

The Indonesian Curriculum in the Era of Generative AI: Reconstructing Competencies and Learning Strategies for the Future of Education

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Abstract

The rapid development of Generative Artificial Intelligence (GenAI) is challenging conventional assumptions about what students need to learn and how learning should be organized. This study aims to examine the need for reconstructing the Indonesian curriculum in response to GenAI, particularly in relation to future-oriented competencies and learning strategies. A qualitative exploratory design was employed involving curriculum experts, educators, and educational practitioners. Data were collected through semi-structured interviews, observations of learning practices, and document analysis, and were analyzed thematically using source and methodological triangulation. The findings indicate that GenAI requires a shift from technology integration toward curriculum reconstruction. Three interconnected dimensions emerged: the reconstruction of future-oriented competencies, the transformation of learning strategies through human-AI collaboration, and the strengthening of human-centered values. Students need not only AI literacy but also critical thinking, creativity, problem-solving, information evaluation, adaptability, ethical judgment, and the ability to collaborate meaningfully with AI. The findings further indicate that inquiry-based, problem-based, project-based, reflective, and verification-oriented learning strategies are more appropriate than approaches focused primarily on knowledge reproduction. The study contributes a Generative AI Curriculum Reconstruction Framework that integrates future-oriented competencies, human-AI learning strategies, and human-centered values. This framework extends existing AI-in-education perspectives by positioning GenAI as a catalyst for curriculum transformation rather than merely an instructional technology.

Keywords: Generative Artificial Intelligence; curriculum reconstruction; future competencies; human-AI collaboration; AI literacy; Indonesian education

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INTRODUCTION

The development of *Generative Artificial Intelligence* (GenAI) presents new challenges for curriculum development in Indonesia (Amin et al., 2025; Kuswadi et al., 2026). The issue is not merely how AI technology can be used as a learning medium, but whether the

competencies formulated in the curriculum remain relevant when various cognitive activities, such as searching for information, summarizing, translating, generating texts, writing code, and developing ideas, can be performed by machines (Assyifa, 2026; Moh. Solikul Hadi, Muhammad Nuril Anam, 2021). This condition creates a fundamental transformation in the learning environment: students are no longer confronted primarily with limited access to information, but rather with an abundance of information and technological capabilities that can generate knowledge instantaneously (Alenezi, 2023; Rahayu, 2023). Under such circumstances, the curriculum needs to address more fundamental questions regarding which competencies must remain uniquely mastered by humans, which competencies need to be reconceptualized and redeveloped, and how learning processes should be designed when students learn alongside AI systems.

This issue indicates a tension between a curriculum orientation that continues to emphasize knowledge acquisition and learning products and the educational needs of an environment in which knowledge can be automatically produced (Niemelä, 2022). If students can obtain answers through GenAI, then the ability to merely produce answers is no longer sufficient as an indicator of learning success. Competencies are shifting toward the ability to formulate questions, evaluate information, verify AI-generated outputs, construct arguments, solve complex problems, make decisions, collaborate with technology, and take ethical responsibility for the use of AI (Mat et al., 2026; Thi et al., 2025). Thus, the primary challenge for the Indonesian curriculum is not simply the integration of AI into learning, but rather the reconstruction of competency orientations and learning strategies to ensure that education remains relevant when AI becomes an integral part of students' knowledge ecosystem (Abrori & Hadi, 2020; Fahmi Husein, Moh Solikul Hadi, 2024; Hadi et al., 2024).

A growing body of previous research has demonstrated increasing attention to the use of AI in education. Studies on *Artificial Intelligence in Education* have extensively examined the potential of AI for learning personalization, feedback provision, instructional material development, improving teacher work efficiency, and supporting students' learning experiences (Hadi et al., 2026; Moh. Solikul Hadi, M. Sayyidul Abrori, 2024). Other studies have focused on teacher readiness, AI literacy, students' perceptions, technology acceptance, as well as ethical issues and academic integrity in the use of GenAI. Research on *AI literacy* has also begun to position the ability to understand, use, evaluate, and critically examine AI technologies as a new competency required by students. These studies provide an important foundation for recognizing that AI has transformed educational practices and requires systematic pedagogical responses (Haningsih et al., 2026).

Nevertheless, previous research still leaves several important areas for further investigation. First, most studies position AI as a technology or instructional tool, rather than as a factor that drives changes in curriculum structure and orientation (Chu, 2025; Nurul et al., 2026). Second, studies on future competencies generally discuss *critical thinking*, creativity, collaboration, digital literacy, and AI literacy separately, and therefore have yet to provide sufficient competency frameworks specifically designed in response to changes in the knowledge ecosystem brought about by GenAI (Chiu, 2025; Cital, 2026). Third, research on AI-based learning strategies has more frequently focused on the effectiveness of particular applications or technology acceptance, while the relationship between competency transformation, learning design, and curriculum development has received comparatively limited integrative attention (Bollaert, 2025; Lin, 2025). Fourth, in the Indonesian context, studies specifically exploring how educational stakeholders perceive the need for competency and learning strategy reconstruction as a foundation for

curriculum development in the GenAI era remain relatively limited (Herviana, 2025; Marzano, 2026).

This research gap has become increasingly important because curriculum development cannot be adequately addressed by simply adding a new competency called *AI literacy*. The addition of AI literacy without corresponding changes in the orientation of learning may reduce AI to merely another subject matter or technical skill. What is required is a more substantive transformation, namely positioning humans' ability to interact critically and productively with AI as an integral component of core educational competencies. From this perspective, *AI literacy* needs to be connected with *critical thinking*, creativity, problem-solving, communication, human–AI collaboration, information literacy, ethics, and reflection. These competency transformations must subsequently be translated into learning strategies and assessment practices that evaluate students' thinking processes rather than merely the final products that can be generated by AI (Castillo et al., 2025; Hadi et al., 2025).

Building on this research gap, the present study differs from previous research in that it does not merely examine the use of GenAI in learning or the readiness of teachers and students to use AI. Instead, this study positions GenAI as a context of curriculum transformation and seeks to understand how changes in the knowledge ecosystem necessitate the reconstruction of competencies and learning strategies in Indonesia. Specifically, the study explores the perspectives and experiences of educational stakeholders regarding which competencies need to be maintained, developed, or reconstructed, as well as which learning strategies are considered relevant for preparing students to navigate an educational environment increasingly influenced by GenAI.

This study aims to analyze the need for competency reconstruction within the Indonesian curriculum in the GenAI era and to identify relevant learning strategies for developing these competencies. More specifically, the study examines changes in the characteristics of competencies required by students, explores forms of learning strategies that are appropriate for human–AI collaboration, and formulates the relationship between competencies and learning strategies as a foundation for developing a curriculum that is adaptive to GenAI.

The novelty of this study lies in the development of a GenAI-based curriculum reconstruction framework that integrates three core components: future-oriented competencies, human–AI learning strategies, and human-centered values. The framework does not position AI as a substitute for human competencies, but rather as a new context that requires education to strengthen human capacities that are critical, creative, reflective, ethical, adaptive, and collaborative. Accordingly, the contribution of this study extends beyond providing recommendations for the use of GenAI in learning; it offers a perspective that technological transformation requires corresponding changes in what students need to master and how these competencies are developed through learning. This framework is expected to provide a conceptual foundation for developing an Indonesian curriculum that is not merely *AI-enabled*, but AI-responsive, human-centered, and future-oriented.

METHOD

This study employed a qualitative exploratory research design to investigate how the emergence of Generative Artificial Intelligence (GenAI) is reshaping the competencies required by learners and the learning strategies that should be reflected in the development

of the Indonesian curriculum (Arif et al., 2025; Halim et al., 2025). A qualitative approach was considered appropriate because the study sought to understand the meanings, perspectives, experiences, and expectations of educational stakeholders regarding curriculum transformation rather than to measure the effectiveness of a particular AI application (Creswell, 2023). The research was conducted within the Indonesian educational context, with particular attention to the changing relationship between curriculum, learner competencies, pedagogical practices, and the growing use of GenAI in educational environments.

The participants were selected purposively based on their knowledge, experience, and involvement in curriculum development and educational practice. They consisted of curriculum experts, university lecturers in education, school teachers, educational practitioners, and education policymakers or curriculum coordinators. The selection of participants followed the principle of information richness, meaning that participants were included because they were considered capable of providing substantive perspectives on curriculum development, future competencies, and the pedagogical implications of GenAI. Data collection continued until the information obtained reached sufficient conceptual saturation, whereby additional interviews no longer generated substantially new themes relevant to the research questions.

Data were collected through semi-structured interviews, document analysis, and limited observations of learning practices involving digital and AI-supported technologies. The interviews explored four major areas: perceptions of the impact of GenAI on the relevance of the existing curriculum, competencies that need to be maintained or reconstructed, learning strategies appropriate for human–AI collaboration, and principles that should guide the development of a human-centered curriculum. The interview questions were developed from the conceptual relationship between GenAI, future competencies, learning strategies, and curriculum transformation. Documentary data included relevant curriculum documents, policy documents, educational guidelines, and scholarly publications concerning curriculum development, AI in education, AI literacy, and future-oriented competencies. These documents were used to complement the interview findings and provide contextual evidence for interpreting participants' perspectives.

The data were analyzed thematically through an iterative process of data condensation, coding, categorization, theme development, and interpretation (Somantri, 2005). First, interview transcripts and documentary materials were reviewed repeatedly to obtain an overall understanding of the data. Second, meaningful statements related to curriculum transformation, competency changes, AI literacy, critical thinking, creativity, problem-solving, human–AI collaboration, ethical awareness, and learning strategies were identified and assigned initial codes. Third, related codes were grouped into broader categories representing emerging dimensions of curriculum reconstruction. The analysis subsequently focused on identifying relationships between changes in learner competencies and corresponding changes in pedagogical strategies. Themes that emerged consistently across different participant groups and data sources were compared and refined to establish a coherent interpretation.

To strengthen the credibility of the findings, the study employed source triangulation and methodological triangulation. Perspectives from different groups of educational stakeholders were compared to identify areas of convergence and divergence, while interview findings were cross-checked against relevant curriculum and policy documents. Member checking was also used by presenting key interpretations to selected participants

to determine whether the findings accurately reflected their perspectives. An audit trail was maintained throughout the analytical process to document the development of codes, categories, themes, and interpretations. These procedures were intended to enhance the credibility, dependability, and confirmability of the research findings (Creswell, 2018; Matthew B. Miles, A. Michael Huberman, 2014).

The final stage of the analysis involved synthesizing the empirical findings into a conceptual framework for curriculum reconstruction in the Generative AI era. Rather than treating AI as an additional instructional technology, the framework was developed by examining how changes in the knowledge environment require corresponding changes in learner competencies and pedagogical practices. The resulting framework connected three central dimensions: future-oriented competencies, human-AI learning strategies, and human-centered values. The framework was then interpreted in relation to the broader objectives of Indonesian curriculum development, providing a conceptual basis for designing a curriculum that is responsive to technological transformation while maintaining human agency, ethical responsibility, and meaningful learning.

RESULT AND DISCUSSION

Result

The findings indicate that the emergence of Generative Artificial Intelligence (GenAI) has created a substantial need to reconsider the orientation of curriculum development in Indonesia. The triangulation of interview data, observations, and documentary evidence identified three interconnected dimensions of curriculum reconstruction: (1) reconstruction of future-oriented competencies, (2) transformation of learning strategies through human-AI collaboration, and (3) strengthening of human-centered values and ethical responsibility. The convergence of evidence across the three data sources suggests that GenAI should not merely be incorporated as an additional learning technology but should become a contextual consideration in redefining what students need to learn and how learning should take place.

Reconstruction of Future-Oriented Competencies

The first finding concerns a shift in the competencies considered essential for students. Interview data suggested that conventional competencies emphasizing knowledge acquisition and reproduction need to be complemented by competencies related to critical evaluation, information verification, problem solving, creativity, AI literacy, and adaptability. Participants particularly emphasized that students need to understand not only how to use AI but also how to question and evaluate AI-generated information.

"Students can now obtain an answer from AI very quickly. The challenge is no longer whether they can find an answer, but whether they can determine whether the answer is correct, relevant, and ethically acceptable."

This perspective was reinforced by observations of learning activities in which students used digital and AI-based tools to obtain information and develop assignments. The observation showed that students were generally able to operate digital tools, but differences emerged in their ability to verify information, explain the reasoning behind their answers, and critically evaluate AI-generated content. In several learning activities, students tended to focus on the final output rather than the process through which the output was developed.

Documentary analysis provided further support for this finding. Curriculum-related documents emphasize competencies such as critical thinking, creativity, collaboration, communication, and learner independence. However, the analysis indicates that these competencies need to be contextualized within an environment in which AI can perform increasingly sophisticated cognitive tasks. Therefore, AI literacy should not be treated as an isolated technical competency but should be integrated with critical thinking, information literacy, problem solving, and ethical judgment.

The triangulation of the three sources can therefore be summarized as follows: interviews identified the perceived need for competency transformation; observations demonstrated the practical gap between technological use and critical engagement; and documentary analysis confirmed the relevance of future-oriented competencies within the broader direction of curriculum development.

Transformation of Learning Strategies through Human-AI Collaboration

The second finding concerns the need to transform learning strategies. Participants generally viewed GenAI as potentially useful for supporting learning, but they emphasized that students should not become passive recipients of AI-generated answers. Learning activities need to be redesigned so that AI becomes a tool for inquiry, comparison, experimentation, feedback, and reflection.

“We should not prohibit students from using AI completely. Instead, the learning process should require them to show how they use AI, what they accept from it, what they reject, and why.”

Observational data indicated that AI-supported learning was most meaningful when teachers required students to compare AI-generated responses with textbooks, academic sources, or other credible references. Activities involving discussion, source verification, presentation, and reflection encouraged students to move beyond simply copying AI-generated content. In contrast, assignments focused exclusively on producing written outputs provided fewer opportunities to assess students' independent reasoning.

The documentary analysis similarly revealed the importance of learner-centered, inquiry-based, problem-based, and project-oriented learning approaches. These approaches provide opportunities to reposition GenAI from an answer-generating mechanism into a learning partner that supports students' inquiry and problem-solving processes. The findings consequently suggest that curriculum reconstruction needs to be accompanied by pedagogical reconstruction.

The three data sources demonstrated a consistent pattern. Interview participants emphasized the importance of responsible AI use; observations showed that learning activities involving verification and reflection generated deeper student engagement; and documentary evidence supported pedagogical approaches that emphasize active, contextual, and learner-centered learning. These findings indicate the importance of developing **human-AI learning strategies** as an integral component of future curriculum development.

Strengthening Human-Centered Values and Ethical Responsibility

The third finding concerns the preservation and strengthening of human-centered values. Although GenAI provides substantial opportunities for improving learning efficiency, participants emphasized that technological competence alone cannot become the primary orientation of curriculum development. Students still need integrity, responsibility, empathy, independence, ethical awareness, and the ability to make judgments that cannot simply be delegated to an AI system.

“The curriculum should prepare students to work with AI without allowing AI to determine everything for them. Human judgment, responsibility, and integrity must remain at the center of education.”

Observations supported this concern. When students were asked to use AI-generated materials, differences were observed in their willingness to verify sources, acknowledge the use of AI, revise inaccurate information, and provide independent interpretations. These practices demonstrate that the educational challenge is not simply access to AI but the development of responsible behavior when interacting with AI-generated knowledge.

Documentary evidence also indicates that technological transformation needs to remain aligned with broader educational purposes, including character formation, learner independence, critical thinking, and responsible citizenship. Thus, the integration of GenAI into curriculum development should not be understood as technological modernization alone. It requires an explicit human-centered orientation that ensures technology supports educational purposes rather than replacing them.

Integrated Triangulation of Findings

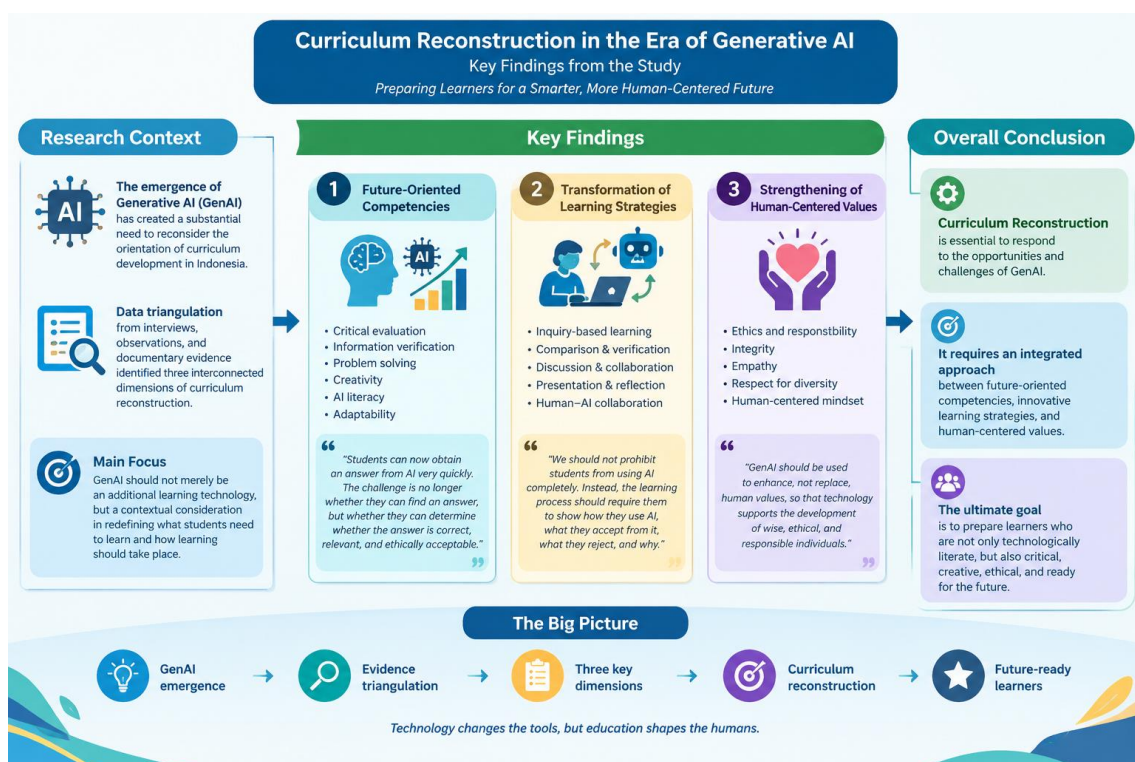
The triangulation process demonstrates a strong convergence among the three sources of evidence. Interview data revealed how educational stakeholders perceive the changing competency requirements and pedagogical challenges associated with GenAI. Observation data provided evidence of how these challenges appear in actual learning practices, particularly in students' use of AI-generated information and their varying levels of critical engagement. Documentary data provided the policy and conceptual context for interpreting these changes within the broader objectives of curriculum development.

Emerging Dimension	Interview Evidence	Observation Evidence	Documentary Evidence	Synthesized Finding
Future-oriented competencies	Need for critical thinking, AI literacy, adaptability, and problem solving	Students can use AI but vary in their ability to verify and evaluate outputs	Curriculum emphasizes critical thinking, creativity, communication, and independence	Competencies need to be reconstructed for an AI-mediated knowledge environment
Human-AI learning strategies	AI should support inquiry rather than replace student thinking	Verification, discussion, reflection, and project activities encourage	Learner-centered and inquiry-oriented approaches are emphasized	Learning strategies need to shift toward meaningful human-AI collaboration

		deeper engagement		
Human-centered values	Importance of integrity, responsibility, independence, and ethical judgment	Differences in source verification and responsible AI use	Educational documents emphasize character and learner development	AI integration must remain human-centered and ethically grounded

The convergence of these findings provides the basis for the development of a Generative AI Curriculum Reconstruction Framework. The framework positions curriculum transformation as a systemic process rather than the addition of AI-related content. It connects future-oriented competencies with human-AI learning strategies, while maintaining human-centered values as the normative foundation. In this framework, AI literacy functions as an enabling competency, critical thinking and problem solving function as core cognitive capacities, human-AI collaboration functions as a pedagogical orientation, and ethics and human agency function as foundational principles.

Overall, the findings demonstrate that the central challenge for Indonesian curriculum development in the Generative AI era is not whether AI should be incorporated into education, but how curriculum design can ensure that students remain capable of thinking critically, creating knowledge, making responsible decisions, and exercising human judgment while working alongside increasingly capable AI systems.



Discussion

The findings of this study indicate that Generative Artificial Intelligence (GenAI) should not be understood merely as a new technological instrument to be incorporated into existing learning practices. Rather, GenAI changes the conditions under which knowledge is accessed, produced, evaluated, and communicated, thereby creating a need to reconsider the orientation of curriculum development. The central finding of this study is that curriculum transformation requires the reconstruction of learner competencies and learning strategies while maintaining human agency and ethical responsibility as the foundation of education. This finding provides an important theoretical discussion because it shifts the position of GenAI from being an instructional tool to becoming a contextual force that influences curriculum design itself.

From the perspective of Technological Pedagogical Content Knowledge (TPACK), the findings strongly support the argument that effective technology integration cannot be achieved through technological knowledge alone. TPACK conceptualizes meaningful technology integration as the interaction between technological, pedagogical, and content knowledge. Recent research on GenAI similarly indicates that its educational value depends substantially on pedagogical scaffolding and the ability of educators to connect AI technology with pedagogical purposes and subject content. The present findings reinforce this theoretical position because participants did not perceive the ability to operate AI tools as sufficient competence. Instead, they emphasized the ability to evaluate AI-generated information, determine its relevance, integrate it with disciplinary knowledge, and use it within appropriate learning strategies. Thus, this study supports TPACK but simultaneously extends its application to the curriculum level. TPACK traditionally explains the knowledge teachers need to integrate technology into teaching; this study suggests that in the GenAI era, its underlying logic needs to be extended from teacher knowledge toward curriculum-level decisions concerning what competencies students should develop and how those competencies should be cultivated.

This extension is consistent with recent empirical evidence showing that teachers' effective engagement with GenAI is influenced not simply by their technological proficiency but by their ability to connect AI with specific pedagogical challenges. A recent international study involving in-service teachers found that technological, pedagogical, and content knowledge were associated with GenAI-related TPACK, while pedagogical knowledge played an important role in translating technological capacity into meaningful educational practice. Similarly, research on teachers' interactions with GenAI suggests that AI-related professional knowledge is enacted through situated collaboration rather than existing merely as a collection of operational skills. The present study extends these findings by demonstrating that the same principle applies beyond teachers' professional knowledge: curriculum itself needs to be redesigned around the changing relationship between knowledge, pedagogy, technology, and human judgment.

The findings also provide substantial support for a constructivist view of learning, particularly the proposition that learning should involve active knowledge construction rather than passive reception of information. The emergence of GenAI makes this principle even more important. When students can obtain an apparently complete answer from an AI system almost instantaneously, the pedagogical value of simply receiving or reproducing information becomes increasingly limited. The findings therefore suggest that learning should emphasize inquiry, comparison, verification, reflection, argumentation, and authentic problem solving. In this respect, GenAI should function as a resource that

stimulates students' processes of knowledge construction rather than as a substitute for those processes.

However, the findings also reveal an important tension within the constructivist perspective. GenAI can potentially facilitate knowledge construction by providing alternative explanations, generating ideas, and supporting exploration, but it can also encourage cognitive offloading when students delegate too much of their thinking to the technology. Recent qualitative research with university students found that GenAI use may be associated with superficial engagement, reduced cognitive effort, and increasing dependence on AI-supported thinking. This evidence helps explain why the present study emphasizes verification, reflection, and independent interpretation. Therefore, the findings do not reject constructivism; rather, they strengthen its relevance under conditions of AI-mediated learning. The constructivist principle remains valid, but learning design must deliberately prevent GenAI from replacing the cognitive processes through which learners construct knowledge.

The reconstruction of competencies identified in this study is also closely aligned with the human-centred AI perspective promoted by UNESCO. UNESCO's AI Competency Framework for Students identifies four dimensions—human-centred mindset, ethics of AI, AI techniques and applications, and AI system design—with progression from understanding to application and creation. The framework emphasizes critical judgment, responsible citizenship, and the ability to engage with AI safely and meaningfully. The findings of the present study strongly support this orientation because participants consistently emphasized that AI literacy should not be reduced to knowing how to operate AI tools. Students need to understand the limitations of AI, evaluate its outputs, exercise judgment, and remain responsible for decisions made with AI assistance.

Nevertheless, the present study extends the UNESCO framework in an important direction. UNESCO provides a competency framework for what students should know and be able to do regarding AI, whereas the present research connects AI competencies directly with curriculum reconstruction and learning strategies. The findings suggest that AI literacy needs to be embedded within a broader competency architecture consisting of critical thinking, creativity, problem solving, information literacy, adaptability, human–AI collaboration, and ethical responsibility. In other words, the contribution of this study is not to propose AI literacy as another isolated curriculum component, but to position it as an enabling competency that interacts with other human capabilities. This interpretation is supported by recent research examining the relationship between AI literacy, prompting skills, and students' critical-thinking dispositions, which indicates increasing scholarly attention to the relationship between AI-related competencies and higher-order thinking.

Another significant finding concerns the transformation from AI-assisted learning toward human–AI collaborative learning. Previous research has demonstrated that GenAI can support cognitive, affective, and behavioral aspects of student learning, but systematic evidence also highlights weaknesses in instructional design, particularly insufficient pedagogical scaffolding. The present study confirms this concern through the observation that students benefit more meaningfully from AI when teachers require them to verify AI-generated information, compare alternative sources, explain their reasoning, and reflect on the learning process. This indicates that the educational effectiveness of GenAI is not an inherent property of the technology. It is mediated by curriculum design and pedagogical decisions.

This finding provides an important qualification to technology-centred approaches to educational innovation. If technology adoption is treated as the primary indicator of educational transformation, schools may simply reproduce existing pedagogies through more sophisticated technological tools. The present study instead suggests that meaningful transformation occurs when GenAI changes the structure of learning activity. Students should move from receiving answers to questioning answers, from reproducing information to evaluating information, and from producing AI-assisted outputs to demonstrating the reasoning underlying those outputs. In this sense, the study supports the pedagogical principle that technology should serve learning objectives rather than determine them.

The findings further suggest that the role of the teacher needs to be reconstructed alongside the curriculum. The teacher is no longer positioned primarily as the dominant source of information but increasingly as a designer of learning experiences, facilitator of inquiry, evaluator of AI-generated information, and guardian of academic and ethical standards. Recent research on teachers' GenAI-related TPACK similarly indicates that meaningful AI integration requires teachers to connect technological knowledge with pedagogical and disciplinary considerations rather than merely acquire operational skills. This finding reinforces the argument that curriculum reform cannot be separated from teacher professional development. A curriculum that requires critical AI literacy but provides teachers with no capacity to design AI-mediated learning experiences would create a structural inconsistency between curriculum expectations and classroom realities.

The study therefore supports the principle of constructive alignment, although with an important extension. If curriculum outcomes emphasize critical thinking, AI literacy, ethical judgment, and problem solving, learning activities and assessment must measure those same capabilities. It would be contradictory to promote critical engagement with AI while continuing to rely predominantly on assessments based on easily reproducible written outputs. The findings imply that assessment should increasingly examine students' reasoning processes, source verification, reflection, decision-making, and ability to explain how AI was used. In this respect, curriculum reconstruction necessarily involves not only changes in competency statements and instructional strategies but also changes in assessment practices.

Taken together, the findings lead to a broader theoretical proposition: GenAI requires a shift from technology integration to curriculum reconstruction. This proposition both supports and extends existing theories. It supports TPACK by confirming that technological integration must be connected with pedagogy and content, but extends TPACK by arguing that the interaction needs to inform curriculum-level competency design. It supports constructivism by emphasizing active knowledge construction, but adds that GenAI creates a new risk of cognitive offloading that must be addressed through deliberate pedagogical scaffolding. It supports the human-centred AI perspective by emphasizing ethics, human agency, and critical judgment, while extending it by linking AI competencies to broader curriculum structures and learning strategies.

Based on this theoretical dialogue, the Generative AI Curriculum Reconstruction Framework proposed by this study can be understood as an integrative framework consisting of three mutually connected dimensions: future-oriented competencies, human-AI learning strategies, and human-centred values. Future-oriented competencies determine what learners need to develop; human-AI learning strategies determine how those competencies are cultivated; and human-centred values determine the ethical and

educational boundaries within which AI should be used. The relationship among these dimensions is therefore not additive but systemic. AI literacy without critical thinking may produce technically capable but epistemically dependent learners; innovative AI-based pedagogy without ethical values may increase technological efficiency without ensuring responsible educational practice; and future competencies without appropriate learning strategies may remain merely declarative curriculum objectives.

The theoretical implication is consequently that curriculum development in the GenAI era should not be framed as a choice between accepting or rejecting AI. The more productive question is how curriculum can redefine human learning in relation to increasingly capable artificial intelligence. The findings suggest that the future curriculum should not attempt to compete with AI in information production. Instead, it should strengthen the capacities that enable learners to question, interpret, evaluate, create, collaborate, and make responsible judgments. In this sense, the study positions GenAI not as the endpoint of educational transformation but as a catalyst for redefining the purpose of curriculum itself.

CONCLUSION

This study concludes that the emergence of Generative Artificial Intelligence requires Indonesian curriculum development to move beyond the conventional paradigm of technology integration toward a more substantive process of curriculum reconstruction. The findings demonstrate that the fundamental challenge is not simply how students and teachers can use GenAI, but how education can redefine the competencies, learning processes, and pedagogical orientations required when AI becomes an increasingly important part of the knowledge ecosystem.

Three central conclusions emerge from the study. First, the competencies emphasized in the curriculum need to be reconstructed to respond to the changing nature of knowledge production. AI literacy should not be treated as an isolated technical skill but integrated with critical thinking, creativity, complex problem-solving, information literacy, adaptability, and ethical judgment. Second, the increasing presence of GenAI requires a transformation of learning strategies from knowledge reproduction toward inquiry, verification, reflection, authentic problem solving, and meaningful human-AI collaboration. Third, curriculum transformation must remain human-centered by strengthening integrity, responsibility, independence, ethical awareness, and human agency.

The principal contribution of this study is the Generative AI Curriculum Reconstruction Framework, which integrates three mutually connected dimensions: future-oriented competencies, human-AI learning strategies, and human-centered values. The framework extends existing perspectives such as TPACK, constructivist learning, and human-centered AI by connecting technological transformation directly to curriculum-level competency and pedagogical reconstruction.

The study therefore proposes that the future Indonesian curriculum should not compete with AI in reproducing information but should strengthen learners' capacity to question, evaluate, interpret, create, collaborate, and make responsible decisions. Such an orientation provides a foundation for developing an Indonesian curriculum that is AI-responsive, human-centered, and future-oriented. Further research is needed to empirically validate and operationalize the proposed framework across different educational levels, subject areas, and regional contexts in Indonesia.

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AUTHOR CONTRIBUTION STATEMENT

Moh. Solikul Hadi contributed to the conceptualization of the study, development of the research framework, methodology, data analysis, interpretation of findings, and manuscript preparation. Dyah Listiyani contributed to data collection, literature review, data organization, and interpretation of the research findings. Ali Kuswaidi contributed to the development of the theoretical framework, analysis and interpretation of data, and critical revision of the manuscript. Feri Riski Dinata contributed to data collection, documentation, data analysis, manuscript review, and editing. All authors contributed to the discussion of the findings, critically reviewed the manuscript, approved the final version, and agreed to be accountable for all aspects of the work.

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