

DUAL IMPACT OF AI IN EDUCATION: BENEFITS, RISKS AND ETHICAL CONSIDERATIONS

Ayub Hassim¹
Suzyanty Mohd Shokory^{2*}

¹ Daro District Education Office

Email: ayub.hassim@moe.gov.my

² Faculty of Management and Economy, Universiti Pendidikan Sultan Idris

Email: Suzyanty@fpe.upsi.edu.my

* Corresponding Author

Article history

Received date : 19-6-2026

Revised date : 20-6-2026

Accepted date : 25-7-2026

Published date : 1-8-2026

To cite this document:

Hassim, A., & Mohd Shokory, S. (2026). Dual impact of AI in education: Benefits, risks and ethical considerations. *Journal of Islamic, Social, Economics and Development (JISED)*, 11 (85), 335 – 350.

Abstract: *This mini-review explores the dual impact of Artificial Intelligence (AI) in education focusing on its benefits, risks and ethical challenges perspectives. The aim of this mini-review is to understand how AI is reshaping teaching, learning and administration of education institution while also confronting the issues arises. A literature search was carried out using Boolean search technique in the Scopus database drawing on studies that discussed AI in education, including original research, reviews, meta-analyses and case studies. The findings show that AI offers clear advantages. It supports personalized and adaptive learning, widens access for diverse learners, streamlines administrative tasks through automation and enriches engagement with tools like intelligent tutoring systems and generative AI. At the same time, serious risks persist such as algorithmic bias, threats to data privacy, academic dishonesty and over-reliance on AI tools that may weaken critical thinking and the teacher-student connection. Ethical considerations add further complexity, particularly around transparency, fairness, accountability and the need to preserve human agency. Debates continue on equity in resource-limited settings and on cultural biases rooted in Western-centric datasets. Significant gaps remain especially in understanding the long-term societal, cultural and emotional consequences of AI in education. In conclusion, while AI has the power to transform and democratize education, its successful integration will depend on strong ethical frameworks, inclusive policies, AI literacy and interdisciplinary collaboration to ensure innovation is balanced with equity and accountability.*

Keywords: *Artificial Intelligence, Education, Benefits, Risk, Ethical Consideration*

Introduction

Artificial Intelligence (AI) is transforming education by improving teaching, learning and educational management (Baker & Hawn, 2022; Holmes et al., 2019). AI enables personalized learning by adapting instructional content to students' individual needs. It also improves student engagement and learning outcomes through adaptive learning systems and intelligent tutoring platforms (Holmes et al., 2019; Zawacki-Richter et al., 2019). In addition, AI reduces teachers' administrative workload by supporting tasks such as grading, feedback generation and scheduling. This allows teachers to spend more time on teaching and student development. Recent studies also show that AI can improve teaching quality, strengthen students' self-efficacy and create more interactive learning experiences (Zhang et al., 2025; Wang et al., 2025).

Despite these advantages, the increasing use of AI also creates several challenges. These include algorithmic bias, data privacy, cybersecurity, academic integrity and excessive dependence on AI technologies (Baker & Hawn, 2021; Selwyn, 2022). AI systems trained using biased data may produce unfair decisions and widen educational inequalities. The extensive collection of students' personal data also raises concerns about privacy and data protection. Furthermore, excessive reliance on AI may weaken students' critical thinking, creativity and independent problem-solving skills. It may also reduce meaningful interactions between teachers and students (López-Borrull & Lopezosa, 2025; Tortella et al., 2025). Although these issues have been widely discussed internationally, evidence from the Malaysian education context remains limited. Most previous studies have focused on the usefulness, acceptance and educational benefits of AI. Comparatively fewer studies have examined how AI can be implemented ethically, responsibly and sustainably within Malaysian schools and higher education institutions (Mat Yusoff et al., 2025).

This research gap is becoming increasingly important because Malaysia is actively promoting digital transformation through the *Rancangan Pendidikan Malaysia* (RPM) 2026-2035. In particular, Strategic Thrust 4 emphasises strengthening digital education, expanding the use of emerging technologies and building a future-ready education ecosystem through the responsible integration of digital technologies, including artificial intelligence (Ministry of Education Malaysia, 2025). Therefore, there is an urgent need to examine AI implementation from a broader perspective that considers not only its educational benefits but also its ethical, organisational and policy implications within the Malaysian context. Such evidence can assist policymakers, educational institutions and educators in developing effective governance frameworks, enhancing teachers' digital and AI competencies, and ensuring that AI is implemented responsibly, equitably and sustainably. The findings may also support the successful implementation of Strategic Thrust 4 of the RPM 2026-2035 and contribute to the development of a resilient, inclusive and digitally empowered national education system (UNESCO, 2023; Ministry of Education Malaysia, 2025).

Methods

A comprehensive literature search was conducted using Scopus databased. Boolean search such as ("artificial intelligence" OR "ai" OR "machine learning" OR "deep learning") AND ("dual impact" OR "impact" OR "benefits" OR "risk" OR "ethical") AND ("education" OR "learning" OR "teaching" OR "instruction") AND ("impact" OR "effect" OR "influence" OR "outcome") AND ("dual" OR "multiple" OR "combined" OR "synergistic") AND ("technology" OR "digital" OR "innovation" OR "tools") AND ("student" OR "learner" OR "educator" OR "teacher"). The searched was conducted on 31 March 2026. Keywords such as artificial

intelligence, machine learning, dual-impact and education were utilized to collect relevant articles. Various types of articles, including original research, systematic reviews, scoping review, meta-analyses and case studies were considered for this mini review. Figure 1 illustrates the PRISMA flow diagram, which outlines the systematic article selection process, including the identification, screening, eligibility assessment and final inclusion of studies based on the predetermined inclusion and exclusion criteria.

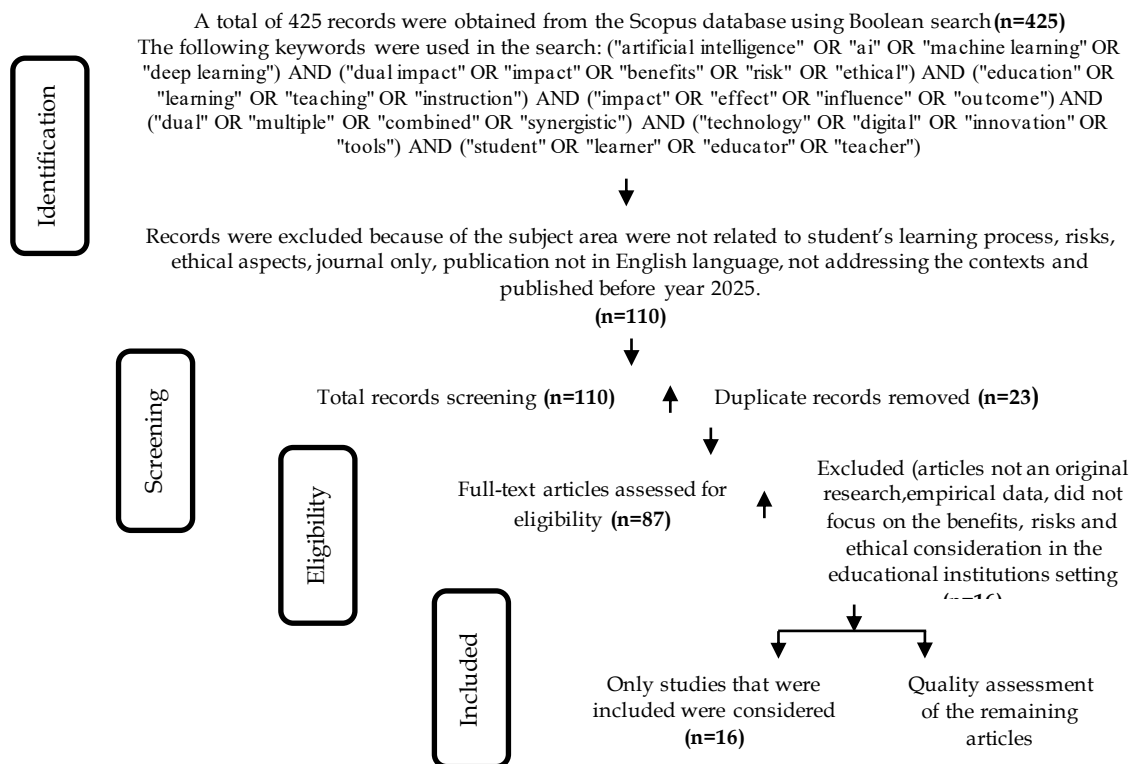


Figure 1: PRISMA Flow Diagram

Inclusion Criteria

The main purpose of determining the inclusion criteria is to specify the characteristics that must have to be included in the study. It's also function to ensure that the selected evidence is directly related to the study. Therefore, in the context of this study, there are four inclusion criteria regarded as the guideline to choose the specific reference. The four inclusion criteria are as follows;

- i. Studies discussing the integration of AI into education reveal its capacity to address global challenges such as teacher shortages, accessibility gaps and personalized learning demands. These works consistently identify machine learning, generative AI, and predictive analytics as the most impactful technologies for shaping adaptive and scalable learning environments.
- ii. Studies focusing on generative AI tools, such as chatbots and intelligent tutoring systems, demonstrate their value in automating assessments, streamlining administrative efficiency and enhancing learner engagement. However, these applications also raise pressing concerns around academic integrity, data security and the risk of fostering student dependency.
- iii. Studies analyzing the strengths, limitations, and potential applications of AI emphasize its promise in fostering inclusivity-such as improved accessibility for learners with

disabilities and equitable resource distribution-while simultaneously warning of risks like algorithmic bias, western-centric datasets and privacy violations. These limitations often undermine the very equity AI aims to promote, fueling ongoing controversies over fairness, transparency and accountability in educational AI systems.

iv. Studies published in English

Exclusion Criteria

As for the exclusion criteria, it's function to identify studies that should not be included, even if they appear related to the topic. To be specific, exclusion criteria help eliminate irrelevant, low-quality or inappropriate evidence. In this study, the exclusion criteria are as follows;

- i. Studies published in languages other than English were excluded.
- ii. Studies that discuss education without explicit reference to Artificial Intelligence (AI) were excluded.
- iii. Grey literature (e.g., conference abstracts, unpublished reports) was excluded.

Discussion and Result

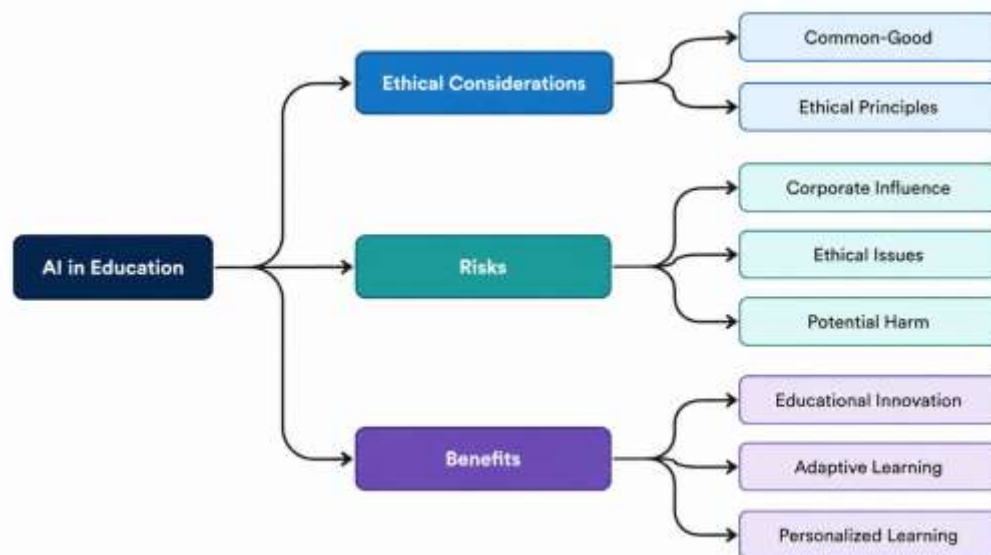


Figure 2: Concept map of the dual-impact of AI in Education

The Benefits

Artificial Intelligence (AI) has emerged as a transformative technology that enhances teaching, learning and educational management by providing more personalised, adaptive and inclusive learning experiences. Recent studies consistently show that AI improves learning efficiency through adaptive learning systems, intelligent tutoring systems, generative AI applications and learning analytics, enabling instruction to be tailored to students' individual abilities, learning pace and educational needs (Kalendera et al., 2025; Zhang et al., 2025; Chandra, 2025; Zhong et al., 2025). These technologies enable educators to identify learning gaps more accurately, provide immediate feedback and develop targeted interventions that improve students' academic performance and learning engagement (Gresko, 2025; Singhal et al., 2026). AI also plays an important role in promoting educational inclusion. AI-powered translation tools, speech recognition, text-to-speech applications and accessibility technologies help reduce barriers faced by students with disabilities and learners from diverse linguistic and cultural backgrounds (Singhal et al., 2026; Chandra, 2025). In higher education, recent evidence

suggests that AI supports collaborative learning, self-regulated learning and digital competence development while increasing learners' confidence in using emerging technologies (Mahawar et al., 2026; Zhong et al., 2025).

Furthermore, AI-supported emotional analytics and intelligent recommendation systems can improve learner motivation, engagement and classroom participation by providing timely and personalised learning support (Yadav, 2024; Ma et al., 2025). Beyond student learning, AI offers considerable benefits for educators and educational institutions. AI automates administrative tasks such as grading, assessment, feedback generation, lesson planning and scheduling, allowing educators to devote more time to teaching, mentoring and personalised instruction (Rachovski et al., 2024). Recent systematic reviews further indicate that generative AI can support curriculum development, content creation, formative assessment and professional learning for teachers, thereby improving instructional quality and educational efficiency (Mohamad et al., 2025). AI-powered chatbots, intelligent tutoring systems and adaptive testing also provide scalable learning support, helping educational institutions address teacher shortages and unequal access to educational resources (Kalendera et al., 2025). Recent Scopus-indexed studies also demonstrate that AI contributes to the development of twenty-first-century competencies, including problem-solving, creativity, critical thinking and digital literacy, particularly when AI is integrated as a complementary instructional tool rather than a replacement for teachers (Zhong et al., 2025; Mahawar et al., 2026). These findings suggest that AI is increasingly viewed not only as a technological innovation but also as a pedagogical partner that supports more flexible, student-centred and evidence-based teaching practices.

Overall, the literature shows that AI has significant potential to improve educational accessibility, learning quality, instructional effectiveness and institutional efficiency (Luan et al., 2026; Halim et al., 2026). AI supports personalised learning by adapting instruction to students' individual needs. It also promotes innovative teaching practices and enhances students' learning experiences across different educational settings (Luan et al., 2026; Halim et al., 2026). Despite these benefits, most existing studies have focused on AI adoption in higher education. The emphasis has mainly been on technology acceptance, learning performance and knowledge management. Comparatively, fewer studies have examined how AI can be effectively implemented in primary and secondary schools (Hussein et al., 2026). Research on institutional readiness, governance, teachers' AI competencies and equitable AI implementation also remains limited, particularly in developing countries such as Malaysia (Khoo et al., 2026). These gaps highlight the need for further research on the responsible, ethical and sustainable use of AI in education. More evidence is needed to help educational institutions develop effective governance, strengthen teachers' digital competencies and promote equitable access to AI technologies. Such efforts are consistent with the recommendations of UNESCO (2023) and the aspirations of the Rancangan Pendidikan Malaysia (RPM) 2026-2035, which emphasises digital transformation and the responsible integration of emerging technologies in education (Ministry of Education Malaysia, 2025).

The Risk

Despite the transformative potential of artificial intelligence (AI) in education, its implementation also introduces several important risks. AI is increasingly used to support personalised learning, automated assessment and educational decision-making. These technologies improve learning efficiency and reduce teachers' administrative workload. They also provide more flexible and accessible learning opportunities. However, the increasing use

of AI raises important questions about the extent to which educational processes should depend on automated systems. Learning is not only a technological process but also involves human interaction, critical thinking and social development, which cannot be fully replaced by AI. The rapid adoption of AI also creates several risks that may affect educational quality and equity if they are not properly managed. One of the main concerns is data privacy. AI systems require large amounts of learner data, increasing the risk of unauthorised access and misuse of personal information. Concerns have also been raised about algorithmic bias, cybersecurity and academic integrity. AI-generated content may encourage plagiarism, spread inaccurate information and reduce the authenticity of students' work. Furthermore, excessive reliance on AI may weaken students' critical thinking, creativity and independent problem-solving skills. These challenges highlight the importance of ensuring that AI supports, rather than replaces, human judgment in education.

The risks associated with AI extend beyond technical issues. They also involve ethical, cultural and social considerations. Long-term dependence on AI may influence students' learning behaviour and reduce meaningful interactions between teachers and learners. Unequal access to digital infrastructure and AI technologies may also widen educational disparities, particularly among disadvantaged communities. These challenges demonstrate that successful AI implementation depends not only on technological advancement but also on responsible governance, equitable access and strong human oversight. Therefore, international organisations such as UNESCO (2023) have emphasised the need for ethical AI governance, comprehensive AI literacy and policies that promote fairness, transparency and accountability. Within the Malaysian context, these risks require even greater attention as the education system continues to accelerate its digital transformation. Although AI offers significant opportunities to improve teaching and learning, its successful implementation depends on reliable digital infrastructure, institutional readiness and teachers' AI competencies. Differences in internet connectivity, digital facilities and AI literacy may create unequal learning opportunities among schools. These challenges are likely to be more pronounced in rural and underserved areas, where technological resources and professional support remain limited. Previous studies have shown that institutional readiness and teachers' competencies are essential for the successful adoption of AI in education (Khoo et al., 2026; Halim et al., 2026).

However, empirical evidence examining these issues in Malaysian primary and secondary schools remains limited. Another important concern is the limited evidence on AI governance and responsible implementation in Malaysian schools. Most existing studies have focused on AI adoption, learning performance and knowledge management, particularly in higher education. Comparatively fewer studies have examined the policy, ethical and organisational risks of AI implementation across the school system (Hussein et al., 2026). As AI becomes more widely integrated into educational practice, schools will require clear governance frameworks, practical implementation guidelines and continuous professional development for teachers. These measures are necessary to ensure that AI protects learners' rights, promotes equitable access to quality education and supports responsible educational innovation. This direction is consistent with the recommendations of UNESCO (2023), which advocate human-centred AI, ethical governance and the development of educators' AI competencies. Similarly, Luan et al. (2026) emphasised that successful AI integration depends not only on technological innovation but also on strong institutional capacity and effective educational support systems.

Overall, the literature suggests that AI-related risks should not be viewed as barriers to innovation but as challenges that require careful planning and effective governance. Existing

evidence has expanded our understanding of AI adoption and its educational potential. However, important gaps remain regarding its long-term implementation, particularly in school settings and developing countries. Future research should therefore examine practical strategies for strengthening institutional readiness, improving AI governance and enhancing teachers' competencies. Such evidence will help ensure that AI is implemented responsibly, ethically and sustainably while maximising its benefits for all learners.

Ethical Consideration

Ethical considerations have become one of the most important issues in the adoption of artificial intelligence (AI) in education. Although AI has the potential to improve teaching, learning and educational management, its increasing use has also raised important ethical concerns. These concerns include privacy, transparency, accountability, fairness and academic integrity (Tortella et al., 2025; López-Borrull & Lopezosa, 2025). AI systems increasingly influence educational decisions, learning opportunities and assessment processes. As a result, ethical issues are no longer viewed as technical challenges alone. They are now recognised as essential factors in ensuring that AI supports education without compromising human values and learners' rights (UNESCO, 2023).

As AI becomes more widely adopted, new ethical challenges continue to emerge. One of the main concerns is the protection of learners' personal data. AI systems require large amounts of educational data, increasing the need for responsible data management and informed consent. Concerns have also been raised about algorithmic bias, digital inequality and the unequal distribution of AI benefits across different educational contexts (Hanshaw & Sullivan, 2025; López-Borrull & Lopezosa, 2025). Furthermore, AI-generated recommendations may influence educational decisions in ways that are difficult for educators and learners to understand or question. These issues highlight the importance of transparency, accountability and human oversight in AI-supported education (UNESCO, 2023).

The ethical use of AI also depends on how the technology is applied in daily educational practice. AI-powered tools can improve personalised learning, accessibility and student engagement. However, excessive dependence on AI may reduce students' opportunities to think critically, solve problems independently and make their own academic decisions (Sun et al., 2025). AI-generated content may also increase the risk of plagiarism, misinformation and other forms of academic misconduct if appropriate safeguards are not established (Tortella et al., 2025). Therefore, AI should be used to support teaching and learning rather than replace educators' professional judgment. Close collaboration among educators, researchers, policymakers and technology developers is essential to ensure that AI is implemented responsibly and ethically (UNESCO, 2023).

From the Malaysian perspective, ethical considerations should become an integral part of AI implementation across the education system. Although AI offers significant opportunities to improve teaching quality and learning outcomes, successful implementation depends on more than technological advancement. Equal attention should be given to data protection, transparency, fairness and respect for learners' rights. Teachers also require adequate AI knowledge and ethical awareness to evaluate AI-generated content, protect students' personal information and make appropriate instructional decisions. Previous studies have shown that teachers' competencies and institutional readiness are important for the responsible adoption of AI in education (Khoo et al., 2026; Halim et al., 2026). However, empirical evidence examining these ethical issues within Malaysian primary and secondary schools remains limited.

Another important issue is the lack of evidence on AI governance and ethical implementation in Malaysian schools. Most existing studies have focused on AI adoption, learning performance and knowledge management, particularly in higher education. Comparatively fewer studies have examined how ethical principles can be translated into school policies, governance practices and classroom implementation (Hussein et al., 2026). As AI technologies continue to evolve, educational institutions will require clear ethical guidelines, effective governance frameworks and continuous professional development for educators. These efforts are necessary to ensure that AI is implemented responsibly, transparently and fairly. They are also consistent with the recommendations of UNESCO (2023), which promote human-centred AI and ethical governance. Similarly, Luan et al. (2026) emphasised that successful AI implementation depends not only on technological innovation but also on strong institutional capacity, ethical leadership and continuous support for educators.

Overall, the literature indicates that ethical considerations should be regarded as a fundamental component of AI implementation rather than an issue to be addressed after adoption. While AI offers substantial educational benefits, responsible implementation requires strong governance, ethical standards, institutional readiness and competent educators. Future research should therefore examine practical approaches for strengthening AI governance, improving teachers' ethical competencies and developing implementation frameworks that are appropriate for different educational contexts, particularly in Malaysian primary and secondary schools. Such evidence will help ensure that AI is used responsibly, ethically and sustainably while protecting learners' rights and promoting equitable access to quality education.

The graph in **Figure 3** shows publication trends from 1989 to 2026. For nearly three decades (1989-2017), the number of documents remained very low. A gradual rise began around 2018, followed by a sharp surge from 2019 onwards. The peak occurred and recorded a significant increase in 2024 and 2025 with over 600 publications. Overall, the data highlights an explosive growth of research in the early 2020s, marking the peak period of scholarly interest.

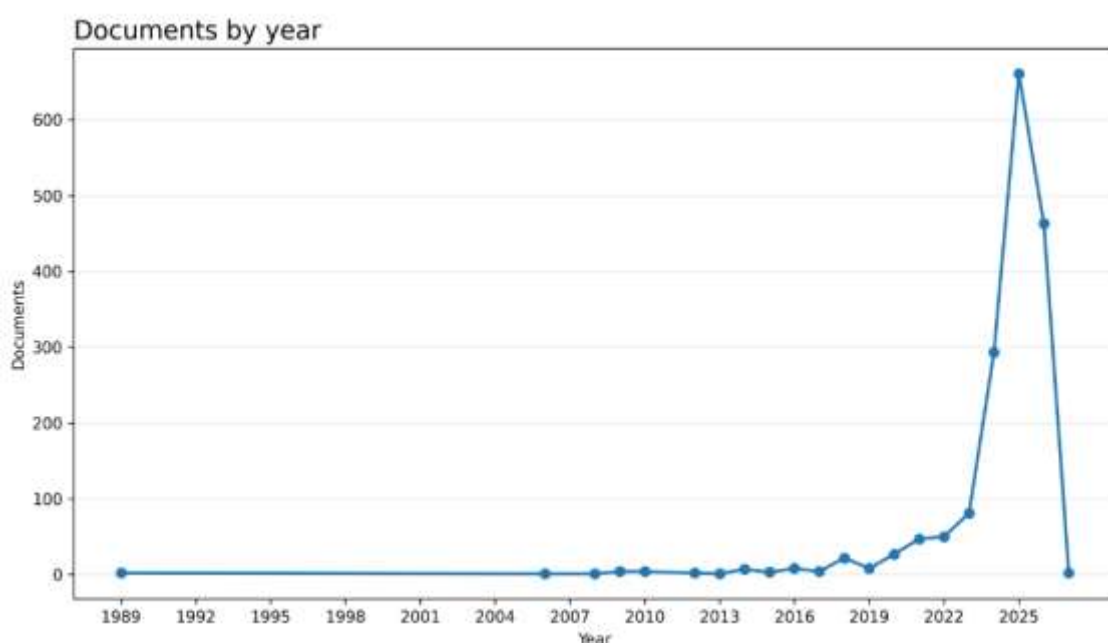


Figure 3: Publication Time-Series Line Chart

The graph in Figure 4 highlights document contributions by country. Among Asian countries, China leads with nearly 340 publications, followed by India (≈ 130) and Malaysia (≈ 40). Saudi Arabia also contributes around 40 documents. This shows Asia's strong research presence, with China dominating globally, while India, Malaysia and Saudi Arabia indicate growing but smaller-scale contributions to the field.

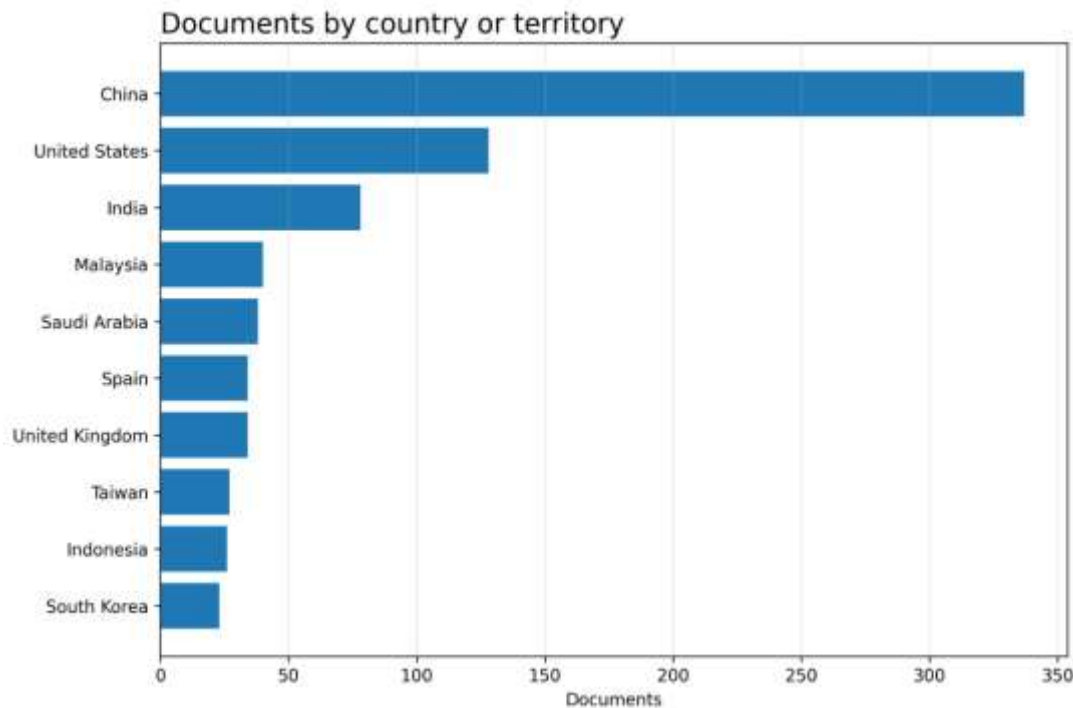


Figure 4: Publication by Country

The publication trend in **Figure 5** shows that articles dominate with 54.5%, followed by conference papers at 28%, reflecting strong dissemination in both journals and conferences. Conference reviews (6.6%), book chapters (4.3%), and reviews (3.8%) contribute moderately. Smaller shares include books (2.2%), while editorials, notes and retracted papers account for less than 1% each. This indicates that scholarly communication in the field is primarily driven by peer-reviewed journal articles and conference contributions, underscoring the balance between theoretical development and practical discussion-based dissemination.

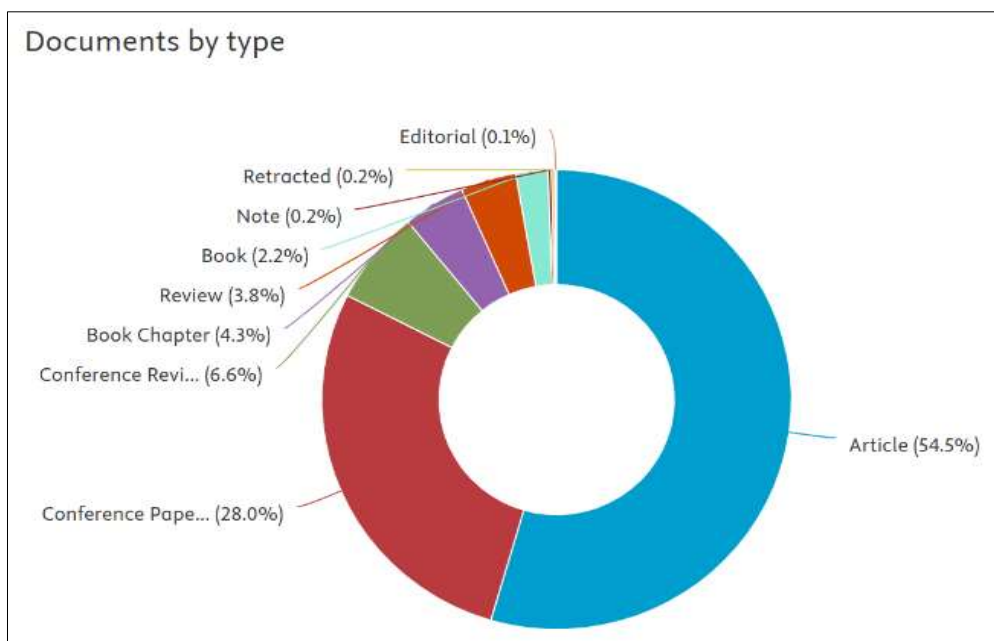


Figure 5: Publication by type

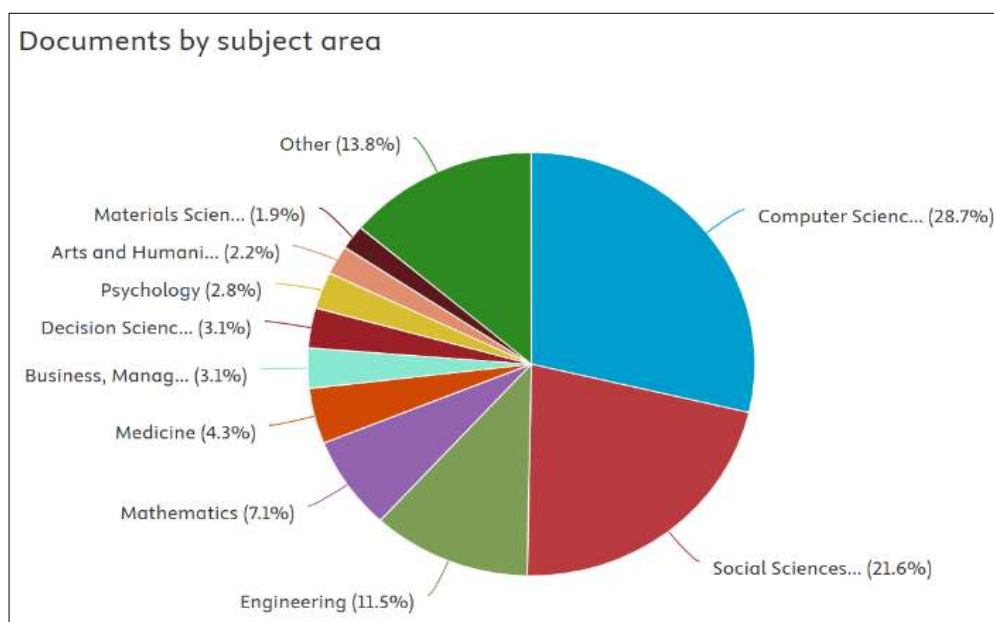


Figure 6: Publication by subject area

The chart in **Figure 6** shows publications by subject area. Computer Science dominates with 28.7%, followed by Social Sciences (21.6%) and Engineering (11.5%). Other significant fields include Mathematics (7.1%) and Medicine (4.3%). Smaller contributions come from Business/Management (3.1%), Decision Sciences (3.1%), Psychology (2.8%), Arts and Humanities (2.2%), and Materials Science (1.9%). The Other category accounts for 13.8%, reflecting diverse interdisciplinary research. Overall, the trend highlights strong engagement in technology-driven and human-focused domains.

Table 1 presents a selection of recent studies on artificial intelligence (AI) in education published between 2025 and 2026 in Scopus databased. The studies were chosen to provide an

overview of current research trends, highlighting the benefits, risks, ethical considerations and future directions associated with AI adoption in educational settings. Collectively, these studies demonstrate the growing interest in understanding both the opportunities and challenges of AI integration, while emphasizing the importance of responsible, equitable and sustainable implementation in education.

Table 1: Recent Research on AI in Education (Scopus Databased)

Author	Year	Article Title	Main Findings
Zhang, L., Liu, Z., Zhao, L., & Gao, J.	2025	The Impact of Digital Technology Use on Teaching Quality in University Physical Education	Benefits: Digital technologies, including AI-supported learning tools, improve teaching quality by strengthening teacher support and enhancing students' self-efficacy.
López-Borrull, A., & Lopezosa, C.	2025	Mapping the Impact of Generative AI on Disinformation: Insights from a Scoping Review	Risks & Ethical Considerations: Generative AI increases the risk of misinformation and fabricated content. At the same time, it highlights the ethical importance of AI literacy, fact-checking and responsible AI use.
Sun, W., Jiang, Z., & Hai, S.	2025	The Double-Edged Sword Effect of Interaction Frequency with AI on College Students	Benefits & Risks: AI interaction can promote positive learning behaviours and collaboration. However, excessive dependence on AI may increase loneliness and reduce meaningful peer interaction.
Liu, Y., Wang, Q., & Lei, J.	2025	Adopting Generative AI in Future Classrooms	Benefits: Teachers are more likely to adopt AI when they perceive it as useful, easy to use and when they possess sufficient AI self-efficacy, indicating the importance of AI competency development.
Bjurström, M. F. et al.	2025	Digital Learning Resource Use among Swedish Medical Students	Benefits: AI-supported digital resources encourage flexible, self-directed and personalised learning among university students.
Wang, L. et al.	2025	Teaching Innovation in a Pharmacy Course	Benefits: The teacher–AI–student instructional model enhances higher-order thinking, questioning ability and knowledge application through collaborative human–AI interaction.
Chance, E. A.	2025	The Combined Impact of AI and VR on Interdisciplinary Learning	Benefits & Ethical Considerations: AI combined with VR improves technical competence, teamwork and decision-making while highlighting the need for ethical judgement in healthcare education.
Hanshaw, G., & Sullivan, C.	2025	Exploring Barriers to AI Course Assistant Adoption	Risks: Low awareness, limited course integration and unclear value reduce AI adoption, suggesting that institutional readiness remains a significant implementation challenge.
Tortella, F. et al.	2025	Knowledge and Use of AI Chatbots among Italian Physiotherapy Students	Benefits, Risks & Ethical Considerations: Students recognise AI chatbots as useful learning tools but remain concerned about information accuracy, academic integrity and ethical use.
Mat Yusoff, S. et al.	2025	Understanding the Role of AI in Malaysian Higher Education Curricula	Benefits: AI acceptance among Malaysian university students is driven primarily by user satisfaction, supported by perceived usefulness and system credibility.

Mahawar K., Rattan P., Jalamneh A., Ab Yajid M.S., Abdeljaber O., Kumar R., Lasisi A., & Ammarullah M.I.	2025	Employing Artificial Bee and Ant Colony Optimization in Machine Learning Techniques as a Cognitive Neuroscience Tool	Benefits: AI-assisted learning enhances students' engagement, learning efficiency and academic performance when integrated into instructional activities.
Luan, J., Halim, H.A., & Saad, M.R.M.	2026	The Effect of AI and Multiple Intelligences in Project-Based Learning on English Achievement	Benefits & Ethical Considerations: AI supports personalised learning and adaptive instruction, but successful implementation depends on teacher readiness, governance and responsible educational policies.
Khoo J.Z.Y., Hollinger F., Han J.Y., Lin C., Tsai C.- C., Schwartz Pohlmann J.K., Anzola D., Choo Y.S.L., & Fung F.M.	2026	Tipping Point in the Future Readiness of Artificial Intelligence and Chemistry Education	Benefits & Risks: AI improves teaching innovation and learning effectiveness; however, unequal digital access and insufficient teacher competency may widen educational disparities.
Halim, U., Ali, M.N.S., & Salleh, S.M.	2026	Artificial Intelligence Use and Digital Educational Practices	Benefits: AI can strengthen teaching effectiveness and assessment practices when educators receive appropriate professional training and institutional support.
Hussein H.D., Ali H.A.H., Abdulmuhsin A.A., Rehman S.U., Al-Adwan A.S., & Jaboob M.	2026	Empowering Knowledge Management in Higher Education	Ethical Considerations: Responsible AI implementation requires strong governance, protection of personal data, transparency of AI systems and clear ethical guidelines for educational use.

Local Impact

From Malaysian perspective, the integration of AI in education mirrors many of the global dynamics observed in international studies but is uniquely shaped by national educational priorities and infrastructure disparities. The Ministry of Education's emphasis on digital transformation and personalized learning aligns with the positive findings of Chance (2025) and Zhang et al. (2025), highlighting AI's potential to improve accessibility and efficiency across urban and rural schools. However, local realities-such as uneven broadband access, limited teacher readiness and disparities in digital literacy-exacerbate the very inequalities identified in global research by Tortella et al. (2025) and Wang et al. (2025). The growing adoption of AI tools for assessment and administrative tasks in Malaysia's schools also introduces ethical and psychological implications similar to those raised by Bjurström et al.

(2025) and Liu et al., (2025), particularly regarding over-reliance and diminished pedagogical autonomy. Moreover, Mat Yusoff et al. (2025) emphasize the need for national regulatory frameworks that balance innovation with accountability—an urgent issue as Malaysia seeks to operationalize the *AI in Education Policy Framework (KPM 2025)* to mitigate algorithmic bias and data privacy concerns. The collective evidence suggests that while AI-driven education can enhance teaching quality and inclusion, without robust ethical governance, the risks of cultural homogenization, teacher deskilling, and inequitable access could widen Malaysia's existing educational gap. Hence, integrating ethical literacy and local contextualization within AI policies is critical to ensure that Malaysia's digital evolution in education remains both equitable and culturally grounded.

Within the context of Malaysia's primary and secondary education system, the increasing adoption of artificial intelligence (AI) in education has significant implications for the nation's educational transformation agenda as outlined in the Malaysia Education Development Plan 2026-2035. The plan recognizes the importance of future-oriented competencies through Strategic Thrust 2, which emphasizes the development of students' future-ready skills and Strategic Thrust 3, which focuses on empowering educators with the capabilities required to navigate emerging educational technologies. In addition, the Smart Assessment enabler highlights the integration of digital technologies and artificial intelligence to support more comprehensive, data-informed and adaptive assessment practices, while Strategic Thrust 4 provides the necessary digital infrastructure and infostructure to facilitate the effective implementation of AI across the education system (Ministry of Education Malaysia, 2026).

In this context, AI offers considerable potential to support personalized learning, enhance assessment practices, automate administrative processes and expand access to quality educational resources, particularly in geographically dispersed regions. However, the successful implementation of AI in Malaysian schools remains dependent on addressing persistent challenges such as disparities in digital infrastructure, unequal access to technology and variations in teachers' digital competencies. These challenges are particularly relevant in rural and underserved communities, where the benefits of AI may not be experienced equally. Furthermore, as AI becomes increasingly embedded in educational practices, concerns related to data privacy, algorithmic bias, transparency and ethical decision-making require greater attention from policymakers and educational stakeholders. Therefore, the local impact of AI extends beyond technological innovation, underscoring the need for effective governance, continuous professional capacity building and context-sensitive implementation strategies to ensure that the aspirations of the Malaysia Education Development Plan 2026-2035 are achieved in an equitable, inclusive and sustainable manner (Ministry of Education Malaysia, 2026).

Conclusion

Artificial Intelligence (AI) is increasingly becoming an important part of modern education. This mini review has shown that AI offers significant opportunities to improve teaching, learning and educational management. Through technologies such as adaptive learning systems, intelligent tutoring platforms, automated assessment and generative AI tools, AI can support personalized learning, improve accessibility and increase learning flexibility. AI also helps educators reduce administrative workload, allowing them to focus more on teaching, mentoring and supporting students. These advantages demonstrate AI's potential to create more inclusive, efficient and responsive educational environments. Despite these benefits, the review also highlights several important risks and challenges associated with AI adoption in education.

Issues related to data privacy, cybersecurity, algorithmic bias and academic integrity continue to raise concerns among researchers, educators and policymakers. The increasing use of AI-generated content may contribute to misinformation, plagiarism and the spread of inaccurate knowledge if appropriate safeguards are not established.

Furthermore, excessive reliance on AI tools may reduce opportunities for students to develop critical thinking, independent reasoning and problem-solving skills. These concerns suggest that the educational value of AI should not be evaluated solely based on efficiency and technological performance. Ethical considerations remain central to the successful integration of AI in education. Questions regarding fairness, transparency, accountability and human oversight must be addressed to ensure that AI systems support rather than replace human judgment. The review also highlights broader concerns related to digital inequality, unequal access to technological resources and the influence of culturally biased datasets. Without careful planning and governance, AI may unintentionally reinforce existing educational and social disparities, particularly among learners from underserved communities.

In the Malaysian context, the aspirations outlined in the Malaysia Education Development Plan 2026-2035 provide a strong foundation for the responsible integration of AI across the education system. The emphasis on future-ready competencies, educator transformation, smart assessment and digital infrastructure reflects the growing recognition of AI as an important enabler of educational innovation. However, achieving these aspirations requires continuous investment in infrastructure, professional development, AI literacy and ethical governance. In conclusion, AI should be viewed as a tool that complements and strengthens human capabilities rather than replacing educators. The future of AI in education depends on balancing innovation with responsibility, efficiency with equity and technological advancement with human values. Through collaborative efforts among educators, researchers, policymakers and technology developers, AI can contribute to a more inclusive, ethical and sustainable educational future.

Acknowledgements

The authors would like to express their sincere appreciation to the Ministry of Education Malaysia for providing financial sponsorship and support for the first author's doctoral studies. The authors also extend their gratitude to the organising committee of the *Seminar Penyelidikan Kebangsaan 2026* for providing a valuable platform for scholarly writing, knowledge sharing and the presentation of research findings. Their support and commitment to fostering academic discourse are greatly appreciated.

References

- Baker, R. S., & Hawn, A. (2022). Algorithmic bias in education. *International Journal of Artificial Intelligence in Education*, 32(4), 1052-1092. <https://doi.org/10.1007/s40593-021-00285-9>
- Bjurström, M. F., Borgquist, O., Kander, T., Lunden, R., Fagerlund, M. J. & Lipcsey, M. (2025). Generative AI: Reasons for using and frequency of use related to submission tasks among medical students. *BMC Medical Education*, 25(849). <https://doi.org/10.1186/s12909-025-07446-7>
- Chandra, R. (2025). Learning reimaged: Role of AI in empowering classroom education. In B. Gupta (Ed.), *Unveiling Social Dynamics and Community Interaction in the Metaverse* (pp.271-280). IGI Global Scientific Publishing. <https://doi.org/10.4018/979-8-3693-8628-6.ch013>
- Gresko, G. (2025). Ethical considerations for the use of Artificial Intelligence (AI) in education. *Generative Artificial Intelligence Applications: Holistic Reflections From The Educational Landscape*, 269-300.
- Halim, U., Ali, M.N.S., & Salleh S.M. (2026). Artificial intelligence use and digital educational practices: Differential effects on learning achievement and satisfaction among Indonesian university students. *Multidisciplinary Science Journal*, 8.0(10.0). <https://doi.org/10.31893/multiscience.2026809>
- Hanshaw, G., & Sullivan, M. (2025). Exploring barriers to AI course assistant adoption in higher education. *Open Praxis*, 17(1), 45-63. <https://doi.org/10.55982/openpraxis.17.1.719>
- Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial Intelligence in Education: Promise and Implications for Teaching and Learning*. Center for Curriculum Redesign.
- Hussein, H.D., Ali, H.A.H., Abdulmuhsin, A.A., Rehman, S.U., Al-Adwan A.S., & Jaboob, M. (2026). Empowering knowledge management in higher education: The synergistic impact of emerging technologies, educator well-being and wise leadership. *International Information and Library Review*. <https://doi.org/10.1080/10572317.2026.2656857>
- Kalendra, D., Nair, S., Sun, M., Rasul, T., Ladeira, W. J., & Ibrahim, M. A. (2025). AI-powered pedagogy: Transforming education in the digital age. In *Handbook of artificial intelligence in higher education* (pp.315-329). Edward Elgar Publishing. <https://doi.org/10.4337/9781035338764.00029>
- Kementerian Pendidikan Malaysia. (2026). *Rancangan Pendidikan Malaysia 2026-2035*. Kementerian Pendidikan Malaysia. <https://www.moe.gov.my/dokumen-penuh-rancangan-pendidikan-malaysia-rpm-2026-2035>
- Khoo, J.Z.Y., Hollinger, F., Han, J.Y., Lin, C., Tsai, C.-C., Schwartz Poehlmann J.K., Anzola, D., Choo, Y.S.L., & Fung, F.M. (2026). Tipping point in the future readiness of artificial intelligence and chemistry education. *Journal of Science Education and Technology*. <https://doi.org/10.1007/s10956-026-10330-8>
- Liu, Y., Wang, H., & Lei, J. (2025). Factors influencing Chinese pre-service teachers' adoption of generative AI in teaching: An empirical study based on UTAUT2 and PLS-SEM. *Education and Information Technologies*, 30, 12609-12631. <https://doi.org/10.1007/s10639-025-13353-7>
- López-Borrull, A., & Lopezosa, C. (2025). Mapping the impact of generative AI on disinformation: Insights from a scoping review. *Publications*, 13(3), 33. <https://doi.org/10.3390/publications13030033>

- Luan J., Halim H.A., & Saad M.R.M. (2026). The effect of AI and multiple intelligences in project-based learning on English achievement. *International Journal of Computer-Assisted Language Learning and Teaching*, 16.0(1.0). <https://doi.org/10.4018/ijcallt.400912>
- Mahawar K., Rattan P., Jalamneh A., Ab Yajid M.S., Abdeljaber O., Kumar R., Lasisi A., & Ammarullah M.I. (2025). Employing artificial bee and ant colony optimization in machine learning techniques as a cognitive neuroscience tool. *Scientific Reports*, 15.0 (1.0). <https://doi.org/10.1038/s41598-025-94642-6>
- Mat Yusoff, S., Rahman, N. H. A., & Abdullah, R. (2025). Ethical governance and regulatory frameworks for AI in education: A Malaysian perspective. *BMC Medical Education*, 25, 910-922.
- Neil Selwyn (2022). The future of AI and education: Some cautionary notes. *European Journal of Education*, 57(4), 620-631. <https://doi.org/10.1111/ejed.12532>
- Rachovski, T., Petrova, D., & Ivanov, I. (2024, June). Automated creation of educational questions: Analysis of artificial intelligence technologies and their role in education. In *Environment. Technology. Resources. Proceedings of the International Scientific and Practical Conference* (2), pp. 465-467.
- Singhal, R., Srivastava, S., & Chandan, H. C. (2026). Ethical Integration of Artificial Intelligence in Education: Opportunities, Risks, and Governance Frameworks. In *Redefining the Roles of Educators and Students in the AI Era* (pp. 309-332). IGI Global Scientific Publishing.
- Tortella, G. R., Pires, F. G., & Da Costa, M. L. (2025). AI and higher education: Pedagogical, ethical, and psychological perspectives on generative AI adoption. *Behavioral Sciences*, 15(1040). <https://doi.org/10.3390/behavsci15101040>
- UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO Publishing. <https://unesdoc.unesco.org/ark:/48223/pf0000386693>
- Wang, X., Zhang, Y., & Zhang, L. (2025). The impact of digital technology use on teaching quality in university physical education: An interpretable machine learning approach. *Applied Sciences*, 15(7689). <https://doi.org/10.3390/app15147689>
- Yadav, S. (2024). Impacts of generative AI on the future of research and education. In *Impacts of generative AI on the future of research and education* (pp. 1-26). IGI Global. <https://doi.org/10.4018/979-8-3693-0884-4.ch001>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – Where are the educators? *International Journal of Educational Technology in Higher Education*, 16(39), 1-27. <https://doi.org/10.1186/s41239-019-0171-0>
- Zhang, L., Liu, Z., Zhao, L., & Gao, J. (2025). The impact of digital technology use on teaching quality in university physical education: An interpretable machine learning approach. *Applied Sciences*, 15(7689). <https://doi.org/10.3390/app15147689>