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Artificial Intelligence (AI), the Erosion of Tacit Knowledge, and the Challenges of Cultivating Wisdom: Epistemological and Ethical Implications for 21st Century Islamic Education

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ABSTRACT
The integration of artificial intelligence (AI) into Islamic education offers efficiency and personalisation, but risks eroding tacit knowledge gained through experience, reflection, and spiritual relationships, which from the basis of wisdom and character building. This study uses a systematic literature review, utilising the Data–Information–Knowledge–Wisdom (DIKW) model and the tacit–explicit knowledge framework. The literature was obtained from academic databases (2020–2025) with strict inclusion and exclusion criteria. The findings show that AI is highly effective in disseminating explicit knowledge, but it cannot replace the vital role of tacit knowledge in nurturing students' manners, wisdom, and spiritual values. Ethical challenges, algorithmic bias and dehumanisation, are increasingly pertinent in the digital era. The study emphasizes the need to position AI as a supportive tool, strengthen AI literacy rooted in Islamic values, and protect the role of teachers and human-oriented learning spaces to ensure that Islamic education remains rooted in humanity.

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ABSTRAK
Integrasi artificial intelligence (AI) *ke dalam pendidikan Islam menawarkan efisiensi dan personalisasi, tetapi berisiko mengikis pengetahuan tacit yang diperoleh melalui pengalaman, refleksi, dan hubungan spiritual, yang menjadi dasar pembentukan kebijaksanaan dan karakter. Studi ini menggunakan tinjauan literatur sistematis dengan memanfaatkan model Data–Information–Knowledge–Wisdom (DIKW) dan kerangka pengetahuan tacit–eksplisit. Literatur diperoleh dari basis data akademik (2020–2025) dengan kriteria inklusi dan eksklusi yang ketat. Temuan menunjukkan bahwa AI sangat efektif dalam menyebarkan pengetahuan eksplisit, tetapi tidak dapat menggantikan peran penting pengetahuan tacit dalam membina akhlak, kebijaksanaan, dan nilai-nilai spiritual peserta didik. Tantangan etis, bias algoritmik, dan dehumanisasi semakin relevan di era digital. Studi ini menekankan perlunya memposisikan AI sebagai alat pendukung, memperkuat literasi AI yang berakar pada nilai-nilai Islam, serta melindungi peran guru dan ruang belajar yang berorientasi manusia untuk memastikan bahwa pendidikan Islam tetap berakar pada kemanusiaan.*

KATA KUNCI
Kecerdasan Buatan, Pengetahuan Tacit, Pendidikan Islam, Kebijaksanaan, Etika Teknologi

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Introduction

The rise of Artificial Intelligence (AI) technology, particularly through deep learning, has significantly transformed the global education landscape. Today, AI can process vast amounts of learning data, assess student performance, provide personalised recommendations, and even construct adaptive curricula driven by algorithms. These developments have sparked optimism for greater efficiency and personalisation in learning. However, amid this digital enthusiasm, fundamental philosophical and epistemological questions arise: can AI truly replace intuition, reflection, and wisdom in shaping a person's entire personality?.

This question touches the core of educational epistemology, particularly for Islamic education, where nurturing wisdom is paramount. In the DIKW (Data–Information–Knowledge–Wisdom) hierarchy, knowledge evolves beyond data and information through experience, relationships, and contemplation of value. At its peak, wisdom involves making decisions that are not only logical but also ethical, sensitive to context, and forward-looking (Rowley, 2007); Ackoff, 1989).

Islamic thought holds that human perfection (insan kāmil) requires education that unites knowledge, adab, and wisdom. By contrast, AI-based learning systems grounded in explicit, structured processes often overlook inner and transcendent dimensions that cannot be reduced to digital codes. This is where the distinction between tacit and explicit knowledge, described by Nonaka and Takeuchi (Nonaka & Takeuchi, 1995), becomes vital. Tacit knowledge encompasses intuition, reflective experience, practical skills, and personal values formed through social and spiritual interaction (Lucena & Popadiuk, 2019; Ormerod, 2021). These qualities cannot be transformed into data or manipulated by algorithms. Meanwhile, explicit knowledge formal, structured, and capable of digital transmission remains the primary domain of AI (Dessimoz & Thomas, 2024). Heavy reliance on AI risks shrinking the affective and spiritual growth that underpins character development in Islamic education (Taufik, 2020).

In fact, within the framework of Islamic epistemology, the goal of education lies not only in the mastery of information or technical skills, but in the formation of wisdom, the ability to make decisions that are contextual, ethical, and meaningful (Husni & Hayden, 2024; Johan et al., 2024; Wicaksono, 2020). In addition, several previous studies on AI in Islamic education have generally focused on ethical and pedagogical aspects, such as Larhzizer's (2025) research, which shows that the integration of AI in Islamic education needs to be bound by the maqasid al-shari'ah framework to ensure that the use of AI remains within the corridor of Islamic educational benefits. Similarly, a study by Rifai et al. (2025) also states the importance of an AI ethics model based on maqasid and national regulations in Islamic educational institutions. Meanwhile, regarding tacit knowledge literature, Lejeune (2011) states that tacit knowledge can only be passed on through direct experience, intuition, and human interaction.

Then Falckenthal (2025) also discusses the potential of AI in helping transfer tacit knowledge in organizations, showing that technology cannot completely replace the implicit and relational dimensions of knowledge. On the other hand, thoughts on wisdom in the AI era, as stated by McGregor (2025) and Boone (2024), warn of the loss of intellectual maturity due to dependence on AI. In addition, many still rely on Western philosophy, which has not integrated the concepts of wisdom, manners, and Islamic epistemology. Therefore, a gap exists in the research, indicating that there has been no comprehensive study linking AI, the erosion of tacit knowledge, and the challenges of forming wisdom within the epistemological and ethical framework of 21st-century Islamic education. Thus, this study aims to fill the critical research gap by highlighting the epistemological limitations of AI from the perspective of Islamic Education, based on the DIKW (Data–Information–Knowledge–Wisdom) framework and the tacit-explicit knowledge dichotomy.

Yet Islamic epistemology maintains that education aims not simply at mastering information or technical skills, but at forming sound wisdom and judgement, rooted in ethics and meaning (Husni & Hayden, 2024; Johan et al., 2024; Wicaksono, 2020). This study examines the epistemological limits of AI from an Islamic educational perspective, drawing on the DIKW framework and the tacit and explicit knowledge.

Through a literature review and theoretical synthesis, this work does not reject AI, but advocates an integrative approach to AI as an instrument (wasīlah), never the ultimate end (ghāyah) in education. This strategy reflects Islamic principles for technology and the vision of developing well-rounded individuals. Strengthening AI literacy, safeguarding spaces where tacit knowledge can thrive, and reaffirming the teacher's role as spiritual mentor are all proposed as ways to advance an adaptive, reflective, and wisdom-oriented Islamic education.

Conceptual Framework

The Hierarchy of Data, Information, Knowledge, and Wisdom (DIKW Model)

The DIKW model (Data, Information, Knowledge, Wisdom) describes the stages of transformation from simple entities (data) to the highest level, namely wisdom. This model provides a clear picture of the epistemological process that occurs in managing information and making decisions (Rowley, 2007); Ackoff, 1989).

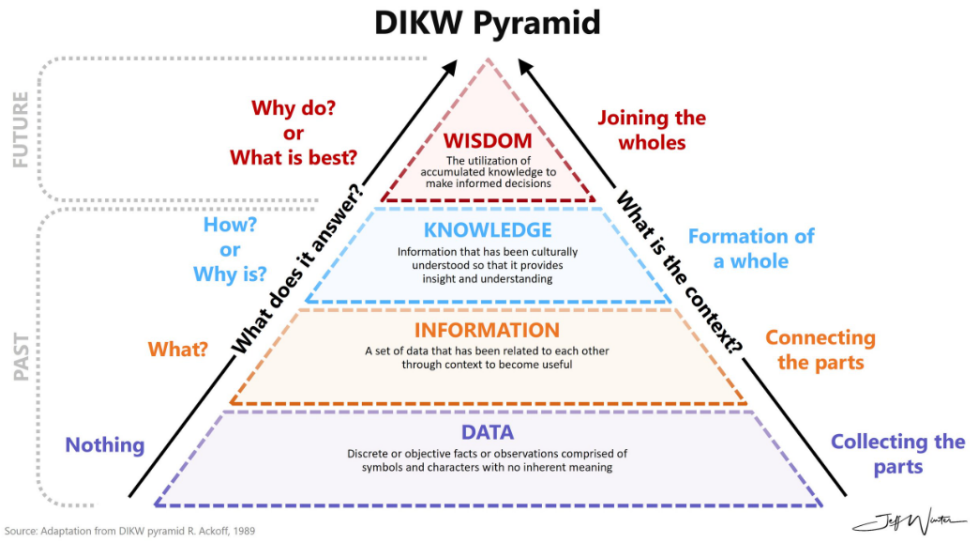

Figure 1. *The Knowledge Pyramid* (Ackoff, 1989), source: https://www.jeffwinterinsights.com/insights/dikw-pyramid

- **Data** are raw facts collected without specific context and therefore have no intrinsic meaning. In the academic sphere, data might refer to student assessment scores or attendance records.
- **Information** is the result of processing data that has been given a particular context or explanation, making it relevant and useful. For example, statistical analysis of exam scores can produce information regarding patterns of student success or failure in a particular course.
- **Knowledge** is the result of integrating information into a more complex structure, encompassing relational aspects (connections between concepts), somatic aspects (skills embodied in practice), and holistic understanding. Knowledge reflects human interpretation guided by experience, intuition, and sociocultural context (Nonaka & Takeuchi, 1995).
- **Wisdom** is the highest stage in this hierarchy, where knowledge is applied wisely, reflectively, ethically, and with vision. Wisdom extends beyond technical or analytical aspects and includes deep moral and cultural values. In education, wisdom is reflected in curricular or academic policy decisions that consider long-term impacts on society (Floridi, 2013).

As explained by Rowley (2007) dan Ackoff (1989) in Figure 1, knowledge transformation begins with data as raw, meaningless facts. When data are given context, they become useful information. Organised information, linked with personal experience and understanding, develops into knowledge. However, wisdom the highest level in this hierarchy requires ethical consideration, intuition, and contextual insight, which can only be achieved through contemplation of values, life experience, and spiritual relationships.

In Islamic education, ḥikmah (wisdom) is central to the educational process. Wisdom is not only about intellectual ability but also about understanding the deeper meaning of knowledge and using it for goodness and sustainability. Therefore, if education only focuses on data and information codified by AI, this epistemological progression falls short of the wisdom that is the primary goal of Islamic education.

Tacit vs. Explicit Knowledge

The concept of tacit and explicit knowledge, widely introduced by Nonaka & Takeuchi (Nonaka & Takeuchi, 1995), underscores the importance of understanding two fundamentally different yet complementary types of knowledge in the process of knowledge formation and transfer. This concept forms an essential foundation for recognising the limitations of AI within value-based education. Tacit knowledge is personal, contextual, difficult to codify, and often cannot be expressed verbally. It develops through direct engagement, deep reflection, and life experience dimensions that are central to the spirit of Islamic learning.

Examples of tacit knowledge include intuition in decision-making, sensitivity to a student's emotional state, or wisdom in guiding morals and etiquette. This knowledge cannot be conveyed solely through texts or algorithmic systems, but is transmitted through example, human interaction, and profound spiritual processes.

By contrast, explicit knowledge is structured, standardised, and easily communicated through digital media including books, modules, and databases. This is the domain mastered by AI, forming the primary basis for information processing in machine learning or deep learning systems. AI can imitate and deliver explicit knowledge efficiently, but cannot reach the depth of tacit knowledge, See Figure 2.

Figure 2. The Iceberg Metaphor: Comparison of Explicit and Tacit Knowledge

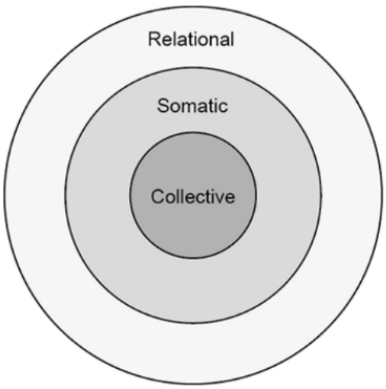

Figure 3. Knowing Inside Out: Three Zones of Tacit Knowledge (Adapted from Collins, 2011, p. 158, Figure 8, "The terrain of tacit knowledge")

The tacit–explicit knowledge dichotomy is not only popularised by Nonaka & Takeuchi (1995), but also further developed by H. M. Collins in his book Tacit and Explicit Knowledge (Collins, 2010). He classifies tacit knowledge into three main categories (see Figure 3):

1. **Relational Tacit Knowledge:** Knowledge that could, in principle, be explained, but is not for social or contextual reasons.
2. **Somatic Tacit Knowledge:** Knowledge embodied in the human body and physical skills, for example the ability to drive or play a musical instrument.
3. **Collective Tacit Knowledge:** Knowledge that cannot be codified because it is embedded within social norms and shared cultural practices.

In Islamic education, these dimensions are manifested through the process of tarbiyah, which nurtures manners, the spirit of knowledge, and the spiritual connection between teacher and student. This is precisely what AI cannot replace. According to Collins, the majority of human knowledge falls within the tacit category, meaning not all forms of knowledge can serve as input for AI-based systems.

On the other hand, explicit knowledge is structured, objective, and easily codified. This knowledge can be stored and disseminated through text, numbers, databases, and algorithms precisely the type most compatible with AI systems, which operate through formal logic and data structures.

AI, particularly deep learning, operates almost entirely within the realm of explicit knowledge. While AI is capable of processing large volumes of information rapidly and efficiently, it faces significant limitations in managing tacit knowledge. AI cannot fully grasp social contexts, morality, or intuitive nuances essential to tacit knowledge (Selwyn, 2019).

This presents serious risks if academic policy or institutional strategic decisions rely solely on AI output without deep human integration. Hence, collaborative interaction between humans and AI is crucial to maintaining a balance between both forms of knowledge in the pursuit of academic wisdom.

Relevance of the Conceptual Framework to Islamic Education

The DIKW model and the tacit–explicit knowledge dichotomy provide a foundation for analysing where AI can and cannot function within Islamic education systems. Islamic education does not merely aim for mastery of information and technical skills, but also seeks to shape individuals who are knowledgeable, well-mannered, and wise. Therefore, an education system overly dependent on AI may only reach the level of information and explicit knowledge, without attaining the essential realm of wisdom.

Within this framework, policies for AI integration in education must consider nurturing students' affective, spiritual, and reflective dimensions. AI should be positioned as an epistemological tool, not a replacement for the humanising process of spiritual tarbiyah.

By recognising AI's epistemological limitations and the central role of tacit knowledge, we can design Islamic education systems that are not only technologically adaptive but also resilient to value disruption. Authentic Islamic education must protect spaces for wisdom to thrive amid the growing tide of automation.

Methods

Materials and methods should enable readers to reproduce the experiment. This study employs a descriptive qualitative approach using the systematic literature review (SLR) method. The primary objective is to critically examine the relationship between the application of Artificial Intelligence (AI) in education and its impact on the formation of tacit knowledge and wisdom among learners, especially in the context of Islamic education, where wisdom is the central objective of learning.

The analysis is focused on three main research questions:

1. Exploration of methods and frameworks used to analyse the role of AI in Islamic education;
2. Identification of the impact of AI use on tacit knowledge and the development of wisdom (ḥikmah);
3. Examination of ethical challenges and strategies to safeguard tacit knowledge and promote AI literacy rooted in Islamic values.

Literature was gathered through systematic searches of academic databases including Scopus, along with official policy documents from international institutions (e.g., UNESCO). The search keywords included: "AI in education", "tacit knowledge", "explicit knowledge", "DIKW model", and "ethical AI".

The selection process for articles followed strict inclusion and exclusion criteria:

- **Inclusion:** Articles discussing the links between AI, education, tacit/explicit knowledge, DIKW, wisdom, or technology ethics; empirical research, systematic reviews, or literature reviews; published in accredited national journals (Sinta) or internationally indexed journals (Scopus); in Indonesian or English; published from 2020 to 2025; full-text available; with education/tacit knowledge as a main subject.
- **Exclusion:** Non-relevant articles, non-peer-reviewed research, non-scientific research, published before 2020, not full-text, or not focused on education/tacit knowledge.

The identification and selection process followed the PRISMA flow: of the 200 articles found, after removing duplicates and screening titles/abstracts, eight articles met the criteria and were included in the final review (see Figure 4). The formulation of research questions in this study centres on the analysis of the effects of AI on tacit knowledge, the development of wisdom, and the integration of ethical values within Islamic education. These questions are based on the five key elements of the PICOC framework (Hosseini et al., 2024; *What Is a PICOC? » CEBMa*, n.d.), as shown in Tables 1 and 2.

Figure 4. Article selection process using the PRISMA diagram

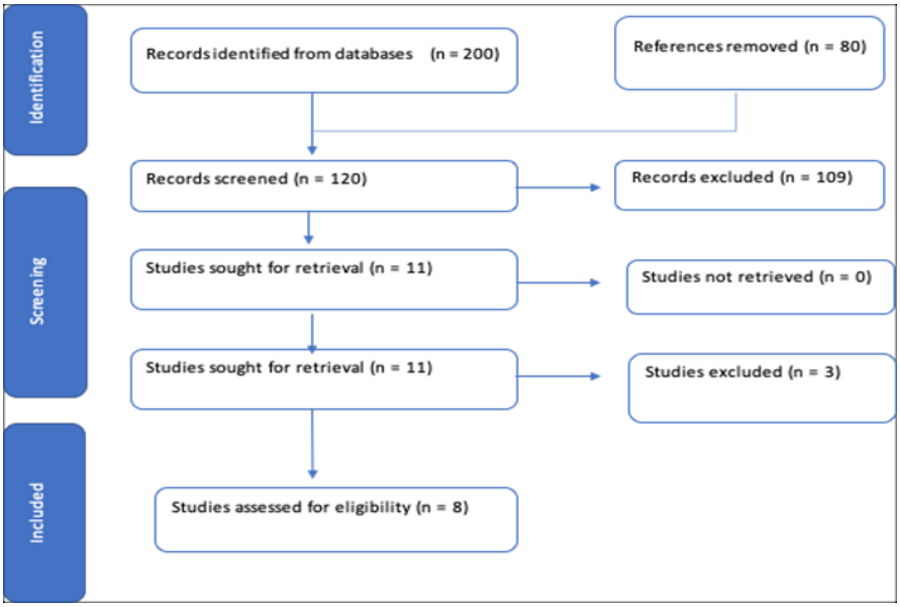

Table 1. PICOC

Component	Description
Population (P)	Education systems, educators, and students in the digital era; Islamic education; 21st-century education
Intervention (I)	Integration and use of Artificial Intelligence (AI) in the learning process
Comparison (C)	AI-based learning vs. conventional or value-/tacit knowledge-based learning
Outcomes (O)	Impact on tacit knowledge, formation of wisdom (ḥikmah), AI literacy, and student character
Context (C)	21st-century Islamic education; digital learning environment; AI integration with spiritual and ethical values

The research questions (RQ) addressed in this SLR are detailed in Table 2.

Table 2. Research Question

RQ	Research Question	Objective
RQ1	What methods and frameworks are used to analyse the role of AI in education?	To identify methods and analytical approaches to AI in education
RQ2	What is the impact of AI use on tacit knowledge and the development of wisdom (ḥikmah)?	To identify AI's influence on tacit knowledge and wisdom
RQ3	What are the ethical challenges and strategies to protect tacit knowledge and promote AI literacy based on Islamic values?	To identify mitigation strategies for tacit knowledge erosion and ethical AI implementation

Table 3. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Articles addressing links between AI, education, tacit/explicit knowledge, DIKW, wisdom, or technology ethics	Articles not relevant to AI, tacit knowledge, DIKW, education, or ethics
Empirical research, systematic reviews, or literature reviews	Methodologically weak, not peer-reviewed, or only opinion/editorials
Published in internationally indexed (Scopus) journals	Popular articles, non-indexed manuscripts, not peer-reviewed
Articles in Indonesian or English	Articles in languages other than Indonesian/English
Published in the last five years (2020–2025)	Published before 2020
Full-text articles accessible for analysis	Only abstracts or not accessible full text
Studies positioning education/tacit knowledge as a main subject	Studies not focusing on education/tacit knowledge

The articles analysed discuss the connections among Artificial Intelligence (AI), tacit knowledge, DIKW, wisdom, and Islamic education, with a publication window from 2020 to 2025 to ensure the relevance and novelty of the findings. Selection was made using the above inclusion and exclusion criteria. Data analysis was conducted thematically, following (Braun & and Clarke, 2006): (1) familiarisation with the literature, (2) initial coding, (3) theme identification, (4) theme review, and (5) thematic interpretation. The analysis highlights AI's limitations in addressing the reflective, affective, and spiritual dimensions of education and formulates integrative strategies based on ethics, Islamic values, and AI literacy. The main theoretical frameworks used are the DIKW model and knowledge conversion theory by Nonaka & Takeuchi (1995), reinforced by technology ethics perspectives from Floridi (2013) and Coeckelbergh (2020). This approach aims to inform policy formulation for Islamic education that emphasises character and wisdom development in the digital era.

Results and Discussion

Result

A systematic search of the Scopus database for the period 2020–2025 yielded 200 articles related to Artificial Intelligence (AI), tacit knowledge, DIKW, wisdom, and Islamic education. After applying strict inclusion and exclusion criteria, eight articles were deemed suitable for in-depth analysis to address the research questions, as shown in Table 4.

Table 4. Validation and Summary of Article Findings

No	Author & Year	Title	Topic/Aim	Method	Main Findings	Relevance to SLR
1	Eitel-Porter, R (2021)	Beyond the promise: implementing ethical AI	Implementation of ethical AI	Review/Analysis	The main challenge in implementing ethical AI lies in bridging the gap between ethical principles and practical application. Strict governance, control, and organisational audits are needed to ensure ethical practice.	Highly relevant for AI ethics and governance policy.
2	Holmes, W & Tuomi, I (2022)	State of the art and practice in AI in education	AI trends & practice in education	Systematic Review	AI is rapidly evolving, enhancing personalisation, learning efficiency, and educational administration. However, challenges regarding bias, privacy, and the need for AI literacy remain significant. The study develops a typology of AI applications in education and stresses the importance of "AI literacy".	Systematic review, highly relevant.
3	Holmes, W et al. (2022)	Ethics of AI in education: Towards a community-wide framework	AI ethics framework in education	Review/Analysis	A multidisciplinary and collaborative AI ethics framework is required to address fairness, accountability, bias, and other issues. Most AIED researchers lack training in ethics.	Strategy for AI ethics framework development, relevant.
4	Perrotta, C & Selwyn, N (2020)	Deep learning goes to school: toward a relational understanding of AI in education	Deep learning & relational dimensions in education	Analysis	Deep learning models explicit knowledge, but fails to address tacit knowledge and lived experience. Human relationships and social context remain dominant in education.	Limitations of AI in dealing with tacit knowledge, highly relevant.
5	Nguyen, ND (2023)	Exploring the role of AI in education	Exploring AI's role in education	Review	AI offers personalisation and efficiency, but teachers remain crucial for meaningful education. Highlights ethical concerns in student data use and the importance of human–AI collaboration.	Human–AI collaboration, relevant for SLR on AI & education.
6	Rubenstein, DS (2021)	Acquiring ethical AI	AI ethical literacy	Review/Analysis	Ethical AI literacy is essential for all stakeholders. Stresses the need for regulation, procurement governance, and control to prevent discrimination and privacy breaches.	Ethical literacy and AI governance, core SLR themes.
7	Dieterle, E., Dede, C. &	The cyclical ethical effects of using artificial	Cyclical ethical effects of AI in education	Synthetic Review	Identifies five "divides": access, representation, algorithms,	Critical framework for evaluating

No	Author & Year	Title	Topic/Aim	Method	Main Findings	Relevance to SLR
	Walker, M. (2024)	intelligence in education			interpretation, and citizenship. These divides are interrelated and may produce cycles of structural bias if not addressed. Human responsibility is key for fairness, inclusion, and educational effectiveness.	AI ethics in education, emphasises cyclical bias and human control.
8	Nguyen, A et al. (2023)	Ethical principles for artificial intelligence in education	Ethical principles for AI in education	Review/Analysis	Maps ethical principles from international bodies, resulting in core principles: transparency, fairness, privacy, accountability, inclusion, and safety. This serves as the ethical foundation for global AIED.	Ethical principles for AI in education, foundational for SLR ethics strategy.

Following an in-depth review of the core articles, the findings are synthesised by research question, as summarised in Table 5.

Table 5. Findings by Research Question

RQ	Research Question	Main Findings
RQ1	What methods and frameworks are used to analyse the role of AI in education?	Most studies employ systematic reviews, critical policy analysis, and thematic analysis of AI ethics. Key frameworks include ethical AI (fairness, accountability, transparency), DIKW, and community models (UNESCO, OECD, EC). Empirical and mixed-methods studies are limited, indicating potential for future research.
RQ2	What is the impact of AI on tacit knowledge and the formation of wisdom (ḥikmah)?	AI is effective for data management, personalisation, and efficiency, especially for explicit knowledge. However, tacit knowledge (intuition, reflection, wisdom) cannot be replaced by AI. Wisdom requires affective, spiritual, and relational processes. AI should complement not replace human guidance and mentoring.
RQ3	What are the ethical challenges and strategies for safeguarding tacit knowledge and AI literacy based on Islamic values?	Challenges include algorithmic bias, limitations of AI interpretation, and risks to citizenship and identity. Strategies involve strengthening the role of teachers, experiential learning, AI literacy rooted in Islamic ethics, and robust governance and audits. Cross-disciplinary collaboration and value-based literacy models are recommended.

Synthesis of Main Findings by Research Question

RQ1: What methods and frameworks are used to analyse the role of AI in Islamic education?

The review shows that systematic literature reviews and critical policy/framework analysis are the most common methods for examining AI's role in education, including Islamic education. Holmes & Tuomi (2022) and Nguyen (2023) use systematic reviews to map AI practices, trends, and challenges in education. Other articles, such as those by Dieterle et al. (2024), rely on reflective and multidisciplinary analyses, particularly to address issues of ethics, bias, and social impact. Dominant analytical frameworks include principles of ethical AI (fairness, accountability, and transparency), the DIKW model, and community frameworks (UNESCO, OECD, and EC). In the context of Islamic education, there is a tendency to integrate ethical, philosophical, and Islamic values into the positioning of AI, although empirical field studies remain scarce. No studies using mixed methods or primary data from Islamic

institutions (e.g., madrasas, pesantren) were found, signalling an area for further research.

RQ2: How does the use of AI impact tacit knowledge and the formation of wisdom (ḥikmah)?

The main findings reveal that AI, especially through adaptive learning systems, deep learning, and learning analytics, is highly effective for broadening access, speeding up learning, and personalising student needs (Holmes & Tuomi, 2022; A. Nguyen et al., 2023; N. D. Nguyen, 2023). AI supports data-driven decision-making and increases efficiency in the domain of explicit knowledge. However, all reviewed literature warns that tacit knowledge including intuition, reflective experience, and affective values remains irreplaceable by AI (Dieterle et al., 2024; Perrotta & Selwyn, 2020). The formation of wisdom/ḥikmah in Islamic education cannot be achieved solely through information delivery; it requires human interaction, spiritual guidance, and deep reflection. Overreliance on AI risks eroding spaces for contemplation, diminishing the depth and meaning, and fragmenting student identity through weakened social relations and value internalisation. AI has yet to facilitate the formation of character and spirituality required for wisdom-based Islamic education.

RQ3: What are the ethical challenges and strategies for safeguarding tacit knowledge and AI literacy rooted in Islamic values?

Ethical challenges identified include algorithmic bias in recommendations and decision-making, limitations in AI interpretation, risks of narrowing social discourse, and threats to citizenship and Islamic identity (Dieterle et al., 2024; Eitel-Porter, 2021). Furthermore, AI is not yet able to internalise the reflective, transcendental, and contextual values of Islam.

Recommended mitigation strategies include:

- Strengthening the roles of teachers and spiritual mentors to maintain and activate tacit knowledge in Islamic educational environments;
- Designing experiential learning spaces, open discussions, personal mentoring, and religious arts/practices that nurture students' character and wisdom;
- Developing AI literacy rooted in Islamic values, including the integration of justice, transparency, public benefit, and social responsibility in all stages of AI adoption and evaluation;
- Implementing strict ethical governance and audits at institutional levels, with involvement from scholars, educators, and community stakeholders in policy-making for AI use in Islamic education.

These studies also emphasise the importance of cross-disciplinary collaboration (among scientists, educators, and ethics experts), active community engagement, and participatory policy development to ensure that AI genuinely supports educational advancement without sacrificing humanistic and spiritual values.

Discussion

Transformation of Learning and Tacit Knowledge in the AI Era

Studies included in this research consistently highlight a fundamental shift in learning processes resulting from the integration of AI within education. AI is shown to improve efficiency, enable personalised learning, and broaden access to explicit knowledge (Dieterle et al., 2024; Holmes et al., 2022; Holmes & Tuomi, 2022; N. D. Nguyen, 2023). Nevertheless, the majority of articles caution that excessive reliance on AI may undermine the dimension of tacit knowledge intuitive, reflective, and affective understanding that is acquired through lived experience and human interaction (Perrotta & Selwyn, 2020).

Reflection, empathy, and wisdom core to personality development in Islamic education cannot be generated through computational processes alone. AI-driven education that prioritises speed and ease of access to information risks eroding the reflective and spiritual spaces that are integral to *tazkiyah al-nafs* and *tahdzīb al-nafs* (Dieterle et al., 2024; Holmes et al., 2022). Thus, the integration of AI in education must be undertaken with discernment, positioning teachers as spiritual guides and facilitators of adab, not merely transmitters of knowledge (Dieterle et al., 2024; Perrotta & Selwyn, 2020; Rubenstein, 2021)

As outlined in these articles, contemporary digital learning is characterised by intense interaction between humans and technology. Modern educational psychology indicates that children's engagement with technologies like AI has a profound impact on their cognitive, social, and emotional development. Children often become accustomed to the instant responses of technology, potentially diminishing patience and reducing their capacity for deep reflection a faculty essential to the cultivation of wisdom in Islamic tradition. While AI promises efficiency, adaptive learning, and broad access to explicit knowledge, unregulated use risks impeding the development of interpersonal and spiritual skills including empathy, intuition, and sound judgement, all of which are fundamental aspects of tacit knowledge (Turkle, 2015). In Islamic education, the loss of these dimensions can disrupt processes of self-purification and moral development. Therefore, effective Islamic educational strategies should integrate AI selectively and thoughtfully, ensuring teachers act as murabbi, not only imparting knowledge but also nurturing character and adab. Teachers must help children balance digital information with inner experience and instil an understanding that wisdom is not a product of algorithms, but is cultivated through the lived appreciation of values, deep reflection, and civilised experience (Gee, 2013; Turkle, 2015).

The Potential and Risks of AI in Learning and Learner Development

This research also finds that AI, particularly through deep learning methods and intelligent recommendation systems, holds significant potential for fostering critical thinking, problem-solving, and data-driven decision-making (Holmes & Tuomi, 2022; N. D. Nguyen, 2023; Perrotta & Selwyn, 2020). These studies highlight how AI can accelerate data analysis, provide personalised feedback, and expand access to learning resources. However, epistemologically, AI's strengths remain largely confined to data processing and information within the DIKW framework, while the development of wisdom in education requires internalisation of values, deep reflection, and affective engagement (Eitel-Porter, 2021; A. Nguyen et al., 2023).

Excessive dependence on digital recommendation systems and algorithmic efficiency may diminish intrinsic motivation, hinder self-exploration, and weaken learners' intuition and emotional resilience (Perrotta & Selwyn, 2020). Recent findings indicate that these

risks are exacerbated when learning becomes fragmented by binary logic and the absence of social discourse, leaving learners less resilient in the face of ambiguity, ethical dilemmas, and real-world complexity (Dieterle et al., 2024; Rubenstein, 2021). Accordingly, AI integration must be accompanied by pedagogical strategies that preserve the balance between technological efficiency and the cultivation of character and socio-emotional intelligence.

Thus, artificial intelligence, particularly through deep learning, offers considerable promise for enhancing the quality of learning and supporting the development of critical thinking and decision-making abilities. AI can present learning materials tailored to individual needs, facilitating more effective personalised learning (Holmes & Luckin, 2016). Moreover, AI supports real-time learning analytics, enabling educators to identify learning patterns and intervene promptly to enhance academic success. AI also enables students to develop decision-making skills through complex simulations, strengthening their ability to integrate explicit and tacit knowledge via reflective practice (Baker et al., 2019).

However, from the perspective of Islamic epistemology, education must go beyond technical proficiency and academic achievement. Knowledge should culminate in wisdom the ability to apply understanding contextually, ethically, and meaningfully. When learning is driven predominantly by AI and over-reliant on digital recommendations, students risk losing the intuitive and imaginative capacities central to tacit knowledge (Kambhampati, 2021; Svoboda, 2024; Turkle, 2015). This dependency may reduce intrinsic motivation, impede self-exploration, and compromise the process of profound understanding (tafaqquh). In the long term, students may experience a disconnect between high cognitive ability and a lack of social awareness, moral discernment, or the ability to respond to ambiguity. Islamic education teaches that wisdom emerges from adab, not merely data processing. Hence, AI integration in education should be framed by maqāṣid al-sharīʿah, safeguarding intellect, soul, and morality (Flores-Vivar & García-Peñalvo, 2023).

The psychological consequences of AI dependence are not negligible. Diminished self-confidence in independent decision-making, reluctance to explore, and declining scientific curiosity and metacognitive ability are among the tangible effects. In broader social contexts, learners habituated to algorithmic efficiency may struggle with ambiguity or ethical dilemmas that can not be reduced to binary logic. This will undermine their intellectual and emotional resilience, particularly in navigating the complexities of real life. It is therefore essential for educational institutions to balance AI utilisation with human pedagogical engagement. Teachers' roles as facilitators of reflection, spiritual mentors, and value-educators must remain central. The 21st-century Islamic curriculum should incorporate training in intuition, reflective thinking, and ethical awareness as integral components of technology-based learning. AI must serve as a partner, not a substitute, in humanising education, cultivating wisdom, and engaging the learner's heart (qalb).

Ethics, Philosophy, and AI Literacy in the Islamic Curriculum

AI integration within Islamic education demands close attention to ethics and philosophy, as AI profoundly influences how knowledge, authority, and human values are understood (Holmes et al., 2022; A. Nguyen et al., 2023). Contemporary studies emphasise that AI-based learning is not simply about the efficient transfer of knowledge, but carries risks of bias, dehumanisation, and marginalisation of spiritual values if not underpinned by a robust ethical framework (Dieterle et al., 2024; Eitel-Porter, 2021).

Internationally developed AI ethics frameworks (A. Nguyen et al., 2023). include principles of transparency, fairness, accountability, privacy, and inclusiveness. These must be critically examined and adapted to the context of Islamic education, which emphasises adab, tazkiyah al-nafs, and social responsibility. Holmes et al. (2022) argue that without deep reflection on values, AI risks reinforcing social divides and generating "algorithmic divides" incompatible with the Islamic commitment to justice (Dieterle et al., 2024).

AI literacy is a strategic necessity in the modern Islamic curriculum. This entails equipping learners to understand how AI operates, its potential and limitations, and to adopt a critical stance towards algorithmic recommendations or decisions (Holmes & Tuomi, 2022; Rubenstein, 2021). AI literacy, then, is not solely a technical domain but also encompasses philosophy and ethics, reinforcing learners' spiritual identity and social consciousness.

Therefore, the integration of AI into Islamic education is not merely a technological adoption but a paradigm transformation requiring a synthesis of technological excellence, traditional wisdom, and ethical sensitivity. Teachers, as exemplars of adab and wisdom, must be positioned not only as users of technology but as custodians of values and moral guides in the age of artificial intelligence (Holmes et al., 2022; Perrotta & Selwyn, 2020). The teacher, or murabbi, in Islamic education leads not only in imparting knowledge but also in shaping civilised character. Amidst rapid automation, teachers bear the responsibility of cultivating critical technological awareness and instilling values of tawḥīd, trust, and responsibility through a process of ta'dīb purifying knowledge from the whims of ego and the dominance of instrumental power. Ethically grounded human–AI collaboration enables education to adapt and thrive without losing its spirit. AI must be deployed to foster reflection, creativity, and reasoning, rather than replace the profound meaning that arises from human interaction. In Islamic education, such ethical strategies provide the foundation for nurturing a generation that is not only intellectually capable but also wise in utilising technology for the benefit of society.

Reactualisation and Protection of Tacit Knowledge in Islamic Education in the AI Era

Despite AI-driven gains in efficiency and personalisation, protecting tacit knowledge remains a central concern across all studies reviewed. Tacit knowledge including intuition, reflection, and inner experience develops optimally through human interaction, direct experience, and the guidance of teachers and social environments (N. D. Nguyen, 2023; Perrotta & Selwyn, 2020). AI is yet unable to replicate these processes.

Therefore, pedagogical approaches must prioritise the role of teachers and real-life experience to counterbalance digital dominance. Holmes & Tuomi (2022) emphasize the need to establish learning ecosystems that integrate humanistic dimensions, ensuring that AI does not diminish the meaning or depth of learning. The synergy between advanced technology and human touch is thus the key to sustaining tacit knowledge.

As Polanyi (1966) observed, "We can know more than we can tell," suggesting that the deepest knowledge cannot always be articulated or encoded as algorithms, but is instead transmitted through examples, shared experiences, and trustful teacher–student relationships. In Islamic education, these tacit spaces are sites of transcendence and true meaning-making, not merely cognitive supplements.

Thus, discussion-based learning, the arts, mentoring, and relationships grounded in mutual respect and trust must be preserved as the main arena for transmitting wisdom. Islamic educational tradition places communal interaction (muʻāmalah) and shared life

experience at the heart of transformation, rather than mere instruction. These experiences are vital for cultivating civilised individuals, moral sensitivity, and spiritual depth.

Tacit knowledge is intimately tied to dzauq (taste), kashf (disclosure of meaning), and tazakkur (spiritual recollection) all dimensions of experiential knowledge inaccessible to the commands of logic or AI. In Sufi and pesantren-based education, such knowledge is nurtured through lived experience, deep contemplation, and sustained spiritual mentoring. The teacher's role as a spiritual guide and facilitator of inner experience is therefore pivotal to educational success in the digital technology age.

Pedagogically, future Islamic education systems must consciously design holistic spaces for interaction. This includes study circles (halaqah), collective reflection, social simulations, and spiritual-emotional training dimensions that technology cannot substitute. Within this framework, tacit knowledge is not merely supplementary; it forms the very essence of authentic Islamic education, sustaining humanity and guiding learners towards maturity in wisdom throughout the ongoing digital transformation.

Conclusion

This systematic literature review confirms that the integration of Artificial Intelligence (AI) into education, particularly Islamic education, presents both promising opportunities and complex challenges. While AI enhances access, efficiency, and personalisation in data-driven learning, it remains incapable of replacing the central role of tacit knowledge, including intuition, reflection, affectivity, and wisdom nurtured through human interaction and spiritual guidance. An overreliance on AI risks eroding students' adab, wisdom, and spirituality, which are core objectives of Islamic education. Hence, strategies for 21st-century Islamic education must adopt a selective and reflective approach, positioning AI as an innovative partner that complements, rather than replaces, the role of the teacher as murabbi and guardian of ethical values.

The practical implications demand that Islamic educational institutions design curricula that strike a balance between digital competence and character formation rooted in spiritual values. Teachers must remain central figures in cultivating AI literacy grounded in ethics and maqāṣid al-sharīʿah, while fostering learning environments that enable the internalisation of tacit knowledge through reflection, discussion, mentorship, and spiritual experience. Furthermore, educational policy must incorporate ethical governance and oversight in the adoption of AI, involving scholars, educators, and communities in the formulation and evaluation of technological applications.

Future research should prioritise empirical investigations into the direct impact of AI on learning processes, the cultivation of hikmah, and the internalisation of value within the contexts of madrasah, pesantren, and other Islamic educational institutions. Additionally, there is a pressing need to develop Islamic value-based AI literacy models that extend beyond technical proficiency to encompass ethical, spiritual, and social dimensions across all stages of learning. In doing so, Islamic education can remain adaptive to technological advancements without compromising the humanistic and spiritual essence at the heart of nurturing the insān kāmil.

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