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Reframing AI for Primary Curriculum Governance: A Systematic Review Toward Human-Centered, Ethical, Inclusive Framework

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Abstract: Reframing AI for Primary Curriculum Governance: A Systematic Review Toward Human-Centered, Ethical, Inclusive Framework. This study addresses the growing complexity of integrating Artificial Intelligence (AI) into primary curriculum governance, where prevailing approaches remain largely technocentric and insufficiently attentive to ethical, cultural, and governance dimensions . **Objective:** This study aims to critically examine and synthesize the scholarly discourse on AI in primary education and to develop a human-centered, ethical, and inclusive framework for curriculum governance. **Method:** A qualitative Systematic Literature Review (SLR) was conducted following PRISMA guidelines, analyzing peer-reviewed publications from Scopus, Web of Science, and ERIC between 2014 and 2024, using thematic synthesis and qualitative coding techniques. **Findings:** The study identifies five interrelated dimensions shaping AI-based curriculum governance: ethical and cultural integration, teacher agency, inclusive data ecosystems, stakeholder participation, and adaptive evidence-based policy. These findings reveal that AI functions most effectively as a co-intelligent system when embedded within socio-cultural contexts, supported by professional agency, and aligned with equity-oriented governance structures. At the same time, structural inequalities, limited teacher readiness, and fragmented policy frameworks remain significant barriers, particularly in developing contexts. **Conclusion:** The study concludes that the transformative potential of AI in curriculum governance lies not in technological advancement alone, but in its integration within human-centered, ethically grounded, and context-sensitive systems. The proposed framework offers a conceptual pathway for advancing inclusive and adaptive educational reform in primary education.

Keywords: artificial intelligence in education; curriculum governance; human-centered AI; ethical AI; inclusive education.

Abstrak: Mereformulasi AI dalam Tata Kelola Kurikulum Pendidikan Dasar: Tinjauan Sistematis Menuju Kerangka Human-Centered, Etis dan Inklusif *Penelitian ini dilatarbelakangi oleh kompleksitas integrasi Artificial Intelligence (AI) dalam tata kelola kurikulum pendidikan dasar yang selama ini masih didominasi pendekatan teknosentris dan kurang memperhatikan dimensi etika, budaya, serta tata kelola .* ***Tujuan:*** *Penelitian ini bertujuan untuk menganalisis dan mensintesis secara kritis kajian ilmiah tentang AI dalam pendidikan*

dasar serta mengembangkan kerangka tata kelola kurikulum berbasis human-centered, etis, dan inklusif. ***Metode:*** *Penelitian menggunakan pendekatan Systematic Literature Review (SLR) berbasis PRISMA dengan menganalisis publikasi ilmiah bereputasi dari Scopus, Web of Science, dan ERIC pada periode 2014–2024 melalui teknik thematic synthesis dan coding kualitatif.* ***Temuan:*** *Penelitian ini mengidentifikasi lima dimensi utama dalam tata kelola kurikulum berbasis AI, yaitu integrasi etika dan budaya, agensi guru, ekosistem data inklusif, partisipasi pemangku kepentingan, serta kebijakan adaptif berbasis bukti. Hasil menunjukkan bahwa AI berfungsi optimal sebagai sistem ko-intelijen apabila diintegrasikan dalam konteks sosial-budaya, didukung kapasitas profesional, dan diarahkan pada prinsip keadilan pendidikan. Namun demikian, ketimpangan struktural, rendahnya kesiapan guru, dan fragmentasi kebijakan masih menjadi hambatan utama, khususnya di negara berkembang.* ***Kesimpulan:*** *Potensi transformatif AI dalam tata kelola kurikulum tidak semata ditentukan oleh kecanggihan teknologi, melainkan oleh kemampuannya untuk diintegrasikan dalam sistem pendidikan yang berpusat pada manusia, berlandaskan etika, dan responsif terhadap konteks lokal. Kerangka yang dihasilkan menawarkan arah konseptual bagi reformasi pendidikan dasar yang inklusif dan adaptif..*

Kata kunci: *Kecerdasan Buatan dalam Pendidikan; Tata Kelola Kurikulum; AI Berpusat pada Manusia; AI Etis; Pendidikan Inklusif*

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INTRODUCTION

The accelerating advancement of digital technologies has precipitated a profound reconfiguration of educational systems worldwide, compelling institutions to transcend conventional pedagogical and governance paradigms. Artificial Intelligence (AI), as a defining feature of the Fourth Industrial Revolution, is increasingly positioned not merely as a technological innovation but as a transformative force capable of reshaping the epistemological, managerial, and policy architectures of education (L. Chen et al., 2020; Russell & Norvig, 2021). Within this evolving landscape, primary education occupies a particularly critical position, as it constitutes the foundational stage for cognitive, socio-emotional, and ethical development. Consequently, the integration of AI into curriculum governance at this level is not simply a matter of efficiency, but a strategic imperative for constructing adaptive, equitable, and future-oriented learning ecosystems. Yet, prevailing approaches continue to conceptualize AI predominantly as an instrument for automation and performance optimization, thereby neglecting its broader potential as a co-intelligent agent in curriculum decision-making processes .

Emerging scholarship has demonstrated that AI-driven systems possess significant capabilities in enhancing personalized learning, real-time assessment, and data-informed instructional design (Akintola et al., 2025; Holmes & Porayska-Pomsta, 2022; Sahito et al., 2024). Through learning analytics and predictive modeling, AI enables the identification of individual learning trajectories, facilitating differentiated instruction and targeted pedagogical interventions. Such developments have been widely interpreted as pathways toward improving learning outcomes and operational efficiency (Davis et al., 2024; Mounkoro et al., 2024). At the policy level, AI also offers the capacity to generate longitudinal insights that inform adaptive and evidence-based decision-making, thereby enhancing the responsiveness of educational governance systems (Benoit, 2024;

Langeveldt, 2024). These contributions have positioned AI as a central component in contemporary discourses on educational transformation.

However, a critical examination of the state of the art reveals a persistent imbalance in the literature. The majority of existing studies remain confined to technical and instructional dimensions, emphasizing algorithmic performance, system design, and learning optimization, while largely overlooking the governance structures within which AI operates (X. Chen, 2023; Ifenthaler & Yau, 2020). This technocentric orientation has resulted in a fragmented body of knowledge characterized by isolated applications and limited theoretical integration. Furthermore, the ethical, cultural, and socio-political implications of AI deployment in education—particularly in relation to curriculum governance—have not been sufficiently theorized or empirically examined (Holmes & Porayska-Pomsta, 2022; Selwyn, 2016). As a consequence, AI is often implemented without adequate consideration of issues such as algorithmic bias, data justice, teacher agency, and participatory decision-making, thereby risking the reinforcement of existing inequalities (Baker & Hawn, 2021; Capraro et al., 2024).

This gap becomes even more pronounced when viewed through a comparative international lens. In high-income countries, AI integration is increasingly embedded within comprehensive digital education strategies supported by robust infrastructure, policy coherence, and professional development systems (OECD, 2023; Schleicher, 2024). In contrast, low- and middle-income countries (LMICs) face substantial structural constraints, including limited technological infrastructure, insufficient teacher readiness, and fragmented policy frameworks (Sain et al., 2024; The Council of Europe, 2024). In such contexts, AI initiatives are frequently implemented as isolated pilot projects rather than as components of systemic reform, leading to limited scalability and sustainability. This disparity not only underscores the uneven global distribution of technological capacity but also highlights the necessity of context-sensitive and ethically grounded approaches to AI integration .

Beyond structural considerations, the conceptual framing of AI in education remains a critical concern. Dominant narratives often portray AI as a neutral and objective tool, thereby obscuring its embeddedness within socio-cultural and political contexts (Molina et al., 2024). Such perspectives risk reducing education to a data-driven enterprise, privileging quantifiable outcomes over relational, ethical, and humanistic dimensions. In response, a growing body of literature advocates for a shift toward human-centered AI, emphasizing the importance of aligning technological development with values of equity, inclusivity, and democratic participation (International Commission on the Futures of Education, 2021; Porayska-Pomsta et al., 2023). This paradigm reconceptualizes AI as a co-intelligent partner that augments, rather than replaces, human judgment, thereby reinforcing the centrality of teachers and learners in educational processes (Cardona et al., 2023; Figaredo & Stoyanovich, 2023).

Despite these emerging theoretical advances, a significant research gap persists in the integration of AI within curriculum governance frameworks. Existing studies rarely address how AI can be systematically embedded into curriculum planning, implementation, and evaluation processes in ways that are ethically grounded, culturally responsive, and institutionally coherent. Moreover, there is a lack of integrative models that synthesize technological capabilities with pedagogical principles and governance mechanisms. This fragmentation limits the potential of AI to function as a transformative force in education, as its application remains confined to discrete domains rather than being integrated into a holistic system of curriculum governance. As highlighted in recent critiques, the absence of such frameworks constrains both theoretical development and practical implementation, particularly in contexts where educational systems are already

characterized by structural inequities and policy incoherence ((Bozkurt et al., 2024; Schiff, 2022).

Addressing this gap requires a fundamental reframing of AI in education—from a tool-centric perspective to a governance-oriented paradigm. This study advances such a reframing by proposing a human-centered, ethical, and inclusive framework for AI-driven curriculum governance in primary education. Drawing on a systematic literature review (SLR) of scholarly publications from 2014 to 2024, the study synthesizes diverse theoretical and empirical insights to construct a comprehensive conceptual model. The methodological choice of SLR is particularly appropriate, as it enables the integration of fragmented knowledge and the identification of underlying patterns, relationships, and gaps within the literature (Boell & Cecez-Kecmanovic, 2015; Page et al., 2021). Through this approach, the study moves beyond descriptive aggregation to provide a theoretically grounded and analytically robust synthesis of the field.

The novelty of this research lies in its integrative and normative orientation. Rather than merely cataloguing existing applications of AI in education, the study develops a conceptual framework that explicitly links AI functionalities with curriculum governance processes, ethical principles, and contextual considerations. This framework is structured around key dimensions, including ethical and cultural integration, teacher agency, inclusive data ecosystems, stakeholder participation, and adaptive policy-making, thereby offering a multidimensional perspective on AI integration . By foregrounding these dimensions, the study contributes to the ongoing discourse on responsible AI in education, while also addressing the specific challenges faced by primary education systems in diverse socio-economic contexts.

In light of these considerations, the primary objective of this study is to critically examine and synthesize the existing literature on AI in primary education with a particular focus on curriculum governance. Specifically, the study seeks to (1) analyze the dominant themes, trends, and limitations in current research; (2) identify the ethical, pedagogical, and structural dimensions of AI integration; and (3) develop a human-centered, ethical, and inclusive framework for AI-driven curriculum governance. Through this inquiry, the study aims to provide both theoretical and practical contributions, offering a coherent and context-sensitive model that can inform policy, practice, and future research. Ultimately, the study positions AI not as an end in itself, but as a means of advancing educational equity, enhancing pedagogical quality, and fostering more responsive and inclusive learning systems in the digital age.

METHOD

This study adopts a qualitative Systematic Literature Review (SLR) design to critically examine and synthesize scholarly discourse on Artificial Intelligence (AI) in primary curriculum governance, with a particular emphasis on human-centered, ethical, and inclusive frameworks. The SLR approach was selected due to its capacity to integrate fragmented bodies of knowledge, generate conceptual clarity, and identify research gaps within complex and interdisciplinary domains (Boell & Cecez-Kecmanovic, 2015; Snyder, 2019). The review process was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines to ensure methodological transparency, replicability, and rigor (Page et al., 2021).

The literature search was performed across three major international databases: Scopus, Web of Science (WoS), and ERIC, selected for their comprehensive coverage of high-quality peer-reviewed publications in education, policy, and technology studies. The search strategy employed a combination of keywords and Boolean operators, including *"artificial intelligence in education," "curriculum governance," "learning analytics,"*

"educational policy," and *"primary education."* To ensure relevance and currency, the search was limited to publications between 2014 and 2024, reflecting the most recent decade of AI development in educational contexts (Ifenthaler et al., 2024; Wan et al., 2024).

The inclusion criteria were defined to ensure conceptual and methodological alignment with the research objectives. Studies were included if they: (1) were published in peer-reviewed journals indexed in Scopus, WoS, or ERIC; (2) explicitly addressed AI applications in education, curriculum development, or governance; (3) provided empirical, theoretical, or systematic insights; and (4) were written in English. Conversely, exclusion criteria eliminated studies that were: (1) non-peer-reviewed (e.g., opinion papers, editorials); (2) lacking methodological clarity; (3) focused solely on technical AI development without educational relevance; or (4) outside the scope of primary or foundational education contexts (Mohammed & Ahmed, 2021; Petticrew & Roberts, 2016).

The screening process followed a multi-stage procedure aligned with PRISMA standards. Initially, duplicate records were removed using reference management tools (Mendeley and Zotero). Subsequently, titles and abstracts were screened to assess preliminary relevance. Articles that met the initial criteria were then subjected to full-text review to determine eligibility based on thematic alignment and methodological rigor. Discrepancies in selection decisions were resolved through iterative discussion and cross-checking to enhance reliability (Kraus et al., 2022).

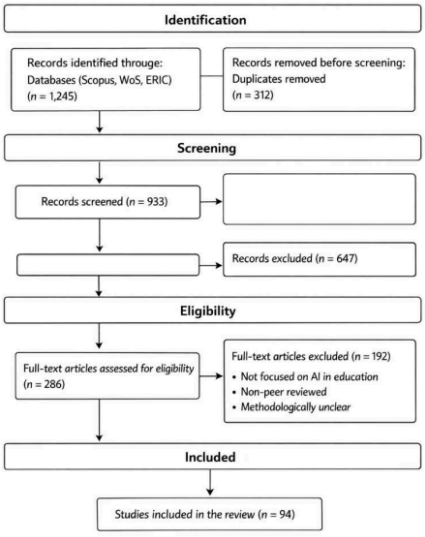

Figure 1. PRISMA 2020 Flow Diagram

The PRISMA flow diagram outlines a systematic review trajectory, beginning with the identification of records from selected databases, followed by screening, eligibility assessment, and final inclusion. This structured process enhances transparency and

reduces selection bias, thereby strengthening the rigor and credibility of the review. Data analysis was conducted using thematic synthesis integrated with qualitative coding through three iterative stages: open coding to identify key concepts, axial coding to establish relationships among categories, and selective coding to synthesize themes into a coherent framework. This approach enabled the identification of critical dimensions, including ethical governance, teacher agency, inclusive data ecosystems, and adaptive policy structures.

To ensure validity and reliability, methodological triangulation was applied by integrating findings across diverse contexts and study designs. An audit trail was maintained to document procedures and decisions, while peer debriefing and iterative coding validation minimized bias and enhanced consistency. Adherence to PRISMA standards further reinforces methodological rigor and supports the development of a theoretically grounded and contextually responsive framework.

▪ RESULT AND DISCUSSION

Result

The findings of this systematic literature review reveal a fundamental shift in how Artificial Intelligence (AI) is conceptualized within primary curriculum governance. Rather than being confined to a technical instrument for automation or efficiency enhancement, AI is increasingly reframed as a socio-technical and co-intelligent agent that interacts dynamically with pedagogical, ethical, and governance systems. Across the reviewed studies, five interrelated thematic domains emerged, each representing a critical dimension in the transformation toward a human-centered, ethical, and inclusive framework of curriculum governance. These themes collectively demonstrate that the effectiveness of AI integration is contingent not only upon technological sophistication but, more importantly, upon its alignment with human values, institutional structures, and socio-cultural contexts .

1. AI as a Catalyst for Dynamic and Learner-Centered Curriculum Design

Artificial Intelligence (AI) has emerged as a transformative catalyst in reconfiguring curriculum design from static and standardized models into dynamic, data-driven, and learner-centered systems. This transformation is primarily enabled through AI's capacity to process real-time learning data and generate adaptive feedback aligned with students' cognitive, emotional, and developmental profiles (Holmes et al., 2019; Holmes & Porayska-Pomsta, 2022). Such capabilities facilitate the development of personalized learning pathways that continuously respond to individual learner variability, thereby challenging the traditional "one-size-fits-all" paradigm and promoting more differentiated instructional approaches.

This shift extends beyond pedagogy, representing an epistemological redefinition of curriculum as an evolving and responsive system rather than a fixed structure. AI-driven learning analytics enable educators to identify patterns of engagement, diagnose learning gaps, and design timely, evidence-informed interventions, thereby enhancing the responsiveness of curriculum governance (Langeveldt, 2024) However, reliance on quantifiable metrics introduces a critical tension, as it risks marginalizing the relational and humanistic dimensions of education, necessitating ethical frameworks to preserve holistic learning.

2. AI-Driven Governance and the Emergence of Adaptive Policy Systems

The second theme underscores the role of AI in reshaping educational governance through the integration of longitudinal data analytics. AI systems enable policymakers to move beyond reactive decision-making toward predictive and anticipatory governance models. By analyzing large-scale datasets, AI can identify systemic inequities, regional

disparities, and early indicators of academic disengagement, thereby informing targeted policy interventions (Langeveldt, 2024; Tsai et al., 2019).

This capacity repositions AI as a strategic infrastructure for governance rather than merely an instructional tool. Educational institutions can leverage AI to streamline administrative processes, reduce bureaucratic burden, and enhance decision-making efficiency. Yet, this transformation is not without its challenges. The literature consistently emphasizes that the interpretive capacity of human actors remains central to the meaningful use of AI-generated insights. Without adequate data literacy and ethical discernment, there is a risk that AI-driven governance may reinforce technocratic decision-making and marginalize contextual considerations.

3. Structural Inequalities and the Fragmented Integration of AI

A third critical theme highlights persistent structural inequalities that constrain the integration of AI in primary education, particularly in low- and middle-income countries (LMICs). The literature identifies three interconnected barriers: inadequate digital infrastructure, limited teacher readiness, and fragmented policy (Rochaendi et al., 2025; Sain et al., 2024). These challenges significantly hinder the scalability and sustainability of AI initiatives, often confining them to isolated pilot projects rather than enabling comprehensive and systemic educational reforms.

The concept of the *"second digital divide"* emerges as a key analytical lens, referring not only to disparities in access to technology but also to unequal capacities in utilizing advanced AI systems effectively. In many contexts, unstable internet connectivity, insufficient hardware, and limited technical support create structural constraints that impede meaningful integration. Moreover, the absence of coherent national strategies contributes to fragmented implementation, weakening the potential for coordinated transformation. These findings suggest that technological solutions alone are insufficient, necessitating broader commitments to educational justice through infrastructure development, capacity-building, and inclusive policy design.

4. Reframing Teacher Agency in AI-Supported Education

The fourth theme underscores the critical role of teacher agency in mediating the integration of Artificial Intelligence (AI) in education. A recurring concern in the literature is the prevalence of technocentric approaches that position teachers as passive recipients of algorithmic outputs, thereby risking the erosion of professional judgment and reducing educators to mere system operators (Molina et al., 2024). In contrast, emerging perspectives advocate for a paradigm shift that reconceptualizes teachers as active co-designers and co-interpreters of AI systems, emphasizing their central role in contextualizing and shaping technology within educational practice.

This reconceptualization highlights the necessity for educators to develop not only technical competencies but also data literacy, ethical reasoning, and interpretive skills (Cardona et al., 2023; Figaredo & Stoyanovich, 2023). Teachers are expected to critically engage with AI-generated outputs and adapt them to classroom realities, thereby preserving the relational and humanistic dimensions of education. Furthermore, sustained professional development that integrates technical training with critical reflection is essential; without it, teachers risk exclusion from AI governance, reinforcing asymmetrical power dynamics.

5. Toward a Human-Centered, Ethical, and Inclusive Governance Framework

The final theme synthesizes the preceding insights into a comprehensive framework for AI-based curriculum governance. This framework is structured around five interdependent pillars: (1) ethical and cultural integration, (2) teacher agency, (3) inclusive data ecosystems, (4) stakeholder participation, and (5) adaptive, evidence-based

policy . Each pillar represents a critical dimension in the transition from technocentric implementation to human-centered governance.

Ethical and cultural integration emphasizes the necessity of aligning AI systems with local values and socio-cultural contexts, thereby preventing algorithmic bias and promoting inclusivity (Baker & Hawn, 2021). Teacher agency underscores the role of educators as active participants in AI design and implementation, ensuring contextual relevance and pedagogical integrity. Inclusive data ecosystems highlight the importance of equitable access to data and the incorporation of qualitative dimensions such as student well-being and social-emotional development. Stakeholder participation calls for the involvement of communities, parents, and students in decision-making processes, thereby enhancing legitimacy and accountability. Finally, adaptive policy frameworks enable continuous refinement of curriculum governance based on real-time data and contextual feedback.

Collectively, these pillars constitute an integrated model that repositions AI as a relational and ethically grounded partner in educational transformation. This model challenges dominant techno-solutionist narratives by asserting that educational quality cannot be achieved solely through data-driven optimization but must be cultivated through ethical deliberation, participatory governance, and sustained professional agency.

Table 1. Synthesis of Key Findings in AI-Driven Curriculum Governance

Study / Author(s)	Focus Area	Key Variables	Key Findings
Holmes et al. (2022)	AI in learning systems	Learning analytics, personalization	AI enables adaptive and differentiated learning pathways
Langeveldt (2024)	AI in governance	Data analytics, policy decision-making	AI supports predictive and evidence-based policy frameworks
Sain et al. (2024)	AI implementation barriers	Infrastructure, teacher readiness	Structural inequalities hinder AI integration
Cardona et al. (2023)	AI and teacher roles	Teacher agency, AI literacy	Teachers must act as co-designers of AI systems
Baker & Hawn (2021)	Ethics in AI education	Algorithmic bias, inclusivity	Ethical frameworks are essential for equitable AI deployment
Figaredo & Stoyanovich (2023)	Responsible AI	Data ethics, stakeholder engagement	Human-centered AI requires participatory governance
Rochaendi et al. (2025)	Curriculum governance	Policy alignment, contextualization	AI must be integrated into culturally responsive systems

Taken together, these findings reveal that the integration of AI into primary curriculum governance is not a purely technical endeavor but a deeply normative and systemic process. The transformation toward human-centered, ethical, and inclusive frameworks requires a reconfiguration of relationships among technology, pedagogy, and

governance. AI, when embedded within such frameworks, has the potential to function as a catalyst for educational equity, enabling more responsive, participatory, and context-sensitive systems.

At the same time, the findings caution against uncritical adoption of AI technologies. Without deliberate attention to ethical, cultural, and structural dimensions, AI risks reproducing existing inequalities and reinforcing technocratic logics. Thus, the future of AI in education depends not on technological advancement alone but on the capacity of educational systems to govern and interpret AI in ways that prioritize human dignity, social justice, and holistic learning.

Discussion

The findings of this study provide a critical basis for re-examining the role of Artificial Intelligence (AI) in primary curriculum governance, particularly when juxtaposed with dominant theoretical frameworks in educational technology, curriculum theory, and governance studies. A comparative analysis reveals that while existing scholarship has predominantly conceptualized AI as a tool for instructional optimization and personalized learning (L. Chen et al., 2020; Holmes et al., 2019), the present study advances a broader interpretation by situating AI within a governance-oriented and human-centered paradigm. This shift aligns with emerging perspectives on responsible and ethical AI (Holmes et al., 2022; Porayska-Pomsta et al., 2022), yet extends them by explicitly integrating curriculum governance as a central analytical domain. In contrast to technocentric models that prioritize efficiency and scalability, the findings underscore the necessity of embedding AI within relational, cultural, and ethical dimensions of education, thereby challenging reductionist interpretations of learning as purely data-driven processes.

From a causal perspective, the transformation of curriculum governance through AI can be understood as a function of the interaction between data infrastructures, institutional capacity, and human agency. The findings demonstrate that AI's ability to generate real-time insights and predictive analytics contributes directly to the emergence of adaptive and evidence-based policy systems (Langeveldt, 2024). However, this causal mechanism is not deterministic; rather, it is mediated by the interpretive and ethical capacities of educators and policymakers. In contexts where data literacy and professional agency are well-developed—such as in OECD countries—AI tends to function as an enabler of responsive and equitable governance (OECD, 2023). Conversely, in contexts characterized by infrastructural deficits and fragmented policy frameworks, such as Indonesia and other developing countries, the same technological affordances may produce limited or even counterproductive outcomes (Rochaendi et al., 2025; Sain et al., 2024). This divergence highlights a critical insight: AI does not inherently produce educational improvement; its impact is contingent upon the socio-institutional ecosystems within which it is embedded.

The study's findings also contribute theoretically by advancing an integrative framework that synthesizes insights from curriculum theory, educational governance, and AI ethics into a coherent model of human-centered curriculum governance. Existing literature on curriculum design has long emphasized the importance of responsiveness, differentiation, and contextual relevance (Chiu & Chai, 2020), while governance theories highlight the role of data-informed decision-making and institutional accountability (Benoit, 2024). Meanwhile, the discourse on AI in education has increasingly focused on ethical considerations, such as algorithmic bias, transparency, and inclusivity (Baker & Hawn, 2021; Figaredo & Stoyanovich, 2023). The present study bridges these domains by proposing a five-pillar framework that integrates ethical-cultural alignment, teacher

agency, inclusive data ecosystems, stakeholder participation, and adaptive policy-making into a unified conceptual architecture. This integrative contribution addresses a significant gap in the literature, where these dimensions have often been treated in isolation rather than as interdependent components of a systemic model.

At the level of practical implications, the findings offer important insights for primary education systems, particularly in Indonesia. First, the transformation toward AI-supported curriculum governance necessitates substantial investment in digital infrastructure and data ecosystems, especially in rural and underserved regions. Without such investments, AI risks exacerbating existing inequalities rather than mitigating them. Second, teacher professional development emerges as a critical lever for effective implementation. Programs must extend beyond technical training to include data literacy, ethical reasoning, and critical engagement with AI systems (Cardona et al., 2023; Walter, 2024) In the Indonesian context, where teacher readiness varies significantly across regions, this implies the need for differentiated and context-sensitive capacity-building strategies. Third, policy frameworks must be reoriented toward participatory and adaptive governance models. Rather than imposing top-down AI initiatives, policymakers should engage local stakeholders in the co-design and continuous refinement of AI systems, thereby ensuring contextual relevance and legitimacy.

Nevertheless, the findings also reveal several paradoxes and tensions that complicate the narrative of AI as a transformative force. One prominent paradox lies in the tension between efficiency and humanism. While AI enhances efficiency through automation and data-driven optimization, it simultaneously risks diminishing the relational and affective dimensions of education that are essential for holistic development (Selwyn, 2019). Another paradox emerges in the relationship between objectivity and bias. Although AI is often perceived as an objective decision-making tool, the literature demonstrates that algorithmic systems can reproduce and amplify existing inequalities if trained on biased datasets (Baker & Hawn, 2021). This raises critical questions about the epistemological assumptions underlying AI-driven governance and the extent to which data can capture the complexity of educational realities.

A further inconsistency can be observed in the dual role of AI as both an enabler and a constraint of teacher agency. On the one hand, AI provides valuable insights that can enhance pedagogical decision-making; on the other hand, it may constrain professional autonomy by privileging algorithmic recommendations over human judgment (Molina et al., 2024). This tension underscores the importance of positioning teachers as active agents in the design and interpretation of AI systems, rather than passive recipients of technological outputs. In this regard, the study reinforces the argument that AI should function as a co-intelligence rather than a controlling mechanism, supporting rather than supplanting human expertise.

From a global perspective, the findings highlight significant disparities in the readiness and capacity of educational systems to integrate AI effectively. High-income countries benefit from robust infrastructure, policy coherence, and institutional capacity, enabling them to leverage AI for systemic transformation (Schleicher, 2024). In contrast, developing countries face structural constraints that limit the scalability and sustainability of AI initiatives. In Indonesia, for instance, challenges related to digital access, teacher readiness, and policy alignment continue to impede the integration of AI into curriculum governance (Rochaendi et al., 2025). These disparities underscore the need for context-sensitive approaches that recognize the heterogeneity of educational systems and avoid one-size-fits-all solutions.

Despite its contributions, this study is not without limitations. As a systematic literature review, it is inherently dependent on the availability and quality of existing

studies, which may vary in methodological rigor and contextual relevance. Furthermore, the majority of reviewed studies originate from technologically advanced contexts, potentially limiting the generalizability of findings to developing countries. Future research should therefore incorporate empirical investigations in diverse contexts, particularly in LMICs, to validate and refine the proposed framework. Additionally, longitudinal studies are needed to examine the long-term impacts of AI integration on curriculum governance and educational outcomes.

In conclusion, this study advances the discourse on AI in education by reframing it as a human-centered, ethical, and governance-oriented phenomenon. Through a critical and integrative analysis, it demonstrates that the transformative potential of AI lies not in its technological capabilities alone, but in its capacity to be embedded within systems that prioritize human dignity, equity, and contextual relevance. The proposed framework offers a pathway for aligning AI with these values, thereby contributing to the development of more inclusive and responsive educational systems.

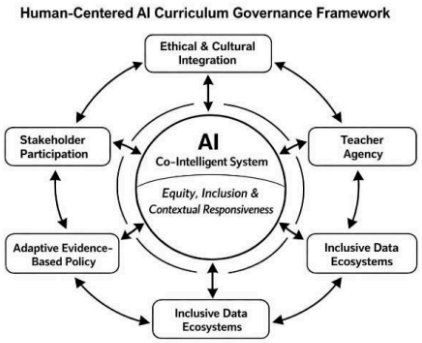

Figure 2. Conceptual Framework of Human-Centered AI for Primary Curriculum Governance

The figure illustrates a Human-Centered AI Curriculum Governance framework, positioning Artificial Intelligence (AI) as a *co-intelligent system* at the core of curriculum governance processes. Rather than displacing human roles, AI is conceptualized as a strategic partner that augments educational decision-making through the integration of data-driven insights and professional judgment. Surrounding this central system are five interdependent pillars: ethical and cultural integration, teacher agency, inclusive data ecosystems, adaptive evidence-based policy, and stakeholder participation, which are dynamically interconnected in a circular configuration. This structure signifies that AI implementation must be grounded in ethical principles, culturally responsive practices, and the active involvement of diverse educational stakeholders. The presence of bidirectional arrows and feedback loops further emphasizes continuous interaction, reflexivity, and iterative improvement among the components, thereby fostering a system that is adaptive, context-sensitive, and responsive to evolving educational needs. Overall, the model asserts that the effectiveness of AI in curriculum governance is not determined solely by technological sophistication, but by its capacity to advance equity, inclusivity, and contextual relevance within primary education systems.

CONCLUSION

This study provides a critical synthesis of the evolving discourse on Artificial Intelligence (AI) in primary curriculum governance by advancing a reframing from a predominantly technocentric orientation toward a human-centered, ethical, and inclusive paradigm**.** The findings demonstrate that AI holds transformative potential not merely as a tool for instructional optimization, but as a co-intelligent system capable of shaping curriculum design, informing adaptive governance, and enabling more responsive and equitable educational ecosystems. Across the synthesized literature, the effectiveness of AI integration is consistently contingent upon its alignment with human values, institutional coherence, and socio-cultural contexts, rather than on technological sophistication alone.

A central contribution of this study lies in the development of **an** integrative five-pillar conceptual framework that bridges previously fragmented domains of inquiry, including curriculum theory, educational governance, and AI ethics. By articulating the interdependence of ethical and cultural integration, teacher agency, inclusive data ecosystems, stakeholder participation, and adaptive policy-making, this study offers a theoretically grounded and systemically coherent model that extends beyond existing descriptive and application-oriented research. This contribution is particularly significant in addressing the absence of governance-oriented frameworks in the current literature, thereby positioning AI as a relational and normative construct embedded within broader educational systems.

From a practical and policy perspective, the study highlights the urgent need to reconfigure educational systems to enable meaningful AI integration. This requires sustained investment in digital infrastructure, particularly in underserved regions, alongside comprehensive professional development programs that strengthen teachers' data literacy, ethical awareness, and interpretive capacity. Equally important is the development of participatory and context-sensitive policy frameworks that actively involve diverse stakeholders in shaping AI-enabled governance, ensuring that technological innovation advances educational equity rather than reinforcing existing disparities, especially in developing contexts such as Indonesia.

However, this study is not without limitations. As a systematic literature review, it is constrained by the scope, quality, and geographical concentration of existing studies, many of which are rooted in technologically advanced settings. This may limit the generalizability of findings to low- and middle-income contexts. Furthermore, reliance on secondary data restricts insight into lived experiences and contextual nuances of AI implementation.

Future research should prioritize empirical and longitudinal studies across diverse contexts, particularly in underrepresented regions, while adopting interdisciplinary approaches. Ultimately, the study affirms that the transformative potential of AI lies in its alignment with equity, inclusivity, and contextual responsiveness.

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