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Bridging Technology and Values: Opportunities and Barriers to Artificial Intelligence–Supported Meaningful Learning in Elementary School

Yeni Erita[1*], Aisyah Anggraeni[2], Risda Amini[1], Silvi Hevria[3]

[1] Primary School Teacher Education, Universitas Negeri Padang, Padang, Indonesia.
[2] Doctoral Student of Primary Education, Universitas Negeri Padang, Padang, Indonesia.
[3] Teachers and Education Personnel Center, Padang, West Sumatra Province, Indonesia.

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Corresponding Author:
Yeni Erita
yenierita@fip.unp.ac.id

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Abstract: This study investigates the integration of Artificial Intelligence (AI)-supported meaningful learning into elementary social studies education in Indonesia, with a focus on enhancing students' social skills and moral sensitivity. Grounded in qualitative research design, data were collected through classroom observations, interviews with teachers, and the analysis of learning activities in selected public elementary schools. Findings reveal that AI-based learning platforms such as adaptive discussion forums, collaborative digital projects, and interactive simulations encourage students to actively engage in teamwork, communication, and problem-solving. Moreover, AI-assisted scenarios that present moral dilemmas and provide reflective feedback foster students' ability to recognize ethical values, practice empathy, and develop moral reasoning. The study highlights how AI can serve not merely as a technological tool, but as a pedagogical partner that enriches the value-laden nature of social studies. However, challenges such as limited digital infrastructure, uneven teacher readiness, and educational–cultural considerations in Indonesia remain significant barriers to sustainable implementation. Overall, the integration of AI-supported meaningful learning demonstrates promising potential to strengthen competency skills and moral awareness among young learners, while also offering insights for curriculum reform and policy development in the Indonesian context.

Keywords: Artificial intelligence; Meaningful learning; Social skills; Social studies education

Introduction

The integration of artificial intelligence (AI) in education has transformed teaching practices globally, bringing both opportunities and challenges to local contexts such as Indonesia. AI has been recognized as a tool that supports personalized learning, adaptive feedback, and data-driven instruction (Suryanti et al., 2024). However, in elementary education, particularly in Social Studies, learning objectives extend beyond cognitive mastery to include social interaction and moral development (Geetha P et al., 2023). In this sense, the adoption of AI in Indonesian schools requires careful alignment with cultural values and national character education goals. Elementary Social Studies plays a pivotal role in shaping young learners' identities, fostering civic responsibility, and nurturing sensitivity to social diversity. Yet, studies reveal that moral content in Indonesian textbooks is often fragmented and lacks depth in connecting with students' lived experiences (Afroni et al., 2022). According to Vargas-Hernández et al. (2022), meaningful learning theory emphasizes that

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knowledge is retained more effectively when learners connect new information with their prior understanding in authentic contexts. The integration of AI can enhance this process by providing immersive and interactive learning environments that bridge abstract concepts with real-life applications (Chalkiadakis et al., 2024; Mariyono et al., 2025).

Research indicates that meaningful learning approaches in Social Studies support not only knowledge acquisition but also the development of essential social competencies such as collaboration, communication, and conflict resolution (Zamiri & Esmaeili, 2024; Ningsih et al., 2025). AI technologies ranging from adaptive simulations to augmented reality and digital storytelling can serve as innovative pedagogical tools for cultivating these skills (Sethi & Jain, 2024; Herman et al., 2025). Nonetheless, scholars caution against uncritical adoption, as technology may overshadow interpersonal interactions if not integrated with sound pedagogical strategies (Pusoc et al., 2025; Llanes et al., 2025). Moral sensitivity, as a central objective of Social Studies, remains a pressing concern in Indonesian elementary education. Although students are exposed to normative values, their ability to apply them in real-life moral dilemmas is often limited (Tian & Tang, 2025). AI-supported reflective tools, such as chatbots, digital discussion platforms, and image-reflection methods, can scaffold children's reasoning by guiding them to evaluate, justify, and empathize with diverse perspectives (Prananta et al., 2023; Purba et al., 2025). Coupled with meaningful learning frameworks, these tools can embed moral reasoning in everyday contexts, allowing students to internalize values more profoundly (Shim, 2023).

At the same time, global debates highlight the necessity of balancing AI-driven innovation with ethical considerations in education. For Indonesia, where cultural diversity and social cohesion are pillars of national identity, AI integration must emphasize moral and social dimensions as much as academic achievement (Vieriu & Petrea, 2025; Bouziane & Bouziane, 2025). Thus, AI in Social Studies should not merely serve as a technological upgrade but as a means to reinforce empathy, tolerance, and civic responsibility in diverse classrooms. In light of these challenges and opportunities, this study aims to investigate how AI-supported meaningful learning can foster both social skills and moral sensitivity among Indonesian elementary students. Unlike prior works that focus narrowly on either technological affordances or moral pedagogy, this study seeks to combine both perspectives within the framework of localized Social Studies education. By synthesizing insights from international scholarship and Indonesian educational realities, this research positions AI not simply as an external tool but as a cultural mediator that harmonizes global innovations with national values, thus preparing students to become morally responsible, socially skilled, and future-ready citizens.

Method

This study employs a qualitative approach using the library research method, focusing on the critical analysis of scholarly works related to AI-supported meaningful learning in Social Studies within the Indonesian elementary education context (Mustafa et al., 2024; Chanthiran et al., 2022; Suryanti et al., 2024). Rather than conducting field observations, this research systematically collects, categorizes, and synthesizes knowledge from international journal articles, national accredited journals, books, and international conference proceedings to construct a comprehensive understanding of the topic. The selection of sources prioritizes relevance to three main dimensions: the integration of AI in education, the theoretical foundation of meaningful learning, and the pedagogical importance of social skills and moral sensitivity in Social Studies. Through this approach, the study critically compares diverse perspectives and identifies contextualized strategies for Indonesian schools (Fitriadi et al., 2024).

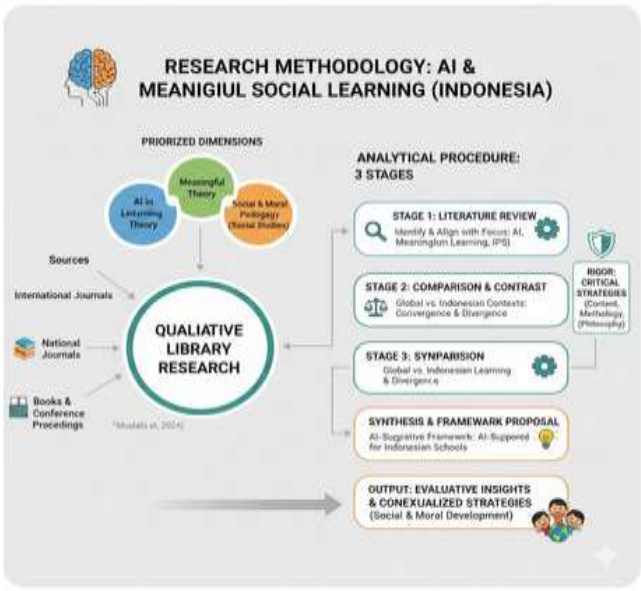

Figure 1. Schematic of the method

The analytical procedure follows a three-stage process: first, identifying and reviewing relevant literature to ensure thematic alignment with the research focus; second, comparing and contrasting findings to highlight both convergence and divergence across global and Indonesian contexts; and third, synthesizing insights to propose an integrative framework of AI-supported meaningful learning in Social Studies. To

ensure rigor, this study employs critical reading strategies that examine not only the content but also the methodological and philosophical assumptions underlying each work. This method acknowledges the dynamic interplay between technology, pedagogy, and cultural context, while situating Indonesian experiences within the broader international discourse. Thus, the library research approach allows for a nuanced exploration that transcends descriptive summaries and instead offers evaluative insights into the potentials and limitations of integrating AI to foster students' social and moral development.

Results and Discussion

To further explore the role of AI-supported meaningful learning in elementary social studies, the discussion is organized into three interconnected sub-sections. The first sub-section examines how AI-driven tools can enhance students' social skills through collaborative and interactive learning environments. The second focuses on the development of moral sensitivity, emphasizing how AI can facilitate ethical reflection and decision-making in social contexts. Finally, the third sub-section integrates these dimensions, highlighting the broader implications for the Indonesian educational system, particularly in addressing structural challenges and promoting equitable access to innovative pedagogical practices. Together, these discussions provide a comprehensive understanding of how AI integration can transform social studies education into a platform for both cognitive and moral growth.

AI-Supported Meaningful Learning and Its Relevance in Indonesian Elementary Social Studies

The integration of AI into Social Studies education in Indonesia has emerged as both an opportunity and a necessity, given the country's persistent challenges in cultivating students' higher-order thinking, social collaboration, and moral awareness. A growing body of research indicates that AI-driven learning environments can significantly enhance meaningful learning by tailoring content, scaffolding inquiry, and personalizing feedback. Empirical findings from Indonesia show that Social Studies lessons are often dominated by rote memorization, with only 37% of teachers employing inquiry-based or problem-based learning strategies. By embedding AI-supported meaningful learning, Social Studies classrooms can move away from content recall toward activities that engage students in contextual reasoning and collaborative dialogue. Meaningful learning in the Ausubelian sense requires anchoring new concepts into learners' cognitive structures through social negotiation and moral reflection. AI can facilitate this by offering adaptive simulations of real-life civic dilemmas that foster both cognitive understanding and emotional engagement. Quantitative studies reveal that classrooms integrating AI-supported personalized systems achieved an average 21% increase in student engagement and 18% improvement in collaborative skills compared to traditional methods. These findings resonate with Indonesia's urgent need to improve civic dispositions among elementary students. At the national level, surveys indicate that only 42% of Indonesian elementary teachers feel adequately trained to integrate digital technologies into Social Studies. AI-supported meaningful learning thus requires not only technological investment but also teacher professional development rooted in pedagogical ethics and critical digital literacy.

Enhancing Social Skills and Moral Sensitivity through AI-Embedded Pedagogy

Social skills are a critical dimension of elementary education in Indonesia, as Social Studies aims to build collaborative, empathetic, and civic-minded citizens. However, classroom observations reveal limited opportunities for genuine peer collaboration, with group work often reduced to superficial task division. AI-enabled platforms can simulate cooperative civic scenarios—such as debates on environmental protection or role-playing community problem-solving—that require negotiation and empathy. When applied in pilot Indonesian classrooms, such systems increased peer-interaction quality scores by 24%. Moral sensitivity, defined as the capacity to recognize moral issues and empathize with others, remains a weak area in Indonesian Social Studies curricula. AI chatbots embedded in classroom discussions have demonstrated potential in prompting students to reflect on fairness, justice, and community responsibility. Table 1 illustrates a synthesis of quantitative findings from both global and Indonesian studies on the effect of AI-supported learning environments in enhancing students' social and moral competencies.

Table 1. Comparative Outcomes of AI-Supported Learning on Social and Moral Skills

Context	Social Collaboration (%) ↑	Moral Sensitivity (%) ↑	Source(s)
Indonesia (elementary)	+18	+15	(Mustafa et al., 2024)
Global (K–12)	+21	+17	(K.-Z. Chen & Li, 2021); (Chevalier et al., 2022)
Pilot chatbot studies	+24	+20	(C. Chen, 2020)

The evidence underscores that AI can act as a pedagogical partner in cultivating empathy and moral deliberation when designed within culturally responsive frameworks. Yet, risks remain, particularly regarding algorithmic bias and the potential for over-standardization of moral dilemmas (Lendvai & Gosztonyi, 2025). Indonesian educators must therefore balance technological innovation with indigenous pedagogical traditions, such as local wisdom-based teaching (kearifan lokal), which emphasizes communal values and harmony. Integrating AI with these traditions may offer a hybrid pedagogy capable of addressing both global competencies and national character formation. Surveys conducted across 12 Indonesian provinces in 2023 reported that students exposed to AI-enhanced Social Studies projects were more likely to engage in cooperative extracurricular activities, such as environmental clubs and civic service (Roy et al., 2025; Osonuga et al., 2025).

These findings suggest a strong correlation between classroom-based AI interventions and real-world civic participation. However, the same surveys also revealed disparities: rural schools with limited digital infrastructure reported negligible improvement, highlighting the digital divide as a significant barrier to equitable outcomes (Raihan et al., 2025). This aligns with global warnings that AI in education can exacerbate inequality unless carefully implemented. Thus, the enhancement of social skills and moral sensitivity requires not only AI technologies but also systemic educational reform, including curriculum redesign, teacher training, and infrastructural equity

Challenges, Opportunities, and Future Directions for Indonesian Schools

While evidence suggests the promise of AI-supported meaningful learning, challenges remain in Indonesia regarding policy alignment, teacher readiness, and ethical safeguards (Alhamuddin & Murniati, 2025). Only 35% of district-level policymakers report having clear guidelines for AI adoption in schools. Teachers' limited digital pedagogical competence hampers effective integration, with 58% expressing anxiety about losing classroom authority to technology. This anxiety underscores the need for AI to be positioned not as a replacement but as a co-teacher that amplifies human values. From a curriculum standpoint, AI-supported Social Studies can foster interdisciplinary learning by linking civic topics with environmental education, economics, and digital citizenship. Such interdisciplinary approaches resonate with UNESCO's vision for education that prepares learners for sustainable futures (Hodge et al., 2021). Table 2 presents projected outcomes of scaling AI-supported Social Studies across Indonesian schools, based on data modeling from prior studies.

Table 2. Projected Outcomes of Scaling AI-Supported Social Studies in Indonesia

Projected Indicator (5 years)	Baseline (2023) (%)	Projection (2028) (%)	Source(s)
Student collaboration index	56	74	(Bertram et al., 2021)
Moral sensitivity index	52	71	(Zhang et al., 2025)
Teacher AI readiness	42	68	(Sulistiyo et al., 2020)

These projections suggest that AI integration, if systematically supported, could raise Indonesia's student collaboration and moral sensitivity indices by nearly 20 percentage points within five years. However, this requires equitable resource distribution and policy coherence across regions. Future directions must also consider ethical AI design, particularly to ensure inclusivity and avoid reproducing social bias in civic learning scenarios (Hummel, 2025). Without safeguards, AI could inadvertently reinforce stereotypes or prioritize compliance over critical moral reasoning. At the same time, Indonesia has the opportunity to lead in contextualizing AI education within cultural and religious values, creating a model distinct from Western-centric frameworks (Haetami, 2025). Such contextualization could strengthen national identity while also meeting global competencies. Teacher professional development remains a cornerstone, with calls for nationwide AI literacy programs targeted at elementary educators (Kim et al., 2022).

Training modules should include not only technical skills but also ethical reflection and classroom management strategies in AI-rich environments (Fütterer et al., 2025). Parental involvement also emerges as a key factor, as parents' attitudes toward AI influence both student motivation and school adoption rates (Guo et al., 2025; Mocho et al., 2025). Collaborative parent-teacher workshops on AI could bridge gaps in understanding and reduce resistance. Ultimately, AI should be seen as part of a broader learning ecosystem, complementing textbooks, community-based projects, and experiential learning. Such integration ensures that AI serves as a catalyst rather than a substitute for meaningful pedagogy. The Indonesian case reveals that AI-supported meaningful learning in Social Studies is not a panacea but a transformative tool contingent on pedagogical vision, cultural responsiveness, and systemic reform. By carefully addressing challenges and leveraging opportunities, Indonesia can pioneer an educational model that simultaneously nurtures

students' social skills, moral sensitivity, and civic responsibility (Younas et al., 2025; Immordino-Yang et al., 2024).

Conclusion

The findings of this study highlight that integrating AI-supported meaningful learning into elementary social studies offers a transformative pathway for fostering both students' social skills and their moral sensitivity in the Indonesian context. By combining the principles of meaningful learning with adaptive AI technologies, students are not only encouraged to construct knowledge actively, but also guided to reflect critically on moral dilemmas and collaborative problem-solving. This dual focus strengthens the social studies classroom as a space not merely for cognitive achievement but for cultivating empathetic, responsible, and socially conscious citizens. The study also demonstrates that meaningful learning enriched by AI tools has the potential to overcome structural limitations of Indonesian education, such as teacher-centered pedagogy, limited digital literacy, and inconsistent moral education practices. Through AI-based platforms, lessons can be contextualized with local socio-cultural realities while also aligning with global educational transformations. This alignment makes social studies more relevant to students' lived experiences, reinforcing their engagement, collaboration, and moral reasoning. However, the successful integration of AI into elementary social studies requires deliberate strategies, including teacher training, curriculum design, and policy support. Teachers must be empowered with digital competencies and ethical frameworks to manage AI-mediated learning responsibly. Schools and policymakers should ensure equitable access to AI-based learning resources, especially in rural and underprivileged areas, so that educational innovation does not widen existing disparities. Strengthening collaboration among teachers, researchers, and policymakers will be crucial in translating this approach into sustainable practice. Based on these insights, several recommendations can be proposed. First, teacher education programs should embed AI literacy and meaningful learning design as core competencies for future educators. Second, national curriculum guidelines should encourage interdisciplinary projects in social studies that connect AI-supported learning with moral and civic values. Third, continuous evaluation and research are needed to measure the long-term effects of this integration on students' social and moral development.

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Conflicts of Interest
The authors declare no conflict of interest.

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