Teaching Machines, Forming Children: Islamic Ethics, Epistemology, and Social Transformation in Indonesia's Primary School Coding and AI Elective

Noor Rizkiyah
Universitas Islam Negeri K.H. Abdurrahman Wahid Pekalongan, Indonesia
E-mail: noorrizkiyah1@gmail.com

Abstract

Indonesia has introduced Coding and Artificial Intelligence (AI) as an elective subject beginning in grade 5 of primary school. Scholarship on Islam and AI has addressed ethics, religious authority, and social effects largely in the abstract and has rarely examined a concrete educational case. This study aims to analyze how ethical, epistemic, and social questions about AI are framed in this case and what an Islamic ethical and epistemic reading implies for primary education. It used a qualitative instrumental case study design. The introduction of the elective under Ministerial Regulation No. 13 of 2025 was examined through policy documents, official statements, news reports, and scholarship, and the data were analyzed through thematic analysis and pattern matching against a framework built from Islamic concepts. Four findings emerged. First, the stated aim of ethical and responsible technology use has no explicit value base. Second, the habits of checking and source-tracing that AI use demands correspond to the Islamic logic of *tabayyun* and *sanad*. Third, the elective status and gradual implementation raise questions of justice in access. Fourth, the deep learning approach opens room for integration with Islamic Religious Education. The study concludes that value-based AI literacy in primary schools is best framed as the formation of *adab*, verification, and responsibility under teachers' guidance, and proposes five principles for implementation. Because the case was analyzed from documents, the findings require validation in schools.

Keywords: artificial intelligence, primary education, Islamic ethics, Islamic epistemology, case study

Introduction

Artificial intelligence is no longer confined to specialist laboratories; it now shapes what people read, how they are assessed, and how they seek answers, including answers about religion. Reviews of AI in education report limited critical reflection on its risks and weak links to pedagogical theory, and much of the evidence concerns higher education rather than the early years of schooling (Holmes & Tuomi, 2022; Zawacki-Richter et al., 2019).

Indonesia has now brought this question into primary school. Ministerial Regulation No. 13 of 2025 introduced Coding and Artificial Intelligence as an elective subject, implemented gradually from the 2025/2026 school year, beginning in grade 5 of SD/MI (ANTARA News, 2025; Kementerian Pendidikan Dasar dan Menengah, 2025a). Ministry officials describe it not as a new curriculum but as part of a deep learning approach (InfoPublik, 2025), aimed at forming people who are critical, productive, ethical, and responsible in

developing and using technology (Kementerian Pendidikan Dasar dan Menengah, 2025b). For primary education this raises a concrete question: what values and what habits of knowing should accompany children's first systematic encounter with AI?

The international literature on AI ethics offers principles but not a ready answer. Reviews of guidelines report convergence on transparency, justice, non-maleficence, responsibility, and privacy (Jobin et al., 2019), yet principles are easily endorsed and hard to apply (Mittelstadt, 2019). Language models generate fluent text by statistical association without grounding in meaning (Bender et al., 2021), may produce confident statements that are unfaithful to any source (Ji et al., 2023), and can reproduce bias, including associations between Muslims and violence (Abid et al., 2021; Noble, 2018). These properties matter for children because they are forming the habits by which they will judge what to trust.

Islamic scholarship has begun to respond. Elmahjub (2023) proposes a pluralist ethical benchmark for AI, Raquib et al. (2022) develop a virtue-based approach in dialogue with the virtue ethics of technology (Vallor, 2016), and the *maqasid al-shari'ah* framework offers a purposive method for judging technologies by the goods they protect (Auda, 2008). Islamic education aims at the balanced growth of the person (Halstead, 2004) and ties knowledge to truthfulness and the proper ordering of the knower, expressed in *adab* (Al-Attas, 1993). What remains underdeveloped is the analysis of a concrete educational case, particularly at the primary level, through these categories. This constitutes a *research gap*.

This study therefore aims to analyze how ethical, epistemic, and social questions about AI are framed in the introduction of the Coding and AI elective in Indonesian primary education, and what an Islamic reading implies for primary schooling. Three research questions guide it: (1) How are these questions framed in the case documents? (2) How do Islamic concepts such as *amanah*, *tabayyun*, *sanad*, *'adl*, and *adab* illuminate them? (3) What implications follow for primary education, including Islamic Religious Education? The study rests on a theocentric view of knowledge in which humans are *khalifah* and bearers of *amanah* (QS. Al-Baqarah [2]: 30; QS. Al-Ahzab [33]: 72), are forbidden to follow what they do not know (QS. Al-Isra' [17]: 36), are commanded to verify reports (QS. Al-Hujurat [49]: 6), and are directed to ask those who know (QS. An-Nahl [16]: 43).

Methods

Research Design

The study used a qualitative approach with an instrumental case study design. A case study suits "how" and "why" questions about a contemporary phenomenon in its real-life context (Yin, 2018). The case is instrumental because it is examined to gain insight into a wider issue, namely how Islamic ethical and epistemic categories can inform AI education (Stake, 1995; Crowe et al., 2011). It is a single case bounded by policy (the elective as established by Ministerial Regulation No. 13 of 2025), level (SD/MI, beginning in grade 5), and time (from the 2025 introduction to the time of writing). Three embedded units of analysis were distinguished: the regulatory text, official public communication, and the context of Islamic Religious Education in primary schools. The study is document-based and involved no human participants or classroom observation.

Participants (Data Sources)

The data are documents, not human participants, in four groups. The first is regulatory: chiefly Ministerial Regulation No. 13 of 2025 (Kementerian Pendidikan Dasar dan Menengah, 2025a).

The second is official communication and press coverage: a ministry press release (Kementerian Pendidikan Dasar dan Menengah, 2025b) and reports by ANTARA News (2025), InfoPublik (2025), and detikBali (2025). The third is normative documents on AI and conduct: the UNESCO (2021) Recommendation, the Indonesian circular on AI ethics (Kementerian Komunikasi dan Informatika, 2023), and the Indonesian Ulema Council fatwa on social media (Majelis Ulama Indonesia, 2017). The fourth is scholarship on AI ethics, AI in education, and Islamic ethics and epistemology.

Research Procedures

The research proceeded in five steps: defining the case boundary and research questions; building an analytic framework from Islamic concepts with textual and juristic grounding, namely *amanah* and *khilafah*, *tabayyun*, *sanad*, *'adl*, and *adab*; collecting and screening documents; analyzing each embedded unit separately and then comparing across units; and verifying the interpretations.

Data Collection Technique

Official and news documents were located through the websites of the ministry and national news outlets using terms such as "Permendikdasmen 13 Tahun 2025" and "koding dan kecerdasan artifisial." Scholarship was located through Scopus, Web of Science, and Google Scholar using keywords such as "artificial intelligence," "AI in education," "Islamic ethics," and "adab," supplemented by citation chaining, with peer-reviewed work from 2016 onward prioritized.

Data Analysis Technique

Analysis followed the logic of document analysis, moving from skimming and reading to coding and interpretation (Bowen, 2009). Text segments expressing ethical, epistemic, or social claims were coded, and codes were organized into themes through reflexive thematic analysis (Braun & Clarke, 2006). Themes were then compared with the analytic framework through pattern matching (Yin, 2018): for each Islamic concept, the analysis asked whether and how the documents address the corresponding question, and where they are silent.

Validity was supported by triangulation across the four groups of data (Lincoln & Guba, 1985), by an audit trail of coding decisions, and by considering rival explanations (Yin, 2018). Statements in the documents were kept distinct from the authors' inferences.

Results

The analysis produced four sets of findings, concerning the profile of the case, its ethical framing, its epistemic demands, and its social and educational implications. They reflect the authors' interpretation of documents and do not describe classroom practice.

Outcome 1: Profile of the Case

Table 1 summarizes the case as it appears in the documents. The elective is introduced gradually, schools are reportedly not obliged to offer it in the first year, and time is allocated at 72 lesson hours per year in grade 5 and 64 in grade 6 (detikBali, 2025).

Table 1 Profile of the Case as Reflected in the Documents

No	Element	Description in the documents	Source
1	Instrument	Ministerial Regulation No. 13 of 2025, revising the national curriculum regulation; not a new curriculum	ANTARA News (2025); InfoPublik (2025)
2	Status	Elective subject; schools not obliged to offer it in 2025/2026	detikBali (2025)
3	Starting levels	Grade 5 of SD/MI, grade 7 of SMP/MTs, grade 10 of upper secondary, gradually from 2025/2026	ANTARA News (2025)
4	Time allocation	Reported as 72 lesson hours per year in grade 5 and 64 in grade 6	detikBali (2025)
5	Stated aim	Form people who are critical, productive, ethical, and responsible in developing and using technology	Kementerian Pendidikan Dasar dan Menengah (2025b)
6	Pedagogical approach	Deep learning, with cross-subject links and flexible co-curricular activities	InfoPublik (2025)

Source: Authors' analysis.

Outcome 2: Ethical Framing

The stated aim names ethics and responsibility explicitly (Kementerian Pendidikan Dasar dan Menengah, 2025b). In the documents reviewed, however, the value base of "ethical" and "responsible" is not spelled out, and religious ethical traditions are not mentioned. This is the authors' reading of the available sources and does not exclude that implementation guidance or teaching materials, which were not in the corpus, address the matter.

Read through Islamic categories, the ethical aim can be given content (Table 2). *Amanah* locates responsibility in identifiable persons, which in a school means teachers, school leaders, and tool developers, and, in an age-appropriate form, pupils. *Adab* shifts the emphasis from technical competence to the formation of character and the right ordering of knowing (Al-Attas, 1993; Halstead, 2004).

Table 2 Analytic Framework: Islamic Concepts and Their Reading for Primary Education

No	Dimension	Islamic concept and basis	Reading for primary education
1	Ethics	*Amanah*, QS. Al-Ahzab [33]: 72; *khilafah*, QS. Al-Baqarah [2]: 30	Responsibility for AI use rests on identifiable persons: teachers, schools, developers, and, appropriately, pupils
2	Epistemology	*Tabayyun*, QS. Al-Hujurat [49]: 6; QS. Al-Isra' [17]: 36	Teach children to pause, check, and ask before accepting an AI answer
3	Epistemology	*Sanad*; *ahl al-dhikr*, QS. An-Nahl [16]: 43	Teach that claims have sources; refer religious questions to teachers and qualified scholars, not to a chatbot
4	Social transformation	*'Adl*, QS. Al-Ma'idah [5]: 8	Attend to fair access, to bias against Muslim pupils, and to unequal provision across schools
5	Formation	*Adab* (Al-Attas, 1993); balanced growth of the person (Halstead, 2004)	Treat AI literacy as formation of character, not only as technical skill

Source: Authors' analysis.

Outcome 3: Epistemic Demands

The documents emphasize critical thinking as a purpose of the subject (Kementerian Pendidikan Dasar dan Menengah, 2025b), but in the sources reviewed they describe it at the level of aims, status, and time allocation and not how children are to be taught to judge AI outputs. Generative systems produce fluent text that may be unfaithful to any source (Bender et al., 2021; Ji et al.,

2023). For a child, fluency can be mistaken for authority, an inference from the properties of the systems rather than a finding about children.

Islamic epistemology supplies a vocabulary for the corresponding habits. Knowledge (*'ilm*) is tied to truthfulness and accountable transmission (Al-Attas, 1993), *tabayyun* requires verification before acceptance (QS. Al-Hujurat [49]: 6), and the logic of *sanad* makes a claim credible to the extent that it can be traced to sources that can be evaluated. In classroom terms these become three child-appropriate habits: asking where an answer comes from, checking it against another source or a teacher, and knowing who answers for it.

Outcome 4: Social Transformation, Access, and Integration with Islamic Religious Education

The elective status and gradual implementation have social consequences that the documents do not themselves discuss. Because provision depends on school decisions, first-year access is likely to vary, a point that follows from the reported design (detikBali, 2025) and remains to be examined with data on actual provision. From the standpoint of *'adl* (QS. Al-Ma'idah [5]: 8), unequal access to a subject presented as preparation for a technological future is a question of justice.

The documents also indicate an opportunity. The deep learning approach allows one topic to be linked across subjects and makes co-curricular activities more flexible (InfoPublik, 2025). This creates room for Islamic Religious Education to engage with the elective, for example by connecting verification in AI use with *tabayyun* and responsibility for what one makes and shares with *amanah*.

Discussion

From a Stated Aim to a Value Base: Amanah and Adab

The first finding is that the policy names ethics as an aim without specifying its content, the familiar gap between principles and practice in AI ethics (Mittelstadt, 2019) appearing in an educational setting. The Islamic categories address the gap in two ways. *Amanah* binds responsibility to identifiable persons, consistent with arguments that machines are instruments whose accountability traces back to human agents (Bryson, 2018) and with the juristic tendency to attach obligation to responsible persons (Hallaq, 2009). *Adab* adds that the goal of AI education is not only competence but right ordering, so that children learn not merely how systems work but how to stand toward them (Al-Attas, 1993; Halstead, 2004). This is consistent with virtue-based approaches to AI ethics (Raquib et al., 2022; Vallor, 2016) and extends them to the primary school.

Tabayyun and Sanad as Child-Appropriate Epistemic Habits

The second finding is that what AI use demands of children corresponds closely to long-standing Islamic epistemic practice. The contemporary demand for provenance and explainability (Burrell, 2016) finds a counterpart in *sanad*, and the demand that users check outputs finds one in *tabayyun*. This does not mean classical institutions can be transplanted unchanged into primary classrooms; it suggests that the coupling of authority with traceability and accountability can guide how teachers present AI. It also tempers optimistic accounts of democratized religious knowledge, since the ease of producing religious-sounding content is not equivalent to its reliability (Bunt, 2018; Turner, 2007). A child who learns to ask who answers for a statement acquires a habit that serves both digital literacy and religious learning.

Justice, Representation, and Governance

The third finding concerns justice. Decolonial and data-justice scholars argue that AI can reproduce patterns of extraction and misrepresentation affecting communities outside the Global North, and that those communities should take part in setting its terms (Birhane, 2021; Couldry & Mejias, 2019; Crawford, 2021; Mohamed et al., 2020). *'Adl* gives a normative vocabulary for this concern and, applied to the case, directs attention to equal provision across schools and to the representation of Islam in classroom tools. The governance literature adds that principles must be embedded in organizational practice and participation (Coeckelbergh, 2020; Dignum, 2019). Existing Indonesian instruments already emphasize verification, accountability, and human oversight (Kementerian Komunikasi dan Informatika, 2023; Majelis Ulama Indonesia, 2017; UNESCO, 2021); they could be connected to primary education and religious guidance rather than remain separate.

Implications for Practice

Five principles for implementation follow from the analysis. First, schools should state the value base of AI teaching explicitly rather than leaving "ethical" and "responsible" undefined. Second, teachers should teach verification and source-tracing as habits, using the questions of origin, checking, and accountability. Third, religious questions should be routed to teachers and qualified scholars, and children told clearly that an AI answer is not a religious ruling. Fourth, schools and authorities should monitor equity of provision across schools and regions. Fifth, Islamic Religious Education teachers should be involved in planning, using the flexibility of the deep learning approach to connect the elective with values already taught.

Limitations and Future Research

The study has limitations. It analyzes documents and does not observe classrooms, interview teachers, or examine teaching materials, so its claims concern the framing of the policy, not its practice. News reports are secondary sources, and madrasah, generally administered by the Ministry of Religious Affairs, may follow separate guidance that was not examined. Islamic thought is diverse, and some scholars may contest how the concepts are applied here. Future research could conduct multiple-case field studies in SD and MI using interviews, classroom observation, and analysis of teaching materials, with appropriate ethical safeguards for research with children, and could evaluate whether the five principles improve pupils' verification habits and teachers' confidence.

Conclusion

This study examined the introduction of the Coding and AI elective in Indonesian primary education as an instrumental case and read it through Islamic ethical and epistemic concepts. It found that the policy names ethical and responsible technology use as an aim without specifying a value base, that the checking and source-tracing which AI use demands correspond to the Islamic logic of *tabayyun* and *sanad*, that elective status and gradual implementation raise questions of justice in access, and that the deep learning approach leaves room for integration with Islamic Religious Education.

The study contributes an analytic framework that links ethics, epistemology, and social transformation at the primary level and five principles for implementation. Its practical implication is that AI literacy for children is best framed as the formation of *adab*, verification, and responsibility under teachers' guidance, with AI positioned as an instrument and not as a

source of religious authority. Future work should test these findings in schools and madrasah through field-based case studies.

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