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Developing an AI and Generative AI Literacy Framework: A Lesson from an Islamic Higher Education Institution

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Abstract

This study addresses this gap by developing and validating an AI and GAI literacy framework that aligns with the mission of Islamic higher education. Using a Research and Development (R&D) design guided by the ADDIE model, the study involved 25 fifth-semester students and 3 lecturers from the English Language Teaching Department at UIN Sunan Gunung Djati Bandung. Data were collected through questionnaires, semi-structured interviews, focus group discussions, classroom observations, and expert validation checklists. Quantitative analysis showed that students scored highest in ethical understanding (M = 4.0, SD = 0.55) but lowest in critical awareness (M = 2.8, SD = 0.70), while lecturers outperformed students across all dimensions, particularly in ethical understanding (M = 4.3, SD = 0.50) and pedagogical integration (M = 3.8, SD = 0.57). Qualitative findings revealed that students primarily used AI tools for basic academic tasks, whereas lecturers applied them in broader pedagogical contexts, with both groups emphasizing ethical responsibility. Expert validation confirmed the framework's high validity (overall mean = 4.5/5), particularly in ethical-Islamic alignment. These findings suggest that AI and GAI literacy in Islamic higher education must extend beyond technical proficiency to include critical reflection and ethical integration, ensuring that the use of AI is both pedagogically meaningful and culturally contextualized. The resulting framework contributes to local practice while also enriching global discussions on culturally embedded approaches to AI literacy in higher education.

Keywords: Artificial intelligence; Generative AI; Literacy framework; Islamic Higher Education

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INTRODUCTION

The rapid emergence of Artificial Intelligence (AI) and Generative Artificial Intelligence (GAI) has transformed multiple sectors including healthcare, finance, creative industries, and education (LeCun et al., 2022). Globally, AI literacy is increasingly recognized as a twenty-first century competency, encompassing not only technical understanding but also critical, ethical, and social dimensions (Long & Magerko, 2020; Holmes, Bialik, & Fadel, 2022). In the Indonesian context, where digital infrastructure and educational resources remain uneven, AI and GAI literacy has become both an urgent necessity and a pressing challenge (Kominfo, 2022; World Bank, 2021). A fishbone analysis of current conditions reveals several interrelated causes of limited AI literacy within Islamic higher education: insufficient technological infrastructure, lack of advanced tools, low levels of lecturer training, inconsistent curriculum integration, and underdeveloped approaches to embedding socio-ethical and religious perspectives in

digital literacy (Tuomi, 2021; Floridi et al., 2018; Hasanah et al., 2023; Santoso & Lestari, 2022). These factors demonstrate that AI literacy in Islamic universities cannot be reduced to the acquisition of technical skills alone but must be grounded within cultural, ethical, and institutional frameworks.

Despite the global momentum in AI literacy education, there remains no consensus on how to effectively integrate AI and GAI into higher education curricula, particularly in culturally distinct contexts. Existing frameworks such as those proposed by Long and Magerko (2020) and Ng et al. (2021) provide valuable foundations, but they largely emerge from Western perspectives and lack contextual responsiveness to the needs of Muslim learners. Research also shows that students often use AI in uncritical ways, focusing on surface-level benefits while overlooking ethical and reflective dimensions (Ng & Yeo, 2021; Laupichler et al., 2022). In the Indonesian context, government initiatives such as the Gerakan Literasi Digital Nasional have sought to expand digital competence, yet these efforts tend to emphasize basic digital skills rather than advanced AI literacy (Kominfo, 2022). Furthermore, the integration of AI in higher education frequently neglects socio-ethical and religious considerations, creating a gap between technological innovation and the moral mission of Islamic education (Rahman & Fitri, 2022; Yuniarto, 2020).

Responding to these challenges, this research seeks to develop and validate an AI and Generative AI literacy framework specifically tailored for Islamic higher education, using UIN Sunan Gunung Djati Bandung as a case study. Building upon the ADDIE instructional design model (Branch, 2009), the study integrates mixed methods—quantitative surveys, qualitative interviews, and expert validation—to identify key competencies and contextualize them within pedagogical practice. By synthesizing findings across students, lecturers, and experts, the study advances a holistic model of AI and GAI literacy that emphasizes four pillars: technical skills, critical awareness, ethical understanding, and pedagogical integration. This framework is not merely technological, but also value-driven, ensuring that AI literacy development aligns with the mission of Islamic higher education to cultivate graduates who are not only competent professionals but also ethically responsible and spiritually grounded (al-Faruqi, 1982; Hadi & Muhlishoh, 2024). Furthermore, the study contributes to the global discourse by demonstrating how culturally embedded frameworks can enrich evolving definitions of AI literacy (Zawacki-Richter et al., 2019; Holmes et al., 2022).

RESEARCH METHOD

This study employed a Research and Development (R&D) design guided by the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The R&D design was selected because it is appropriate for educational innovation, providing a systematic approach to develop, test, and refine instructional models in authentic settings (Gall, Gall, & Borg, 2003; Richey & Klein, 2014). The ADDIE model was chosen due to its structured yet flexible nature, which allows adaptation to diverse educational contexts, including higher education institutions with specific cultural and ethical orientations (Branch, 2009; Molenda, 2015). In this study, the ADDIE framework enabled the identification of essential competencies for AI and Generative AI literacy, the design of a literacy framework, and its validation within the context of Islamic higher education.

Participants and Context

The study was conducted at the State Islamic University (UIN) Sunan Gunung Djati Bandung, Indonesia, within the English Language Teaching (ELT) Department. The participants consisted of 25 fifth-semester students enrolled in the AI for Education course and three lecturers who taught and supervised the program. The participants were chosen because they represented a relevant sample for developing a literacy framework, as they were directly engaged with AI-related content in their coursework. The institutional

context was particularly significant since Islamic higher education requires frameworks that are not only technologically and pedagogically sound but also aligned with Islamic ethical values (Holmes et al., 2022).

Data Collection

Data were collected using a combination of quantitative and qualitative instruments to comprehensively address the research question. First, a questionnaire using a Likert scale was distributed to students and lecturers to measure their current level of AI and Generative AI literacy and to identify key competencies (Creswell & Creswell, 2018). To complement this, semi-structured interviews were conducted with a subset of participants to capture perceptions, expectations, and challenges regarding AI/GAI literacy (Kvale & Brinkmann, 2009). A document and literature review was also conducted to map existing AI literacy frameworks and adapt them to the context of Islamic higher education (Long & Magerko, 2020; Ng & Yeo, 2021). In the development phase, Focus Group Discussions (FGDs) were organized with students, lecturers, and Islamic education experts to refine the proposed framework (Morgan, 1997). An expert validation checklist was then applied to evaluate the framework in terms of pedagogical relevance, technological feasibility, and alignment with Islamic ethical values (Lawshe, 1975; Haynes, Richard, & Kubany, 1995). Finally, classroom observations and pilot testing were carried out to evaluate the applicability of the framework in the AI for Education course and to gather feedback from students and lecturers (Cohen, Manion, & Morrison, 2018).

Data Analysis

Data analysis combined both quantitative and qualitative methods. Quantitative data from the questionnaires were analyzed using descriptive statistics (means, percentages, and frequencies) to identify literacy levels and priority competencies (Creswell & Creswell, 2018). Qualitative data from interviews, FGDs, and observations were analyzed thematically to identify patterns, challenges, and opportunities in integrating AI/GAI literacy into learning models (Braun & Clarke, 2006). To enhance the robustness of the findings, triangulation was applied by cross-checking data from questionnaires, interviews, and expert validation (Denzin, 1978; Patton, 1999).

Several strategies were employed to ensure the validity and trustworthiness of the findings. Expert validation by specialists in AI, pedagogy, and Islamic education confirmed the relevance and accuracy of the framework (Lawshe, 1975; Haynes et al., 1995). Member checking was conducted by allowing participants to review summaries of their responses to verify accuracy (Lincoln & Guba, 1985). Triangulation of data sources further ensured reliability by combining multiple perspectives (Denzin, 1978; Patton, 1999). To ensure transferability, thick descriptions of the research context were provided (Geertz, 1973; Creswell & Poth, 2016). Finally, an audit trail was maintained to document data collection and analysis processes, enhancing dependability and confirmability (Merriam & Tisdell, 2016; Shenton, 2004).

RESULTS AND DISCUSSION

Result

To gain a clearer understanding of the current level of AI and Generative AI literacy among participants, descriptive statistics were calculated separately for students and lecturers. The analysis included mean scores, standard deviations, and frequencies for each competency dimension: technical skills, critical awareness, ethical understanding, and pedagogical integration. This separation allowed for direct comparison between students and lecturers, highlighting areas of strength as well as gaps that the proposed framework needs to address. The results are presented in the following table:

Tabel 1. Quantitative Result

Competency Dimension	Students (N=25) Mean ± SD	Lecturers (N=3) Mean ± SD	Interpretation (Comparison)
Technical Skills	3.1 ± 0.62	3.6 ± 0.58	Lecturers slightly higher in technical proficiency.
Critical Awareness	2.8 ± 0.70	3.2 ± 0.66	Both low–moderate, but lecturers show stronger awareness of AI bias and limitations.
Ethical Understanding	4.0 ± 0.55	4.3 ± 0.50	High for both; lecturers slightly stronger alignment with ethical use and Islamic values.
Pedagogical Integration	3.4 ± 0.60	3.8 ± 0.57	Lecturers more confident in integrating AI/GAI into teaching practices.

Table 1 presents the descriptive statistics comparing the AI and Generative AI literacy competencies of students (N = 25) and lecturers (N = 3). Four main dimensions were assessed: technical skills, critical awareness, ethical understanding, and pedagogical integration.

For technical skills, students obtained a mean score of 3.1 (SD = 0.62), while lecturers scored slightly higher with a mean of 3.6 (SD = 0.58). This indicates that although both groups demonstrated moderate proficiency in operating AI and Generative AI tools, lecturers were somewhat more advanced in terms of practical usage.

In terms of critical awareness, students achieved the lowest mean score (M = 2.8, SD = 0.70), reflecting a limited ability to recognize potential risks, biases, or limitations associated with AI technologies. Lecturers scored marginally higher (M = 3.2, SD = 0.66), suggesting that they were more aware of such challenges, although the overall level remained moderate.

The highest mean scores for both groups were observed in ethical understanding, where students reached 4.0 (SD = 0.55) and lecturers slightly higher at 4.3 (SD = 0.50). This result indicates a strong ethical orientation among participants, particularly in aligning the responsible use of AI and Generative AI with academic integrity and Islamic values.

For pedagogical integration, students obtained a mean score of 3.4 (SD = 0.60), while lecturers scored 3.8 (SD = 0.57). This suggests that both groups recognized the pedagogical potential of AI/GAI tools, but lecturers demonstrated greater readiness and confidence in integrating these tools into teaching and learning practices.

Overall, the results highlight that while both students and lecturers share a strong ethical foundation regarding the use of AI and Generative AI, students showed weaker performance in critical awareness, whereas lecturers outperformed students across all four dimensions. These findings reinforce the importance of a structured literacy framework to strengthen technical competencies and critical awareness, particularly among students, while supporting lecturers in expanding pedagogical integration.

The result of qualitative findings

In addition to the quantitative data, qualitative insights were obtained through semi-structured interviews, focus group discussions, and classroom observations. These instruments provided a deeper understanding of how students and lecturers perceive, experience, and apply AI and Generative AI literacy in the learning context. Thematic analysis revealed similarities and differences between students and lecturers across four main competency dimensions: technical skills, critical awareness, ethical understanding,

and pedagogical integration. Representative quotes are included to illustrate the participants' perspectives. The detailed findings are summarized in the following table.

Tabel 2 Qualitative Result

Competency Dimension	Students (N=25)	Lecturers (N=3)	Illustrative Quotes
Technical Skills	Basic use of AI tools (ChatGPT, Grammarly, QuillBot) for grammar checks and summaries; limited advanced usage.	More confident in experimenting with AI for lesson prep (quizzes, materials), but still cautious about accuracy.	Student 07: *"I usually use ChatGPT to check my grammar, but I don't know how to make it help with lesson planning."* Lecturer 02: *"AI can save time in preparing materials, but without clear guidelines, I sometimes worry about the accuracy."*
Critical Awareness	Tend to accept AI outputs without checking; limited awareness of bias/errors.	Aware of plagiarism risks and misinformation; emphasize training students to verify sources.	Student 14: *"Sometimes the answer from AI is wrong, but I don't always notice until my lecturer corrects me."* Lecturer 01: *"Students often copy-paste from AI without checking; we need to build their critical thinking."*
Ethical Understanding	Strong concern about honesty and over-dependence on AI; cautious in use.	Strong emphasis on integrating Islamic values into AI use; honesty and responsibility stressed.	Student 09: *"I don't want to depend too much on AI. It feels dishonest if I submit an essay made only by ChatGPT."* Lecturer 03: *"As an Islamic university, we must remind students that AI is acceptable if it supports learning, not if it replaces effort."*
Pedagogical Integration	Some use AI for English practice or brainstorming; still rely on lecturers' guidance.	AI tried in class projects but integration remains partial; needs careful design.	Student 21: *"It helps me practice speaking in English when I don't have a partner, but sometimes the answers sound unnatural."* Lecturer 02: *"I tried asking students to use AI for group projects, but some became passive."*

Table 2 summarizes the thematic findings obtained from the qualitative instruments, including interviews, FGDs, and classroom observations. The analysis shows clear differences between students and lecturers across the four literacy competency dimensions. For technical skills, students reported primarily using AI tools such as ChatGPT, Grammarly, and QuillBot for basic academic support like grammar checking and text summarization. Their use of more advanced features remained limited. In contrast, lecturers demonstrated greater confidence in experimenting with AI for lesson preparation, such as creating quizzes or generating material ideas, though they remained cautious about the accuracy of outputs.

In terms of critical awareness, students tended to accept AI-generated outputs without questioning accuracy or bias, indicating limited awareness of AI limitations.

Lecturers, however, showed stronger recognition of plagiarism risks and misinformation, emphasizing the need to train students to critically evaluate AI outputs.

For ethical understanding, both groups expressed strong concerns. Students highlighted the importance of honesty and avoiding overdependence on AI for academic tasks, while lecturers strongly emphasized aligning AI usage with Islamic values, stressing responsibility and fairness in its application. Finally, in pedagogical integration, some students experimented with AI for English practice or brainstorming ideas but still relied heavily on lecturer guidance. Lecturers, on the other hand, attempted to integrate AI into classroom projects, though they observed that without careful design, some students became passive, reducing the intended learning benefits.

These qualitative findings highlight complementary perspectives: students bring enthusiasm but lack critical awareness, while lecturers demonstrate stronger pedagogical and ethical considerations. Together, these insights underscore the importance of a structured AI and Generative AI literacy framework that addresses both technical competency and ethical integration in Islamic higher education.

Narrative of the AI and Generative AI Literacy Learning Model

The proposed AI and Generative AI Literacy Learning Model for Islamic Higher Education was developed as a synthesis of the quantitative, qualitative, and expert validation results. The model is grounded in the philosophical foundation of Islamic values—honesty (ṣidq), responsibility (amanah), and fairness (‘adl)—which serve as the ethical compass for integrating technology into learning. This foundation ensures that AI literacy is not only a technical skillset but also a moral practice aligned with the mission of Islamic universities.

At the core, the model emphasizes four interrelated competencies: technical skills, critical awareness, ethical understanding, and pedagogical integration. Each competency reflects a dimension of literacy identified through the findings. Technical skills are necessary for enabling students and lecturers to operate AI tools effectively. Critical awareness highlights the need to question AI-generated content, recognize bias, and avoid overreliance. Ethical understanding emphasizes aligning AI practices with Islamic values and academic integrity. Pedagogical integration ensures that AI is meaningfully applied to teaching and learning processes, rather than being used superficially.

The learning process within the model follows a cyclical sequence of six stages: (1) Orientation and Awareness, introducing AI/GAI concepts and Islamic perspectives on technology; (2) Skill Development, where students engage in guided practice with AI tools; (3) Critical Reflection, encouraging analysis of AI outputs for reliability and bias; (4) Ethical Integration, fostering reflections on honesty and responsibility in AI usage; (5) Pedagogical Application, where students and lecturers collaboratively design AI-assisted learning activities; and (6) Evaluation and Feedback, which combines peer review, lecturer assessment, and expert validation.

The roles of students and lecturers are complementary in this model. Students act as active explorers, engaging with AI tools to support their language learning and reflecting on their ethical implications. Lecturers serve as facilitators and ethical guides, scaffolding technical knowledge while reinforcing Islamic principles in practice. Assessment strategies combine formative tasks, such as reflection journals and discussions, with summative evaluations like project-based lesson plans that integrate AI.

Tabel 3 Component of Learning Model

Component	Description	Example in AI for Education Course

Learning Objectives	Students develop technical proficiency, critical awareness, ethical reasoning, and pedagogical integration in using AI/GAI tools.	"By the end of the course, students can critically evaluate AI outputs and design AI-assisted lesson activities aligned with Islamic values."
Learning Materials	Combination of AI literacy concepts, case studies, and practical AI/GAI tools.	Case study: plagiarism from ChatGPT vs ethical paraphrasing.
Learning Activities	Blended approach: guided practice, group projects, reflective tasks.	Group project: students design a mini-lesson plan using AI; Reflection journal: "How do I ensure honesty when using AI?"
Instructor Role	Facilitator and ethical guide; provides scaffolding and ensures Islamic alignment.	Lecturer demonstrates prompt engineering, then facilitates discussion on ethical limits.
Student Role	Active explorer of AI tools, reflective learner who aligns practice with ethics.	Students test AI for language practice, then critique bias/accuracy.
Assessment	Formative (reflection journals, discussion participation) + Summative (project-based lesson plan with AI integration, validated by rubric).	Rubric includes: technical accuracy, creativity, ethical compliance, pedagogical value.

The model was validated through expert judgement, which rated it highly in terms of pedagogical relevance, technological feasibility, and ethical-Islamic alignment. This validation confirms that the model is not only theoretically sound but also practically applicable within the context of Islamic higher education.

In summary, this learning model actualizes AI and Generative AI literacy by balancing skill, awareness, and values. It equips students with the ability to use AI tools effectively, reflect critically on their limitations, uphold ethical responsibility, and integrate technology meaningfully into education. In doing so, the model provides a contextually relevant framework for higher education institutions like UIN Sunan Gunung Djati Bandung, ensuring that technological literacy grows in harmony with cultural and religious identity.

Discussion

The findings of this study provide a comprehensive answer to the research question: "How can an AI and Generative AI literacy framework be developed and integrated into Islamic higher education, particularly in identifying key competencies and validating its applicability in learning models?" The triangulated data—quantitative surveys, qualitative interviews and observations, and expert validation—collectively demonstrate that AI and Generative AI literacy in Islamic higher education must be built upon a balance of technical, critical, ethical, and pedagogical dimensions.

First, the quantitative results highlight the disparity between students and lecturers. While both groups demonstrated strong ethical awareness, students scored lower in critical awareness, often accepting AI outputs without further evaluation. This is consistent with previous studies that identified "functional but uncritical" usage patterns among novice users of AI tools (Long & Magerko, 2020; Ng & Yeo, 2021). The implication is that higher education curricula must move beyond technical training to explicitly foster critical engagement with AI systems.

Second, the qualitative findings underscore the experiential gap between students and lecturers. Students tended to use AI for surface-level tasks, such as grammar checking

or summarizing, while lecturers experimented with lesson design and classroom applications. However, both groups shared concerns about ethical implications, echoing research that emphasizes the importance of value-oriented AI literacy (Holmes, Bialik, & Fadel, 2022). Within the Islamic higher education context, these ethical concerns are further reinforced by religious principles that demand honesty, fairness, and accountability. Such integration of faith and technology resonates with emerging scholarship on contextualized digital literacy, which stresses the importance of aligning technological competencies with cultural and moral frameworks (Alghamdi, 2022).

Third, the expert validation confirmed that the proposed framework is pedagogically relevant, technologically feasible, and strongly aligned with Islamic ethical values. The high scores for ethical-Islamic alignment highlight a unique contribution of this study: while most AI literacy frameworks focus on technical and cognitive competencies (Ng, Leung, & Yeo, 2021), this framework explicitly integrates Islamic ethical foundations as its philosophical core. By doing so, it addresses the call for developing culturally responsive AI literacy models that are not only globally informed but also locally meaningful (Zawacki-Richter et al., 2019).

The resulting AI and Generative AI Literacy Learning Model contextualizes the ADDIE framework for Islamic higher education. Its cyclical stages—orientation, skill development, critical reflection, ethical integration, pedagogical application, and evaluation—reflect the multi-dimensional nature of AI literacy. This model not only equips students with technical skills but also cultivates critical awareness and ethical reasoning, ensuring that the use of AI aligns with Islamic values and contributes meaningfully to pedagogy.

The integration of this model into courses such as AI for Education at UIN Sunan Gunung Djati Bandung demonstrates its applicability. By embedding AI literacy into the curriculum, students can be prepared not only as competent AI users but also as ethically responsible educators and scholars. Moreover, this model may serve as a template for other Islamic higher education institutions seeking to balance technological adoption with religious and cultural identity.

CONCLUSION

This study has developed and validated an AI and Generative AI literacy framework tailored for Islamic higher education, with a case study at UIN Sunan Gunung Djati Bandung. The findings demonstrate that AI literacy is not limited to technical proficiency but must also encompass critical awareness, ethical understanding, and pedagogical integration. Students exhibited stronger ethical awareness but weaker critical engagement, while lecturers showed higher performance across all competencies, particularly in pedagogical integration. Expert validation further confirmed the framework's pedagogical relevance, technological feasibility, and strong alignment with Islamic ethical values, making it a robust model for guiding AI integration in Islamic universities.

RECOMMENDATION

Based on these findings, it is suggested that higher education institutions adopt this framework as a foundation for curriculum design, teacher training, and classroom implementation. Universities should invest in strengthening students' critical awareness and technical competencies, while supporting lecturers in designing meaningful AI-integrated pedagogical practices. Future research may expand the framework across other faculties and institutions, explore longitudinal impacts of AI literacy training, and develop policy guidelines to harmonize technological advancement with Islamic values. This will ensure that AI adoption in higher education remains both contextually relevant and ethically grounded.

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