there are some risks involved that can’t be ignored—things like cybercrime, mistakes made by AI, ethical dilemmas, and effects on mental well-being. It wouldn’t make sense to dismiss the role of technology, particularly AI in education, outright. What really matters is approaching this development carefully, making sure technology supports humans rather than replacing or undermining our intellectual role (Dewanto, 2023).

Yollanda & Ramona (2024) discuss some of the difficulties involved in applying AI within educational settings. First, they highlight the technology gap—that is, the divide in digital access particularly between urban and rural regions. Then, they bring up concerns around data security. Even though AI holds considerable promise, putting it into practice for network security brings its own set of tough problems. For one, AI models rely heavily on having good-quality data to learn from. Additionally, these systems can be vulnerable to adversarial attacks, which essentially trick or manipulate the AI. On top of that, there's the challenge of fitting AI tools smoothly into the security frameworks that are already in place, which isn’t as straightforward as it might seem.

AI technology's use in education is subject to several risks, including the potential loss of academic integrity, diminished critical thinking and overreliance; the lack of solidarity due to personalized learning experiences (which may be harmful); the extent of human skills being lost, the impact of effective teaching and its removal from curriculum. To prevent harm to individuals, the environment, and society, Sugiono (2024) asserts that generative AI should be supported by a solid understanding of its ethical utilization.

The foundational principles for trusting AI systems (Dirjen Dikti Ristek, 2024) are as follows: (1) Fairness – ensure AI models are fair to all users; (2) Explainability - ensure that AI datasets, model architecture, and training processes are clearly presented to users); (3) Robustness— ensure artificial intelligence cannot be maliciously hacked or manipulate to harm or benefit specific groups;(4) Transparency communicate when a product is AI-generated and provide summary or metadata about whether this information.

AI's quick advancement has resulted in ethical and responsible use considerations, affecting various aspects of decision-making including freedom of expression, privacy protection, and non-discrimination. Educational curricula in Indonesia have increasingly emphasized the importance of AI literacy. To be well-informed about AI and its functioning, it is essential to possess knowledge of its workings. Literacy is the term used to describe a person's capacity to comprehend, evaluate, interact with, and make decisions using information obtained from AI technologies in practical situations. It includes understanding the fundamental principles of AI, identifying uses, being cognizant of ethical, social and privacy concerns, and acknowledging the effects of artificial intelligence on humans and their emotions, all with the aim of using AI responsibly.

Dirjen Dikti Ristek (2024), states that the key components of AI literacy are: 1) knowledge of artificial intelligence concepts (machine learning and neural networks) to use AI effectively and with a knowledge base of relevant fields to improve productivity in the technology industry; 2) understanding of how AI affects emotions (emotional intelligence and empathy); (3) awareness of the impact of interaction with AI with emphasis on emotional intelligence or AI security;(4) awareness about the safety and security aspects of an AI, including privacy breaches by algorithms and their consequences.

AI literacy in higher education has been shown to enhance skills such as critical thinking, career readiness, writing proficiency, language learning support, and innovative learning methods. When AI users are well literate, they will use it ethically and responsibly. The ethics of GenAI use in learning include: (1) Academic integrity – reflecting the core values of higher education institutions; (2) Data security and protection – addressing high vulnerability and risk associated with digital technologies; (3) Equity and accountability – ensuring fair access and mitigating potential disparities in AI usage; (4) Environmental impact – considering the consequences of GenAI utilization (Dirjen Dikti Ristek, 2024).

The ethical management of artificial intelligence in education differs from country to country, but is based on the same fundamental principles as those examined in the literature. Ethical AI adoption is recognized and promoted by UNESCO on a global level through institutional policies that prioritize human rights, dignity, safety/security, privacy/data protection (Leslie & Perini, 2024), accountability, transparency, explainability, human oversight; sustainability, awareness; literacy, fairness, and non-discrimination. Indonesia's understanding of the importance of AI literacy and responsible AI usage, as outlined by Dirjen Dikti Ristek (2024), emphasizes the need for fairness, transparency, and data privacy when it comes to ethical AI implementation in education. Scholars

highlight the risks of academic integrity, data security, overreliance, bias, and erosion of critical thinking, in addition to a regulatory perspective, emphasizing the necessity of maintaining ethical awareness at both institutional and individual levels. These findings (McDiarmid & Yin, 2025) indicate that while institutional maturity and regulatory structure for ethical AI frameworks vary across nations, they all share a commitment to the promotion of human agency through responsible use and reinforce the core values of education.

3.5 Regulation of AI Utilization

Educational institutions are also recognized as key actors in the primary research literature. The role of educational institutions is essentially similar to that of instructors, namely to understand the perceptions and needs of students in using AI technology. This is necessary so that educational institutions can formulate policies applicable within their environment. Liu & Zhong (2025), schools or universities must develop and implement appropriate guidelines and policies for integrating generative AI technology within their institutions. Policies on generative AI usage set by schools enable actors in the educational environment to understand and evaluate generative AI technologies.

Government agencies responsible for education are also closely involved in policies on generative AI usage and the curriculum implemented in education. For example, the New York City Department of Education has banned access to ChatGPT on all school devices and networks (Grassini, 2023). In the United Kingdom (Departement of Education, 2023), Australia (Departement of Education, 2023), and New Zealand (Kamalov et al., 2023), regulations on the utilization of generative AI within schools have already been established. Funa & Gabay (2025) explain that as AI becomes increasingly integrated into education, there is an urgency to design clear and appropriate policies and guidelines. Similarly, national-level policies and curricula should be capable of facilitating generative AI in teaching and learning activities.

Stanford University, recognizing the potential negative impact of AI adoption on the academic civilization, published the Foundation Model Transparency Index (FMTI) within its curriculum, utilizing 100 indicators divided into three domains: upstream (pre-training), model, and downstream (post-training), measuring the presence or absence of these indicators for each evaluated system (Dirjen Dikti Ristek, 2024). In Indonesia, AI regulations have not been a major concern for schools; efforts are still primarily focused on developing programs of study related to AI (Inilah.com, 2024). Universities such as ITS, BINUS and UNAIR are also involved in the project. Educational institutions are currently more focused on public awareness as part of new study programs, whereas understanding and regulating AI utilization should not only exist at the program level but also institutionally, with ethical AI usage embedded at the organizational level, not solely in individual departments.

The Indonesian government (executive) and the House of Representatives (legislative) have not yet succeeded in developing comprehensive regulations regarding AI adoption. Although discussions on drafting regulations have begun within the Ministry of Communication and Digital Affairs, these efforts are still limited to workshops and discussion series (KOMDIGI, 2024). The government and the House of Representatives should be more proactive in addressing ethical needs in this modern era, considering that the negative impacts of AI adoption could undermine human intelligence itself, potentially resulting in a regression of a nation's scientific advancement and leading to a crisis.

Fritjof Capra (Haba Ora et al., 2020; Riwu Kore, et al., 2020), global crises are caused by: (a) the separation of science, knowledge, and technology from morality, ethics, and spirituality; (b) disharmony or injustice in the utilization of science, knowledge, and technology toward the environment; and (c) a paradigm in which humans place themselves above all else. Brameld (Riwu Kore et al., 2020) states that in such crisis situations, a therapeutic function is necessary, consisting of: (a) diagnosing and prognosing factors causing the crisis; and (b) modifying and innovating scientific theory and philosophy to achieve relatively stable, harmonious, and balanced justice in society based on new social and cultural foundations.

The establishment of AI regulations is crucial due to the threats to moral and ethical aspects inherent in massive technological utilization, which could endanger human survival. Various countries and international organizations have started initiatives to anticipate these concerns. UNESCO has issued recommendations on AI ethics emphasizing the following values (Dirjen Dikti Ristek, 2024): (1) Respect, protection, and promotion of human rights, fundamental freedoms, and human dignity; (2) Care for and protection of the environment and ecosystems; (3) Ensuring diversity, inclusiveness, and peaceful, just, and interconnected societies. Indonesia has existing regulations regarding ethical AI usage, but they remain general in scope and do not yet cover lex specialis, being limited to Ministerial Decree of the Ministry of Communication and Informatics No. 9 of 2023 on Artificial Intelligence Ethics.

According to *The Conversation*, European Union regulations were formulated and issued by the Council and European Parliament on 9 December 2023, referred to as the EU AI Act, a hard-law AI regulation focusing on supporting AI development across multiple sectors. In the United States, no formal legislation has been enacted; however, on 30 October 2023, then-President Joe Biden issued the Executive Order on Safe, Secure, and Trustworthy Artificial Intelligence, regulating AI development and use without violating ethical standards. In Indonesia, AI-related legislation is covered under the Electronic Information and Transactions Law (UU ITE), which focuses on electronic agents, whereas AI is public and widely accessible with massive societal impact. UU ITE primarily regulates industrial standards, such as Minister of Communication and Informatics Regulation No. 3 of 2021 on business activity standards and product standards for risk-based business licensing in postal, telecommunications, and electronic systems and transactions.

3.6 Managerial Implications

Generative AI (GenAI) technology is a tool that offers a wide range of benefits in learning activities, including content creation, content modification, content understanding, content combination, and searching for content and ideas. As a technology that utilizes probabilistic techniques to generate content, GenAI carries various risks in its use. To maximize the benefits of GenAI technology in learning, users must be aware of potential risks.

It is now a certainty that GenAI will be used in learning due to its conveniences. To prevent negative impacts from its use, it is essential to have policies and regulations in place at multiple levels, including government, higher education, curricula, and during learning interactions. The use of GenAI requires policies and rules that safeguard users, ensuring secure, ethically, and responsibly.

The learning process must be altered to mitigate the risks associated with GenAI. Why? Teachers must maintain academic integrity while also focusing on reasoning and engaging with students through various learning methods. ". The use of GenAI must be used safely, ethically,

and responsibly based on several factors, including safety and security in AI usage, data privacy concerns, fairness, transparency, accountability, etc. GenAI's utilization presents both ethical and legal challenges, including errors, misinformation, bias in training data collection practices (such as machine learning), and concerns about privacy and security. Additional information is available on request. Effective mitigation strategies involve training and educating AI professionals on both regular and responsible use of GenAI. Additionally, there are several other approaches in place to address the problem.

4. CONCLUSION

The study suggests that the application of artificial intelligence in educational settings presents a crucial dilemma between its transformative potential and the ethical, pedagogical, and governance challenges it brings. Although artificial intelligence has the potential to improve personalized learning, instructional effectiveness and data visualization, it also presents serious issues with academic integrity, data privacy (as well as an algorithmic bias), and the loss of human participation in educational processes. But the results show that "the question at hand isn't whether we should adopt AI, it is how to integrate it responsibly into educational systems." The challenge lies in balancing regulatory frameworks, strengthening digital and ethical competencies among educators and learners, and implementing policies that align technological innovation with educational values.

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ORCID
Fellyanus Haba Ora 0009-0003-5118-222X
Morrison Hendrik Riwu Kore 0009-0008-9254-4115
Jefirstson R Riwu Kore 0000-0001-8489-5021

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