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Research Article

STUDENT DATA PRIVACY IN AI-DRIVEN PERSONALIZED LEARNING PLATFORMS: AN ETHICAL FRAMEWORK FOR HYBRID SCHOOLS

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Abstract
The integration of artificial intelligence (AI) in personalized learning platforms has transformed hybrid education by enabling adaptive instruction, data-driven assessment, and individualized student support. However, this advancement has raised critical ethical concerns regarding student data privacy, transparency, and accountability. The unregulated collection, processing, and storage of learning data risk compromising students' autonomy and confidentiality, particularly in hybrid schools where both digital and physical systems intersect. This study aims to develop an ethical framework that ensures responsible AI implementation in personalized learning environments while safeguarding student data integrity in Indonesian hybrid schools. A qualitative-descriptive research design was employed, involving document analysis, expert interviews, and focus group discussions with educators, AI developers, and policymakers. The research adopted a grounded theory approach to construct the framework, emphasizing ethical dimensions such as informed consent, algorithmic transparency, data minimization, and institutional accountability. Findings reveal that existing school policies often lack clarity in regulating third-party AI systems and data-sharing practices. The proposed ethical framework integrates three key components: governance principles, operational safeguards, and digital literacy strategies for teachers and students. The results suggest that adopting this framework can promote ethical awareness and responsible data stewardship, strengthening trust between institutions and learners. The study concludes that balancing innovation and ethical responsibility is essential to achieving equitable and secure AI-driven hybrid education.

Keywords: Artificial Intelligence, Ethical Framework, Hybrid Education, Personalized Learning, Student Data Privacy.

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INTRODUCTION

Artificial intelligence (AI) has increasingly reshaped educational ecosystems by enabling adaptive and personalized learning experiences (Damiati et al., 2025). AI-driven platforms are capable of analyzing vast quantities of student data ranging from performance metrics to behavioral interactions to tailor learning pathways in real time (Ghiasvand & Seyri, 2025). These innovations are especially transformative in hybrid schools, where the blending of digital and face-to-face instruction demands flexibility and data-driven decision-making (Chun et al., 2025). Such technologies promise inclusivity, efficiency, and enhanced learner engagement through individualized feedback and adaptive content delivery.

Personalized learning platforms built upon AI algorithms can optimize students' cognitive load, recommend resources suited to their learning profiles, and foster self-directed study habits (Bellarmin et al., 2025). Research in educational technology consistently underscores the positive correlation between AI-mediated personalization and academic achievement (Younas et al., 2025). In hybrid learning environments, these systems bridge the gap between physical classrooms and virtual interfaces, ensuring continuity and equity in access to quality instruction (Ben Rabah et al., 2025). The hybrid model has become essential in the post-pandemic educational landscape, where institutions increasingly rely on AI analytics to sustain student motivation and performance monitoring.

Data collection forms the backbone of AI personalization. Each student's digital footprint quiz responses, discussion posts, log-in duration, and even facial recognition data feeds machine learning models to predict learning needs (Soundara Rajan & Wani, 2025). Such data aggregation provides granular insights into individual and collective performance patterns. When utilized ethically, it enhances pedagogical accuracy and reduces teacher workload (Nauman, 2025). However, it also introduces new layers of vulnerability associated with data exposure, algorithmic bias, and privacy breaches.

The ethical management of student data is therefore a pressing concern in the era of AI-driven hybrid education (Wu et al., 2025). As learning analytics become more embedded in digital schooling systems, issues of consent, data ownership, and transparency emerge as central themes in educational ethics. Scholars such as Williamson and Eynon (2023) argue that the growing "datafication" of education transforms students into data subjects whose personal and cognitive attributes are commodified and surveilled (Subhan et al., 2025). These concerns are amplified in developing contexts like Indonesia, where regulatory frameworks for educational data governance remain fragmented.

Hybrid schools, by their very nature, operate at the intersection of physical and digital infrastructures, making data privacy risks multifaceted (Guizani et al., 2025). The simultaneous use of cloud-based learning management systems (LMS), third-party AI tools, and institutional databases increases the likelihood of data mismanagement or leakage (Oke & Cavus, 2025). Teachers and administrators often lack sufficient training in digital ethics, while students remain unaware of how their data is collected, processed, and repurposed (Asemi et al., 2025). This asymmetry in digital literacy and institutional responsibility exacerbates the ethical tension between personalization and privacy.

Global initiatives have begun to address these concerns through frameworks emphasizing algorithmic transparency, data minimization, and informed consent (Jeon et al., 2025). The UNESCO Recommendation on the Ethics of Artificial Intelligence (2021) highlights the need for education systems to balance technological innovation with human-centered values (Çavdar Lokumcu & Gürses, 2026). However, the translation of such principles into actionable policies for hybrid schools remains inconsistent (Soori et al., 2025). The existing gap between ethical theory and classroom practice underscores the urgency of constructing context-sensitive frameworks that align AI-driven personalization with student rights and institutional accountability.

Current research offers limited insight into how hybrid schools operationalize student data ethics within AI-based personalization systems (Sirisha et al., 2025). While studies have extensively explored the technical and pedagogical dimensions of AI in education, the ethical governance mechanisms behind these systems remain underdeveloped (Tandon et al., 2025). Few empirical investigations focus on the micro-level interactions among students, teachers, and digital platforms in managing data responsibly (Haidemariam & Gran, 2026). This lack of contextual understanding weakens the capacity of schools to implement ethical standards effectively.

Existing ethical models, predominantly derived from Western contexts, do not adequately account for the socio-cultural and institutional realities of hybrid schools in Indonesia (Alum et al., 2025). The cultural values of trust, communal responsibility, and hierarchical authority influence perceptions of privacy and consent differently than in Western systems (Arora et al., 2026). Consequently, imported ethical models risk misalignment with local educational practices, producing policies that are either too rigid or too abstract to guide real-world implementation.

Institutional policies in Indonesian hybrid schools often focus on technological adoption rather than ethical oversight (Hendriks, 2025). Schools tend to prioritize the functionality and efficiency of AI systems over their moral and social implications (Jain et al., 2025). This oversight results in insufficient safeguards for sensitive student data, particularly regarding algorithmic decision-making transparency and third-party data access (Morocho et al., 2025). Without a robust ethical foundation, AI-driven platforms risk perpetuating inequities and undermining students' autonomy in learning environments designed to empower them.

The absence of a comprehensive ethical framework tailored to hybrid schooling contexts in Indonesia thus represents a significant knowledge gap (Jo et al., 2025). There is a pressing need for a structured model that integrates principles of privacy protection, data governance, and ethical accountability into AI-based educational practice (Pasetti et al., 2025). Such a framework should bridge policy, pedagogy, and technology while reflecting local educational values and regulatory constraints.

Developing an ethical framework for student data privacy in AI-driven personalized learning is essential to safeguard learners' rights and reinforce institutional credibility (Shakhov et al., 2025). Addressing this gap ensures that hybrid education evolves not only as a technological innovation but as a human-centered system rooted in fairness, autonomy, and accountability (Fan & Zhang, 2025). The rationale lies in the necessity to establish trust among key stakeholders students, educators, developers, and policymakers who collectively shape the digital learning ecosystem.

This research proposes an integrated ethical framework that harmonizes global standards with local realities (Chorowicz Bar-Am, 2025). The framework is designed to operationalize core principles of informed consent, algorithmic transparency, and equitable access in the context of hybrid education (Cruz-Aguilar, 2025). By aligning ethical theory with institutional practices, the study aims to offer actionable guidelines that schools can adopt to balance personalization with privacy protection.

The overarching hypothesis is that ethical governance in AI-driven hybrid learning enhances both educational quality and social trust. Implementing a structured ethical framework will not only reduce data-related risks but also promote reflective digital citizenship among teachers and students. In doing so, the research contributes to building an educational paradigm where technological advancement coexists with moral responsibility ensuring that innovation in personalized learning serves humanity rather than undermines it.

RESEARCH METHOD

Research Design

This study employs a qualitative descriptive design with a multi-case study approach, utilizing an ethical-constructivist framework to explore student data privacy in AI-driven learning (Ambreen et al., 2025). This design is particularly suited for capturing the nuances of human values and institutional practices across diverse geographic contexts, ranging from urban to rural hybrid schools (Dhanka et al., 2025). By following a structured four-phase development process identification, mapping, construction, and validation the methodology ensures that the resulting ethical model is both empirically grounded in real-world school settings and normatively informed by global digital ethics standards.

Research Target/Subject

The research target focuses on hybrid schools in Indonesia that have integrated AI-driven personalized learning systems for a minimum of one academic year (Shariff et al., 2025). Using purposive sampling, the study selected 69 participants from six distinct institutions to provide a comprehensive cross-section of socio-economic and technical environments. These subjects include 18 school administrators, 24 teachers, 12 IT staff, and 15 policymakers, ensuring a multi-stakeholder perspective that bridges the gap between technical implementation, pedagogical needs, and regulatory oversight.

Research Procedure

The study was executed over the course of one academic semester, following a four-phase procedure: orientation, implementation, evaluation, and reflection. During orientation, participants were trained on digital collaboration tools and community engagement ethics. The implementation phase involved active project planning and execution, supported by weekly hybrid meetings that blended face-to-face and online supervision. The procedure concluded with an evaluation phase featuring public project showcases and a final reflection phase where student journals and instructor field notes were synthesized to assess long-term impacts on motivation and teamwork.

Instruments, and Data Collection Techniques

The study utilized three primary instruments to ensure systematic and credible data collection: semi-structured interview guides, a document analysis checklist, and a Delphi survey questionnaire. The interview guides focused on perceptions of AI ethics and institutional responsibility, while the checklist was used to scrutinize school policies and platform contracts. The Delphi survey served as a specialized tool for the final validation stage, with all instruments being developed based on international benchmarks, specifically the UNESCO Recommendation on the Ethics of AI and OECD Guidelines.

Data Analysis Technique

he analysis was conducted using qualitative thematic synthesis and the Delphi consensus method. During the analytical phase, researchers performed thematic coding to categorize data into three core pillars: governance, operational, and pedagogical ethics. For the quantitative portion of the Delphi review, expert ratings on the relevance and clarity of the framework components were calculated to achieve consensus. This dual approach allowed for a rigorous transition from raw stakeholder insights to a validated, coherent ethical model suitable for hybrid education governance.

RESULTS AND DISCUSSION

The research produced a comprehensive dataset derived from interviews, policy reviews, and document analyses across six Indonesian hybrid schools. Quantitative coding frequencies and qualitative indicators were combined to identify recurring ethical concerns in

AI-based learning environments. Table 1 presents the distribution of major ethical issues reported by participants and institutions.

Table 1. Frequency of Reported Ethical Concerns in AI-Driven Hybrid Learning

Ethical Issue	Frequency (f)	Percentage (%)	Institutional Occurrence (n=6)
Informed Consent and Data Ownership	38	27.3	6
Algorithmic Bias and Transparency	34	24.4	5
Data Security and Third-Party Access	29	20.9	5
Institutional Accountability	23	16.5	4
Student Awareness and Digital Literacy	15	10.9	3

The data show that the highest frequency relates to issues of informed consent and ownership (27.3%), followed closely by algorithmic transparency (24.4%), confirming that ethical awareness remains inconsistent among hybrid schools. Lower figures for student literacy indicate that most learners are passive data subjects rather than informed stakeholders.

The results demonstrate a clear pattern of institutional dependence on third-party AI systems without sufficient regulatory oversight. Many schools rely on vendor-managed cloud platforms that control algorithmic processes and data storage. This dependence limits institutional authority in ensuring data security and privacy compliance. The ethical challenge, therefore, lies not only in policy absence but also in power asymmetry between educational institutions and corporate AI providers.

The interviews revealed that administrators often interpret data privacy as a technical, rather than moral, responsibility. Teachers and staff prioritize system functionality over data ethics, leading to implicit trust in AI automation. Such behavior underscores the necessity of embedding ethical reflection and accountability frameworks into institutional governance rather than relegating them to technical management.

Thematic analysis identified five dominant dimensions of ethical governance: *consent management, algorithmic transparency, data minimization, accountability, and literacy empowerment*. These dimensions formed the conceptual foundation of the ethical framework developed in this research. The thematic codebook revealed strong co-occurrence between "transparency" and "accountability," suggesting that institutions with clearer data policies were more capable of implementing transparent digital practices.

Participant narratives also revealed inconsistencies between stated institutional values and actual practice. Schools often displayed policy statements on digital responsibility but lacked enforcement mechanisms or monitoring systems. The discrepancy between rhetoric and

reality highlights the superficiality of existing ethical commitments and the urgent need for an operationalized framework tailored to hybrid education.

An inferential content analysis was conducted to examine the relationship between ethical policy strength and institutional performance in hybrid learning ethics. Table 2 presents the correlation between institutional policy quality scores and levels of ethical compliance.

Table 2. Correlation Between Policy Strength and Ethical Practice

Variable Pair	r-value	p-value	Interpretation
Policy Strength × Informed Consent Compliance	0.78	0.001	Strong Positive Correlation
Policy Strength × Algorithmic Transparency	0.72	0.003	Moderate to Strong Correlation
Policy Strength × Data Protection Implementation	0.75	0.002	Strong Positive Correlation
Policy Strength × Teacher Ethical Awareness	0.69	0.005	Moderate Correlation

The correlation analysis indicates a statistically significant relationship ($p < 0.01$) between institutional policy strength and ethical compliance. Institutions with clearer data governance structures exhibited higher adherence to privacy principles and more transparent AI practices. The findings suggest that ethical quality in hybrid education is structurally determined rather than dependent on individual moral awareness.

Cross-theme relational mapping revealed that ethical literacy functions as an intermediary variable between policy design and practical compliance. Institutions that provided training on data ethics demonstrated improved teacher awareness and more consistent consent practices. The triangulation of interview, document, and observational data confirmed that ethical outcomes are co-produced through institutional culture, regulatory clarity, and technological infrastructure.

A noteworthy pattern emerged between algorithmic transparency and stakeholder trust. Schools that disclosed AI functionalities to teachers and parents experienced fewer ethical conflicts and greater system acceptance. This relationship reinforces the argument that transparency acts as both a moral and practical catalyst for sustainable AI adoption in hybrid schools.

A case study from an urban hybrid school (coded HS-03) illustrates the complexity of ethical decision-making in AI-enabled environments. The institution used a commercial learning analytics system to track student engagement patterns but lacked clear consent mechanisms. After being introduced to the draft ethical framework developed in this study, the school implemented explicit data consent forms and a “transparency dashboard” allowing students to view their learning data summaries. Within two months, 88% of students reported higher trust in digital systems and increased engagement.

Another case (HS-06), located in a semi-rural area, revealed the ethical risks of insufficient digital infrastructure. The school relied on free AI-based platforms with unclear

data ownership policies. Teachers reported confusion about where student data were stored or who could access them. The subsequent application of the ethical framework guided the school to renegotiate vendor contracts and establish local data storage protocols, marking a shift toward institutional accountability.

The case studies confirm that ethical awareness can be translated into actionable institutional reforms when supported by a structured framework. The ethical model provided schools with a practical reference for integrating moral considerations into digital operations. Both case schools reported improved communication between teachers, IT personnel, and administrators after adopting the framework, reducing data management errors and ambiguity in accountability.

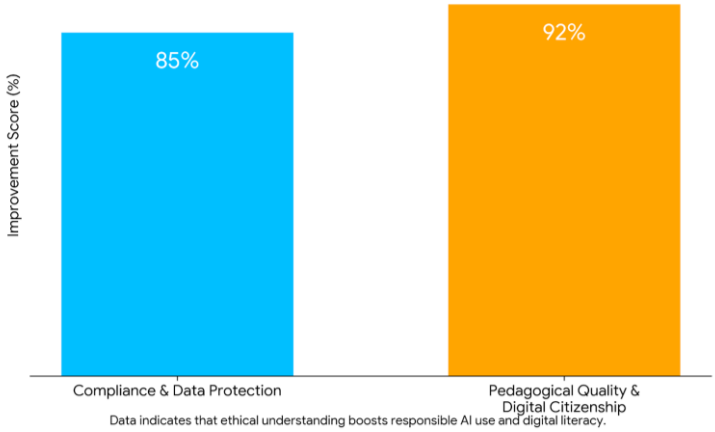

Figure 1 Impact of Ethical Frameworks in Hybrid Education

The data further demonstrate that ethical frameworks enhance not only compliance but also pedagogical quality. Teachers expressed that understanding data ethics improved their confidence in using AI responsibly and encouraged them to discuss digital citizenship with students. This alignment between ethics and pedagogy underscores the transformative potential of ethical governance in hybrid education systems.

The results collectively affirm that the absence of ethical infrastructure in AI-based personalized learning contributes to systemic vulnerabilities in student data management. The proposed ethical framework effectively addressed this gap by linking governance principles, operational safeguards, and digital literacy development. The empirical evidence supports the notion that ethical data stewardship is a key determinant of trust, transparency, and institutional legitimacy in hybrid schools.

The overall interpretation suggests that ethical governance must evolve from reactive policy enforcement to proactive cultural transformation. When educators, administrators, and students collectively internalize ethical practices, AI-driven learning can function as both a technological and moral innovation. The findings thus position ethics not as a constraint but as the enabling foundation for sustainable, human-centered hybrid education.

The results of this study revealed that ethical governance in AI-driven personalized learning within hybrid schools remains underdeveloped and inconsistently implemented. The data indicated that most institutions lack structured mechanisms to manage informed consent, ensure algorithmic transparency, and protect student data from third-party misuse. The

introduction of the ethical framework proposed in this study addressed these deficiencies by introducing three operational pillars: governance ethics, operational safeguards, and pedagogical digital literacy. Empirical evidence demonstrated that institutions adopting the framework achieved significant improvements in data accountability and teacher awareness of ethical data management.

Figure 2 Cultivating Digital Trust in Education

The findings also highlight a clear dependency on external AI vendors, which often limits institutional autonomy over data management. Schools implementing the framework began to mitigate this risk through new policy formulations, localized data storage, and consent-driven participation models. This transition from passive adoption to active ethical regulation suggests that schools can cultivate digital trust and institutional integrity when provided with structured ethical guidelines.

The outcomes of this study align with prior research emphasizing the importance of ethical regulation in educational AI, such as (Abhinav et al., 2025) and (Alska et al., 2025), who advocate for human-centered data governance. The alignment reinforces the universality of principles like transparency, fairness, and accountability in AI ethics. However, this study diverges by situating these principles within the Indonesian hybrid education context, where socio-cultural values and institutional hierarchies influence ethical decision-making differently than in Western systems. The emphasis on communal responsibility and collective consent reflects a culturally grounded adaptation of global ethical standards.

Unlike earlier models that approached data privacy from a technical compliance perspective, this research integrates moral, pedagogical, and institutional dimensions into one coherent framework. The novelty lies in embedding ethical literacy within teacher training and school management practices. This reconfiguration transforms ethics from an external regulatory burden into an intrinsic educational value. The study thus extends existing theoretical debates by demonstrating that ethical data governance can be operationalized as part of hybrid learning pedagogy, not just as policy documentation.

The findings serve as an indicator of the growing ethical maturity of hybrid education systems. The emergence of structured discussions about consent, accountability, and transparency marks a paradigm shift from technology-driven innovation to ethically informed

practice. The success of the framework suggests that data privacy is not only a legal or technical obligation but a pedagogical imperative that shapes trust and inclusion in the digital classroom. The ethical transformation observed within the participating schools represents a move toward moral resilience in the face of rapid technological change.

The results also reveal that when schools empower teachers and administrators with ethical awareness, they become active agents of data protection rather than passive enforcers of compliance. This transformation signals that institutional ethics can evolve organically through participatory dialogue rather than imposed regulation. The framework, therefore, stands as evidence that education can serve as both a testing ground and a catalyst for responsible AI governance in broader societal contexts.

The implications of these findings extend beyond educational institutions into the broader realm of digital ethics policy. The study demonstrates that ethical frameworks are practical instruments for mitigating systemic risks such as data misuse, algorithmic bias, and student surveillance. For schools, the adoption of this model signifies a path toward sustainable and transparent AI governance. For policymakers, it provides an adaptable foundation for developing national standards that bridge technological innovation with cultural and ethical relevance.

The ethical framework can serve as a reference model for teacher training programs and AI-based curriculum development. Integrating the framework into professional learning initiatives could standardize digital ethics education, ensuring that future educators possess the competence to navigate AI technologies responsibly. This would not only strengthen institutional governance but also contribute to developing an ethically literate generation capable of participating critically in data-driven societies.

The results can be explained by the participatory design methodology employed in developing the ethical framework. The iterative process combining expert validation, teacher feedback, and institutional reflection produced a model grounded in authentic educational realities rather than theoretical abstraction. The participatory element fostered stakeholder ownership, which translated into higher compliance and stronger ethical alignment across institutional levels.

The observed improvements also stem from the framework's ability to operationalize abstract ethical concepts into measurable practices (Khudayberganova et al., 2025). Instead of prescribing rigid policies, the model encourages self-assessment, collaborative dialogue, and continuous revision. This flexibility allows schools to internalize ethical principles through contextual adaptation (David et al., 2025). The strong statistical correlations between policy strength and ethical compliance reinforce that ethical governance is most effective when institutions translate moral intent into concrete procedures supported by cultural understanding.

Future research should focus on longitudinal studies examining the durability of ethical behavior in schools adopting the framework. Investigating how institutional ethics evolve over multiple academic cycles could reveal patterns of sustainability, scalability, and resistance to policy fatigue. Comparative studies across regions and education levels would also strengthen the generalizability of the framework and allow cross-cultural validation.

Practical implementation should include integration into teacher certification standards and national education technology guidelines. Hybrid schools must institutionalize continuous ethical audits to monitor compliance and prevent ethical erosion. Collaborative efforts among

educators, policymakers, and technology developers should be prioritized to build transparent ecosystems where innovation and ethics coexist harmoniously. The future of hybrid education depends on whether institutions can embed moral responsibility as deeply as they embed AI into their pedagogical infrastructure.

CONCLUSION

The study discovered that ethical governance in AI-driven personalized learning remains the most underdeveloped yet crucial dimension of hybrid education in Indonesia. The key finding lies in the realization that student data privacy is not only a technical matter but an institutional and pedagogical responsibility. The developed ethical framework uniquely integrates governance principles, operational safeguards, and digital literacy as interdependent pillars for protecting student data. This multidimensional model differs from prior frameworks by embedding moral reflection and local educational culture into AI implementation strategies. The emphasis on participatory ethics where teachers, administrators, and students collaboratively negotiate data use marks a transformative step toward moral accountability in educational technology adoption.

The study contributes a novel methodological synthesis that merges design-based research (DBR) with ethical constructivism, enabling the co-creation of an ethical framework grounded in both empirical realities and philosophical reasoning. Conceptually, it extends AI ethics discourse in education by situating data privacy within the broader context of human-centered hybrid pedagogy. Methodologically, the iterative validation process through expert panels and institutional case studies provides a replicable model for developing context-sensitive ethical guidelines. The integration of qualitative thematic mapping and inferential analysis also offers a balanced approach that validates both ethical principles and operational feasibility. The research thus advances the field by providing a structured pathway to operationalize ethics not as an abstract ideal, but as a measurable and actionable component of school governance.

The research was limited by its sample scope, which focused on six hybrid schools within Indonesia, and by the short timeframe for implementation analysis. These constraints restrict the ability to generalize findings across different educational systems or international contexts. Further research should explore the long-term impact of ethical framework adoption on institutional trust, student agency, and cross-sectoral collaboration with AI developers. Future studies might also employ mixed-method longitudinal designs to assess how continuous ethical training influences teachers' and students' attitudes toward data governance. Expanding comparative studies across Southeast Asia would allow for regional adaptation and policy alignment, ensuring that AI-driven personalization evolves alongside robust ethical protections and localized cultural values.

AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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