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Towards Effective Artificial Intelligence-Driven Learning in Indonesian Child Education: Understanding Parental Readiness, Challenges, and Policy Implications

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Research Article

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Abstract

Background/purpose. The integration of artificial intelligence (AI) into child education presents transformative opportunities, yet Indonesian parental readiness remains insufficiently explored. This study examines parental preparedness, barriers to adoption, and policy interventions to ensure effective AI implementation in child education.

Materials/methods. A mixed-methods approach was employed, involving surveys of 100 Indonesian parents to assess AI literacy, accessibility, and attitudinal challenges. In-depth interviews provided qualitative insights into socio-economic constraints and cultural apprehensions. Quantitative data were analyzed using descriptive statistics and regression modeling, while thematic analysis was applied to qualitative responses.

Results. Survey findings revealed that while most parents recognized AI's potential, their ability to support AI-integrated learning effectively remained limited. Higher education levels, digital literacy, and stable internet access were strong predictors of AI adoption readiness. However, substantial challenges persisted, including data privacy concerns, algorithmic bias apprehensions, and anxieties over reduced human interaction in learning. The practical implication of this study suggests that targeted AI literacy programs are key to empowering Indonesian parents for effective AI integration in child education.

Conclusion. Parental readiness for AI integration in Indonesian child education remains critically limited, shaped by inadequate digital competencies, socio-economic constraints, and ethical apprehensions. This study proposes a policy agenda centered on AI literacy programs tailored to parents, accessible educational resources, equitable infrastructure, and data protection frameworks to enable responsible and inclusive AI adoption. As the first empirical mapping of Indonesian parental readiness in this domain, the study offers a globally relevant insight that underscores the urgent need to empower parents as co-navigators of AI-driven educational futures.

1. Introduction

The integration of artificial intelligence (AI) into child education and parenting has significantly reshaped pedagogical methodologies, learning paradigms, and strategies for parental engagement. AI-driven educational technologies, such as adaptive learning systems, intelligent tutoring platforms, and AI-enhanced parental monitoring applications, offer innovative avenues to enhance children's educational experiences and cognitive development (Janardhanan et al., 2023; Pitrella et al., 2024). These technological advancements have notably contributed to improved learning outcomes, especially in early childhood education (ECE), where AI applications have effectively supported interactive learning modalities, predictive analytics for developmental conditions, and bridging educational disparities in resource-constrained contexts (Chen, 2024). Furthermore, intelligent tutoring systems in STEM education have significantly improved student proficiency in complex subjects like mathematics and physics (Asunda et al., 2023).

However, implementing AI in education and parenting contexts faces substantial challenges. Key among these challenges are digital literacy disparities, socio-economic inequities, ethical concerns, and cultural resistance. Particularly in developing countries, many parents exhibit limited digital literacy, thereby reducing their ability to effectively support AI-facilitated educational experiences (Chen, 2024; Nurhayati et al., 2022). Additionally, the unequal distribution of AI-based educational resources across socio-economic groups exacerbates existing educational inequities (Chen, 2024). Ethical issues, including algorithmic bias, data privacy risks, and the opacity of AI decision-making processes, further complicate AI adoption (Adiyono et al., 2025; Cain, 2023; Fu & Weng, 2024). Moreover, cultural apprehensions related to increased screen time, reduced physical activity, and diminished social interactions deepen skepticism about AI's educational role (Aslan et al., 2024).

Despite the growing awareness of these challenges, little empirical research has explored parental readiness for adopting AI-driven educational technologies in developing regions such as Indonesia. This research aims to fill this gap by systematically investigating the determinants and barriers of parental readiness in the context of Indonesian child education. Through this analysis, the study contributes meaningful insights into policy implications required to enhance digital literacy and promote equitable AI adoption among parents. Addressing these structural and contextual challenges is essential for developing effective, inclusive policies to support widespread AI integration in child education. Based on the gaps in literature and contextual challenges identified, this study addresses the following research questions:

1. To what extent are Indonesian parents ready to integrate AI into family life and child education?

2. What challenges do parents face in understanding and managing AI-based educational tools?

3. What policy strategies do parents propose to support responsible and effective AI adoption in child education?

2. Literature Review

2.1. The Integration of AI in Educational and Parenting Domains

Contemporary scholarly discourse underscores the transformative potential of artificial intelligence (AI) within educational and parenting spheres, particularly emphasizing implications for child learning outcomes and parental engagement practices. AI technologies dynamically personalize educational content, which is instrumental in addressing persistent educational disparities across diverse socio-economic settings (Ahmed et al., 2024; Asad et al., 2023). In early childhood education (ECE), AI-driven methodologies effectively support interactive and predictive instructional designs,

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substantially mitigating developmental and educational deficits, especially in resource-limited contexts (Chen, 2024; Yi et al., 2024).

AI-based parenting tools facilitate structured monitoring of children's digital interactions, optimal management of screen time, and provision of curated educational content, thereby promoting responsible digital behavior and healthy digital habits among young learners (Aslan et al., 2024; Bajwa et al., 2024). Additionally, AI-enabled devices can monitor children's emotional and physical states, providing valuable insights for supporting child well-being (Bajwa et al., 2024). AI-interfaced toys and applications engage children in interactive learning, fostering early-stage inquiry literacy and creative thinking (Kewalramani et al., 2021).

2.2. Critical Barriers to AI Integration in Educational Contexts

Integrating artificial intelligence (AI) into educational contexts presents significant opportunities for pedagogical advancement and improved learning outcomes; however, its practical implementation faces numerous substantial challenges, which are extensively examined in recent academic discourse. Ethical concerns are Prominent among these challenges, notably data privacy and algorithmic bias. Scholars have raised serious questions regarding the ethical implications of AI deployment in education, particularly emphasizing the risks associated with the mishandling or unauthorized disclosure of sensitive student data, which necessitate rigorous privacy protections and transparent data management practices (Babenko & Bezuglova, 2025; Gallent-Torres et al., 2024; Sharma et al., 2024). Additionally, algorithmic biases embedded within AI technologies may unintentionally reinforce pre-existing socio-economic and demographic disparities, potentially leading to inequitable educational outcomes and biased evaluation processes, thus calling for vigilant oversight and regular bias audits (Ahmed et al., 2024; da Silva et al., 2024; Rizvi, 2023).

Technological and infrastructural inadequacies represent another major challenge, significantly constraining the successful implementation and sustained adoption of AI technologies in educational settings. Educational institutions, particularly in resource-constrained regions, frequently face substantial limitations in digital infrastructure, including insufficient network bandwidth, inadequate hardware resources, and a lack of reliable technological support, all of which impede effective AI utilization (Al-Zahrani & Alasmari, 2025; Maina & Kuria, 2024). Furthermore, the existing skills gap among educators, attributed to insufficient or nonexistent technical training, limits the practical application of AI tools. Educators require comprehensive training programs and sustained technical support to develop the competencies necessary for the effective integration and optimal utilization of AI resources in their teaching practices (Karroum & Elshaiekh, 2023; Parviz, 2024).

Resistance to change stemming from entrenched pedagogical traditions and systemic reluctance toward technological innovation further complicates AI integration efforts. Educators and administrators often exhibit hesitance rooted in concerns that AI technologies could diminish direct human interactions and potentially compromise the relational aspects inherent in traditional pedagogical processes. Overcoming this resistance requires targeted strategies, including evidence-based demonstrations of AI's educational effectiveness and structured transitional support to ease adaptation to new technological paradigms (Roy et al., 2024).

Financial constraints also pose a significant barrier, limiting the accessibility and sustainability of AI-based educational initiatives. The substantial costs associated with procuring, maintaining, and updating AI technologies, alongside necessary infrastructure enhancements, constitute prohibitive financial burdens for institutions, especially those operating within economically disadvantaged environments. Addressing these financial barriers requires targeted policy interventions, strategic resource allocation, and collaborative investment from public and private stakeholders to enable equitable and inclusive access to advanced AI educational technologies (Al-Zahrani & Alasmari, 2025).

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Lastly, the lack of comprehensive regulatory frameworks and clear policy guidelines complicates the systematic integration and ethical application of AI in educational contexts. Effective regulation and robust policy structures are vital for clarifying the acceptable scope of AI use, ensuring alignment with educational ethics, and protecting stakeholder interests. Explicit policies facilitate ethical accountability, mitigate potential misuse, and foster greater transparency and confidence among educators and learners alike (Cheng & Wang, 2023; Shamsuddinova et al., 2024). Addressing these critical barriers requires an integrated approach, emphasizing ethical considerations, infrastructure enhancement, capacity-building through targeted training, financially sustainable solutions, and well-defined policy guidelines. A strategic, holistic approach is essential to harness the potential of AI to revolutionize educational outcomes fully.

2.3. Enhancing Parents and Teacher Digital Literacy to Facilitate AI Adoption in Child Education

Strengthening digital literacy among educators and parents represents a foundational component for facilitating effective adoption and integration of artificial intelligence (AI) technologies within educational environments. Contemporary scholarly literature underscores a significant relationship between increased digital literacy and heightened stakeholder confidence regarding the pedagogical capabilities of AI, thus promoting deeper integration and more widespread adoption within educational settings (Galindo-Domínguez et al., 2024; Lim, 2023; Su, 2024). Comprehensive training programs must be strategically developed and systematically implemented to advance digital literacy. These training programs should integrate theoretical foundations with practical applications, allowing educators and parents to gain direct experience with AI technologies, thereby reducing anxiety, overcoming resistance, and fostering positive perceptions towards technological integration (Kočková et al., 2024; Nurhayati et al., 2022; Wang, 2023).

Structured conceptual frameworks also play a vital role in enhancing digital literacy among stakeholders. Models such as KSAVE (Knowledge, Skills, Attitudes, Values, and Ethics) provide structured guidelines, assisting educators and parents in acquiring a holistic understanding of AI capabilities and its ethical implications. Additionally, the application of pedagogical models like Technological Pedagogical Content Knowledge (TPACK) has been advocated to facilitate the seamless integration of AI into teaching practices by assessing and developing educators' readiness and proficiency (H. Cai & Wong, 2024; Chan & Tang, 2025). Moreover, collaborative learning environments are instrumental in fostering enhanced digital literacy. Interactive, AI-mediated educational spaces enable meaningful human- computer interactions, increasing educators' and parents' comfort and proficiency with AI technologies. These collaborative, interactive experiences enhance practical learning outcomes and help cultivate a positive orientation towards adopting AI-driven solutions (Koravuna & Surepally, 2020; Voulgari et al., 2021).

Institutional support plays a pivotal role in the sustainability and efficacy of digital literacy initiatives. Educational institutions must provide ongoing resources, reliable technological infrastructure, and regular professional development opportunities. Universities and educational institutions can function as central resource hubs, offering continuous access to updated materials, expert assistance, and dedicated platforms for knowledge exchange and skill development, thereby ensuring continuous learning and effective AI integration (Y. Cai et al., 2024; Khalil & Alsenaidi, 2024; Musa et al., 2024). Moreover, to overcome barriers to AI adoption, targeted interventions addressing resistance to change, technological access disparities, and infrastructure limitations must be implemented. Comprehensive strategic planning, sustained investment in technological infrastructure, and continuous stakeholder engagement are pivotal in ensuring successful integration and optimal use of AI in educational contexts (Karroum & Elshaiekh, 2023; Musa et al., 2024; Nurhayati & Musa, 2025).

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2.4. Socio-economic Factors Influencing AI Adoption

Socio-economic factors critically shape parental adoption patterns of AI-based educational technologies, particularly within developing nations. Financial constraints, inadequate digital infrastructures, and deep-seated infrastructure, and cultural skepticism significantly hinder the widespread integration of AI within educational and parenting practices (Dampitakse et al., 2021; Kuzmina et al., 2024). Lower-income households frequently face limited access to AI-enabled educational tools, exacerbating educational disparities and underscoring the urgent need for cost-effective, inclusive AI interventions (Khan et al., 2024). Research further highlights the pivotal influence of economic stability and infrastructural development on AI adoption, with notably widespread AI integration within educational and parenting practices (Dampitakse et al., 2021; Kuzmina et al., 2024). Lower-income households frequently face limited access to AI-enabled educational tools, exacerbating educational disparities and underscoring the urgent need for inclusive, cost-effective AI interventions (Khan et al., 2024). Economic stability and infrastructural development significantly influence AI adoption, with higher adoption rates observed among economically advantaged demographics (Brey & van der Marel, 2024).

InGlobal policy frameworks aimed at enhancing parental AI literacy have emerged in response to these critical challenges, global policy frameworks aimed at enhancing parental AI literacy within educational contexts have emerged. Notable among these is the ED-AI Lit Framework, which delineates comprehensive strategies encompassing knowledge acquisition, evaluative competencies, collaborative practices, context-specific applications, autonomy, and ethical considerations (Allen & Kendeou, 2024). Similarly, China's SIACC Framework provides targeted guidelines for early childhood education, emphasizing safety, cognitive enhancement, and capability development (Luo et al., 2024). Furthermore, the AI Literacy Competency Framework categorizes AI competencies hierarchically, tailoring educational interventions to effectively address diverse stakeholder needs, including parents, educators, and learners (Chee et al., 2024). Nonetheless, substantial barriers persist in implementing these frameworks, particularly in developing contexts where inadequate funding, limited infrastructural capacities, and insufficient public awareness significantly impede comprehensive adoption (Chee et al., 2024; Salha et al., 2025). Nonetheless, substantial barriers persist in implementing these frameworks, particularly in developing contexts where inadequate funding, limited infrastructural capacities, and insufficient public awareness significantly impede comprehensive adoption (Salha et al., 2025). Figure 1 below illustrates the conceptual framework drawn from the literature.

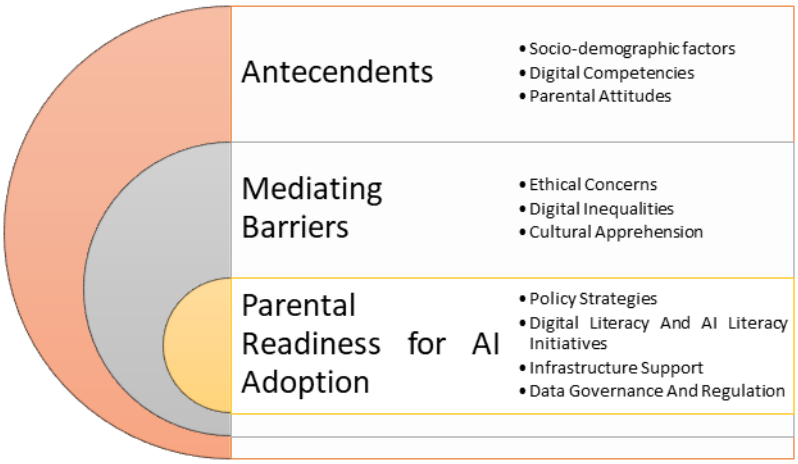

Figure 1. Conceptual Framework

This conceptual framework presents a multilayered systems model illustrating the structural, perceptual, and policy-related dimensions that collectively shape parental readiness for AI adoption

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in child education. Positioned in concentric alignment, the framework begins with antecedent factors—comprising socio-demographic characteristics, digital competencies, and parental attitudes—that serve as foundational predispositions influencing parental engagement with AI technologies. These antecedents are filtered through a set of mediating barriers, including ethical concerns, digital inequalities, and cultural apprehension, which function as critical moderators that can either constrain or facilitate behavioral transition toward AI integration. At the core lies parental readiness, conceptualized as an emergent outcome contingent upon both enabling antecedents and mitigating interventions. This readiness is reinforced by targeted policy strategies encompassing digital literacy and AI education initiatives, infrastructural enhancement, and data governance mechanisms. The visual architecture of the framework underscores the recursive and interdependent nature of these domains, offering a holistic model to guide empirical inquiry and inform policy formulation for equitable and context-sensitive AI integration in parenting and education.

Existing literature reveals a significant deficiency in empirical studies specifically addressing parental AI adoption in developing countries, notably within Indonesia. This review emphasizes the necessity for targeted empirical investigations aimed at exploring the unique structural and contextual factors affecting AI integration in these regions. Addressing these research gaps will generate critical insights to inform policy development, thereby facilitating equitable, comprehensive, and ethically sound integration of AI technologies into educational and parental contexts (Tan et al., 2025).

3. Methodology

3.1. Study design

This study adopts a mixed-methods research design to comprehensively assess parental readiness for AI integration in child education within the Indonesian context. Given the intersectionality of AI adoption with socio-economic, educational, and technological determinants, this approach facilitates a rigorous investigation of both quantitative and qualitative dimensions. The fusion of survey-based statistical analysis and in-depth qualitative inquiry ensures a multifaceted understanding of parental experiences, perceptions, and barriers in engaging with AI-driven educational tools (Creswell & Creswell, 2017). The study employs an exploratory and descriptive framework to capture the nuances of AI readiness among parents. The quantitative component utilizes a cross-sectional survey to evaluate AI literacy, digital accessibility, and socio-economic influences. Concurrently, the qualitative phase employs semi-structured interviews to delve into parental attitudes, contextual constraints, and strategic adaptations in AI adoption (Braun & Clarke, 2021). This integration enhances analytical depth by enabling triangulation, which bolsters the validity of findings through the synthesis of multiple data sources (Creswell & Creswell, 2017). The rationale for this methodological selection lies in its capacity to bridge empirical statistical trends with richly contextualized narratives, thereby ensuring a robust and comprehensive assessment of parental AI preparedness.

3.2. Participants

A stratified random sampling technique was implemented to ensure a representative sample encompassing diverse socio-economic and educational backgrounds. Participants were selected from five regencies in Central Java—Demak, Grobogan, Kudus, Jepara, and Pati—chosen to reflect heterogeneity in digital infrastructure, educational attainment, and access to AI-driven learning resources. The study engaged 100 parents (N=100) who met the inclusion criteria of having at least one child enrolled in primary or secondary education, possessing digital literacy to some extent, and demonstrating willingness to contribute to the research. Stratified sampling facilitated proportional representation across key demographic parameters, including education level, income bracket, and technological access. This methodological choice mitigated selection bias, strengthened the external

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validity of findings, and enhanced the study's generalizability. The sampling strategy ensured that participants from both urban and rural settings were adequately represented, allowing for a holistic analysis of parental AI adoption disparities.

3.3. Data collection tools

Data collection was conducted in two phases to maximize reliability and comprehensiveness. The first phase involved administering a structured questionnaire designed to quantify parental digital literacy, AI-related attitudes, and perceived adoption barriers. The instrument utilized a five-point Likert scale to measure agreement levels (1 = strongly disagree to 5 = strongly agree). The questionnaire was divided into sections assessing demographic characteristics (age, education, employment, and income), digital literacy (self-reported competency in navigating AI-integrated tools), perceptions of AI in education (anticipated benefits and concerns), and adoption barriers (technical complexity, financial constraints, and ethical apprehensions). Prior to full-scale deployment, the instrument underwent pilot testing with 15 respondents to refine clarity, reliability, and validity. To accommodate digital accessibility variations, surveys were distributed both online and in printed format.

The second phase encompassed semi-structured interviews with a purposively selected sample of 100 parents. These interviews explored subjective perspectives on AI's role in education, firsthand experiences with AI-enhanced learning platforms, socio-cultural and economic constraints, and expectations regarding AI literacy interventions and policy initiatives. Interviews were conducted either in person or through virtual platforms, depending on participant availability. All interviews were recorded, transcribed verbatim, and systematically analyzed for thematic content (Braun & Clarke, 2021). This methodological approach ensured the extraction of in-depth qualitative insights that complemented the quantitative survey findings.

3.4. Validity of data collection tools

The questionnaire underwent a rigorous validation process conducted by a panel comprising three experts who specialized in digital literacy, parental readiness for educational technology, and research methodology. This expert panel systematically evaluated the instrument to determine the relevance and clarity of its items, ensuring alignment with the core objectives of the research. The panel concurred that the questionnaire effectively addressed the central dimensions pertinent to parental AI preparedness. To further strengthen the study's methodological rigor, several validation measures were undertaken. Content validity was meticulously established through a structured expert review, ensuring that each item accurately reflected essential constructs of AI literacy. Additionally, construct validity was rigorously assessed using exploratory factor analysis (EFA), verifying that the survey items consistently represented the intended dimensions of parental AI readiness. The reliability of the instrument was evaluated through Cronbach's alpha, applying an accepted standard of internal consistency reliability set at a threshold of $\alpha > 0.70$, thus confirming the dependability and internal coherence of the questionnaire items.

For qualitative validation, member-checking was employed, wherein participants were provided with summaries of their interview responses to verify accuracy and representation. Additionally, methodological triangulation—integrating survey and interview findings—served to cross-validate data sources, mitigating biases and reinforcing research integrity. Reflexivity measures, such as researcher journaling and peer debriefing, were further incorporated to enhance analytical objectivity.

3.5. Data collection procedure

Quantitative data were processed using descriptive and inferential statistical techniques to identify overarching trends in parental AI adoption readiness. Descriptive statistics, including mean

values, standard deviations, and frequency distributions, were utilized to characterize parental digital literacy levels and accessibility to AI-based educational resources. Furthermore, Pearson correlation analysis was employed to examine associations between key variables, such as parental education, digital competency, and AI adoption intentions. Multiple regression analysis was conducted to determine the predictive influence of these factors on AI integration attitudes. All statistical computations were executed using SPSS 27 software, ensuring methodological rigor. Prior to conducting regression analyses, assumption checks were performed to ensure the validity of the statistical procedures. Normality of distribution was examined using the Shapiro-Wilk test ($p > .05$), indicating no significant deviation from normality. Linearity and homoscedasticity were assessed through residual plots, confirming the appropriateness of linear regression modeling. Multicollinearity was ruled out, as variance inflation factor (VIF) values for all predictors remained below the accepted threshold of 2. These assumption checks confirm that the dataset met the basic requirements for valid parametric analysis.

For qualitative data, thematic analysis was employed following Braun and Clarke's (2019) six-step framework: (1) data familiarization, (2) initial coding, (3) theme identification, (4) theme review, (5) theme definition, and (6) report generation. Manual coding was undertaken, followed by verification through cross-analysis with a secondary researcher to enhance interpretative reliability. For example, a coding tree diagram was developed to visually represent the emergence of key themes from parent responses (see Figure 2). Codes such as "data privacy fears and anxiety," "lack of or no digital training," and "trust in AI" were clustered under major themes like ethical concerns, capacity gaps, and socio-cultural resistance. The integration of statistical modeling with thematic interpretation enabled a triangulated approach to data synthesis, reinforcing the credibility and depth of analytical outcomes.

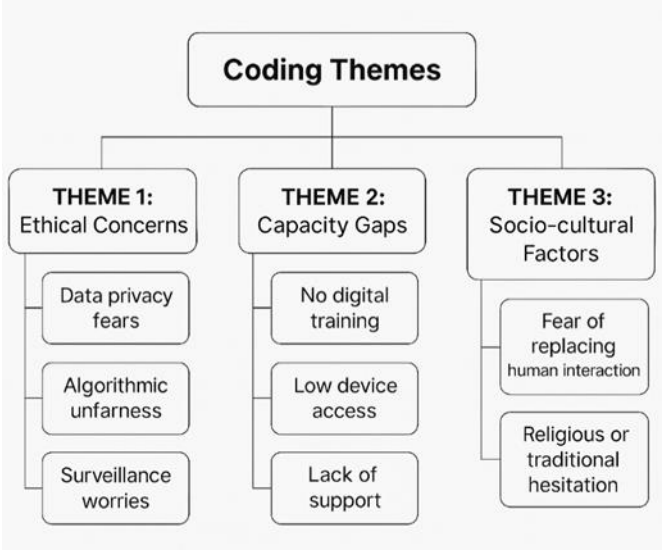

Figure 2. Coding Tree Diagram Example

3.6. Ethical considerations

This study strictly adhered to the ethical principles governing educational research. Participants were thoroughly informed about the study's objectives, scope, and procedures, which focused on parental readiness for AI integration in educational contexts. Their voluntary and informed consent was obtained before data collection, with strict guarantees of anonymity and confidentiality, ensuring full compliance with ethical and regulatory standards. Furthermore, the ethical guidelines set forth by the Institute of Teacher Training and Educational Sciences (IKIP) Siliwangi were meticulously followed, particularly in safeguarding participants' rights and maintaining the integrity of collected data. Given the study's non-experimental design and the absence of sensitive data collection, formal

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approval from an ethics committee was not required. Nevertheless, rigorous ethical considerations and methodological precautions were implemented to uphold scientific integrity, transparency, and participant welfare throughout the investigation of parental preparedness for AI adoption in education.

4. Results

4.1. Parental Readiness for AI Integration in Family Life and Child Education

To assess the readiness of parents in integrating AI into family life and child education, a structured survey was conducted with 100 respondents. The survey measured key variables influencing parental AI adoption, including understanding of AI, education level, access to technology, digital literacy, concerns about AI impact, availability of AI education resources, and participation in community-based training programs. Each variable was analyzed in terms of mean scores, standard deviations, correlation coefficients, and regression values to determine their significance in shaping parental readiness for AI adoption. The results are presented in the following table 1. The table provides a comprehensive overview of the statistical analysis results. The mean scores indicate the average level of each variable among the respondents, while the standard deviation reflects the variation in responses. Correlation values (r) highlight the strength and direction of the relationship between each variable and AI comprehension, while regression coefficients (β) indicate the predictive power of each factor in determining parental AI readiness.

Table 1. Survey Results on Parental Readiness for AI Integration

Variable	Mean	Standard Deviation	Correlation (r)	Regression (β)
Understanding of AI	2.85	0.76	0.62**	0.54**
Education Level	3.40	0.82	0.58**	0.49**
Access to Technology	3.75	0.68	0.65**	0.57**
Digital Literacy	2.70	0.79	0.60**	0.52**
Concerns about AI Impact	3.20	0.85	-0.55**	-0.48**
AI Education Resources	2.95	0.72	0.63**	0.56**
Formal Education	3.50	0.81	0.61**	0.50**
Internet Access	3.80	0.75	0.67**	0.58**
Community-Based Training	3.10	0.80	0.64**	0.55**

A systematic analysis of survey responses from 100 parents revealed a prevailing deficiency in AI literacy, as reflected by a mean score of 2.85 (SD = 0.76). Notably, the highest mean scores were recorded for access to technology (M = 3.75, SD = 0.68) and internet availability (M = 3.80, SD = 0.75), suggesting that while the technological infrastructure is largely in place, a substantive gap persists in parental comprehension and engagement with AI technologies.

The correlation analysis demonstrated a statistically significant positive relationship between parental education level and AI comprehension ($r = 0.58$, $p < 0.01$), implying that advanced educational attainment facilitates greater proficiency in AI-related concepts. Additionally, access to the internet ($r = 0.67$, $p < 0.01$) and participation in community-based digital literacy initiatives ($r = 0.64$, $p < 0.01$) exhibited robust correlations with parental readiness for AI adoption. These findings suggest that while infrastructural readiness—such as internet access and device availability—is relatively high, cognitive and affective readiness remains limited. In other words, having access to

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technology does not necessarily equate to the ability or willingness to engage with AI tools in meaningful ways. The significant negative association between AI concerns and readiness (β = -0.48) further emphasizes that emotional trust and perceived risks play a crucial role in shaping parental decision-making. This readiness gap points to the importance of interventions that go beyond hardware provision and address deeper dimensions such as perception, literacy, and ethical awareness. Further regression analysis identified access to technology (β = 0.57, $p < 0.01$) and the availability of AI-focused educational resources (β = 0.56, $p < 0.01$) as significant predictors of parental inclination toward AI integration in child education. In contrast, apprehensions regarding AI's potential adverse effects exhibited a statistically significant negative association (β = -0.48, $p < 0.01$), underscoring the role of parental concerns in moderating AI adoption.

To complement the quantitative survey results, in-depth interviews were conducted with 100 parents to explore their perceptions, concerns, and experiences regarding AI integration in family and educational settings. The qualitative data provide insights into parents' levels of AI awareness, their usage patterns, and their concerns regarding its potential impact on their children's education. Table 2 presents the distribution of responses based on key themes emerging from the interviews.

Table 2. Interview Results on Parental Readiness for AI Integration

Response Category	Details of the Response	Examples of participants' responses	Frequency/ Percentage n=100
Basic understanding of AI	Parents have some knowledge of AI but lack deeper comprehension.	*"I have heard of AI but don't fully understand how it works…"*	25 (25%)
No knowledge of AI	Parents have never encountered or learned about AI.	*"I don't know what AI is or how it affects education."*	40 (40%)
Understand AI but do not know how to use it	Parents are aware of AI but lack practical skills to implement it.	*"I know about AI, but I am unsure of how to use it effectively in my child's education..."*	35 (35%)
Actively use AI in child education	Parents utilize AI-driven tools for their child's learning.	*"I use AI-powered applications to help my child learn new concepts."*	15 (15%)
Believe AI can support child education	Parents recognize the potential benefits of AI in learning.	*"AI could be useful, but I need more guidance on how to implement it effectively."*	50 (50%)
Concerned about AI's negative impact	Parents worry about AI's risks in child education.	*"I worry about the risks of AI replacing traditional learning methods..."*	60 (60%)
Have adequate internet access	Parents have stable internet access, allowing AI tool use.	*"We have a good internet connection, but I lack knowledge on AI-related educational tools."*	70 (70%)
Lack stable internet access	Parents experience difficulties due to unreliable internet.	*"My internet connection is unreliable, which makes it hard to access AI resources."*	30 (30%)
Have attended digital literacy training	Parents have received formal training on digital literacy.	*"I attended an AI literacy workshop, but I still find it challenging to integrate AI in parenting..."*	20 (20%)
Have never attended digital literacy training	Parents have not received training on AI or digital literacy.	*"I have never received any formal training on AI, and I find it overwhelming."*	80 (80%)

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A comprehensive analysis of in-depth interviews conducted with 100 parents reveals significant gaps in AI literacy and preparedness for AI integration in child education. Notably, 40% of respondents reported having no knowledge of AI, while 35% demonstrated a basic understanding but lacked the skills necessary to utilize AI tools effectively. Only 15% of parents actively incorporated AI-driven technologies into their children's education, underscoring a substantial barrier in AI adoption among parents. In terms of parental perceptions, 50% of respondents acknowledged AI's potential benefits for their children's education. However, 60% expressed apprehensions about AI's potential negative implications, reflecting a prevailing ambivalence—parents recognize AI's advantages yet remain uncertain about its associated risks. Access to digital infrastructure emerged as a pivotal factor influencing AI readiness. While 70% of parents reported stable internet access, 30% faced challenges related to connectivity reliability. Moreover, only 20% had participated in digital literacy courses, whereas 80% had never received any formal education regarding AI or digital tools. These findings underscore the urgent need for expanding digital literacy initiatives to equip parents for the AI era better. These findings highlight a multidimensional readiness gap—one that is not solely rooted in infrastructure or education, but also in cognitive, emotional, and ethical domains. To further contextualize these patterns, the following section explores parents' specific challenges in understanding and managing AI within educational and familial settings.

4.2. Key Challenges Parents Face in Understanding and Managing AI in Child Education

The qualitative data reveal that gaps in parental readiness manifest in a variety of challenges that inhibit meaningful engagement with AI tools. These include conceptual confusion, difficulties in supervising children's use of AI, issues of trust, and inequitable access—all of which affect the practical usability of AI in everyday parenting contexts. Insights from in-depth interviews further underscore a spectrum of obstacles, ranging from knowledge deficits to regulatory ambiguities, that constrain parents from effectively integrating AI into both caregiving and educational practices. Table 3 summarizes the primary challenges identified in the study, along with their frequency among respondents.

Table 3. Challenges Faced by Parents in Understanding and Managing AI for Child Education

Key Challenge	Details of Challenges	Examples of Participants' Responses	Frequency (n=100)/Percentage
Lack of understanding of AI concepts	Many parents struggle with understanding how AI functions, its applications, and its potential implications for child development and education. This knowledge gap hinders their ability to guide children in responsible AI usage.	*"I don't really know what AI does or how it affects my child's learning. I worry that I cannot teach them what I don't understand myself…"*	45 (45%)
Difficulty in monitoring children's AI usage	Parents face challenges in regulating screen time and assessing whether AI-driven applications are beneficial or harmful. The lack of parental controls and knowledge about AI-driven recommendations increases concerns.	*"My child spends hours on AI-powered apps, and I can't tell if they're learning or just wasting time. I wish I knew how to monitor it better."*	40 (40%)

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Concerns about data privacy and security	Many parents fear their child's data is being collected without their consent. There is uncertainty about how companies use AI to track personal behaviors and whether these platforms are safe for children.	*"I have no idea what information AI apps collect from my child. What if this data is misused? It makes me hesitant to allow my child to use them..."*	55 (55%)
Insufficient AI educational resources	Parents lack access to user-friendly resources that explain AI and its safe usage for children. Existing information is often too technical, making it difficult to apply in parenting and education.	*"I've tried to find books or online courses about AI for parents, but everything is too complicated. I need simple guidance on how to use AI responsibly with my child."*	50 (50%)
Negative perceptions of AI	Some parents believe AI could negatively impact traditional learning and socialization. There are concerns that excessive reliance on AI might replace critical thinking, human interactions, and emotional intelligence in children.	*"I feel that AI is making kids too dependent on technology. Instead of thinking for themselves, they just follow whatever the app tells them to do."*	35 (35%)
Limited access to adequate technology	Parents in lower-income households or rural areas struggle with unreliable internet, outdated devices, or the high costs of AI-based educational tools, preventing equal opportunities for AI integration in learning.	*"We don't have a good internet connection at home, and AI-powered learning tools are expensive. My child is missing out compared to others..."*	30
Difficulty in providing digital guidance to children	Parents feel unequipped to help children navigate AI safely. Many lack the technical skills to explain AI functions or enforce proper digital behavior, leading to excessive screen time or unregulated content consumption.	*"I want to teach my child how to use AI responsibly, but I don't even understand it myself. It's overwhelming trying to keep up with technology."*	60
Lack of clear regulations and guidelines	Parents are unsure about the legal and ethical implications of AI in children's education and entertainment. The absence of standardized policies for AI-driven platforms increases uncertainty.	*"There should be clear laws on AI for kids. I don't know if these apps are really safe, and I don't feel like anyone is protecting my child's data."*	42

Findings from in-depth interviews with 100 parents presented in Table 3. indicate that the most prevalent challenge is the lack of understanding of AI concepts, with 45% of respondents acknowledging insufficient knowledge about how AI operates and its potential applications in parenting. The lack of conceptual understanding of AI among nearly half of the participants reflects more than a knowledge deficit—it reveals a deeper disconnect between the technological language of AI and the everyday realities of parenting. Parents are not only unfamiliar with technical definitions, but also uncertain about how to position AI within their values, goals, and responsibilities

as caregivers. This epistemic gap contributes to a sense of powerlessness, as many parents feel unequipped to guide their children in digital environments they themselves do not comprehend. Without targeted support, this lack of conceptual grounding may exacerbate educational inequality in AI-integrated learning ecosystems. Additionally, 40% of parents reported difficulties in supervising their children's use of AI-powered technologies, highlighting concerns about ensuring safe and productive digital engagement. Privacy and security concerns represent another major issue, with 55% of respondents expressing uncertainty regarding how AI handles their children's personal data. Furthermore, 50% of parents reported challenges in accessing adequate educational resources to comprehend AI and effectively introduce it to their children.

A notable proportion of parents (35%) exhibited negative perceptions of AI, particularly regarding its impact on children's social interactions. This suggests prevailing concerns that AI may replace human engagement in learning and child-rearing processes. Moreover, limited access to suitable technology (30%) and difficulty in providing digital guidance to children (60%) further hinder parental readiness for AI adoption. Regulatory gaps also emerged as a significant concern, with 42% of parents indicating that the absence of clear guidelines on AI use in households and educational settings contributes to their uncertainty regarding its adoption. Taken together, these challenges reflect the lived realities behind the statistical indicators reported in section 4.1, affirming that parental readiness for AI adoption is influenced by more than just material conditions. In response to these thematic challenges, parents proposed a series of context-sensitive policy strategies, discussed in the following section.

4.3. Proposed Policy Strategies to Enhance Parental Readiness for AI Adoption in Child Education

Building on the structural and perceptual challenges identified in Section 4.2, this section presents a set of policy strategies proposed by parents to facilitate the integration of AI in child education. These strategies are designed not only to address immediate barriers but also to enhance long-term parental readiness. While AI offers considerable opportunities to enrich children's learning experiences and streamline parental responsibilities, its adoption requires both a comprehensive understanding and well-defined policy frameworks to ensure responsible and equitable implementation. Challenges such as limited digital literacy, restricted access to educational resources, and the absence of clear regulatory guidelines suggest that, in the absence of targeted policy interventions, many parents will remain ill-equipped to engage with AI in meaningful and sustainable ways. Accordingly, this study seeks to examine the most salient policy strategies articulated by parents to strengthen their capacity to manage AI within the domains of parenting and child education.

Before presenting the findings in Table 4, it is important to contextualize the various policy strategies identified through in-depth interviews with parents. These strategies address critical barriers such as digital literacy gaps, regulatory shortcomings, and accessibility challenges, all of which significantly influence parents' ability to integrate AI into their child-rearing practices. The proposed strategies highlight a range of interventions that can facilitate responsible AI adoption by parents (see Table 4.)

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Table 4. Proposed Policy Strategies for AI Integration in Child Education

Proposed Policy Strategy	Details of Proposed Policy	Examples of Participants' Responses	Frequency (n=100)	Percentage (%)
Digital literacy training for parents	Structured programs aimed at improving parents' understanding of AI and digital tools through workshops, online courses, and hands-on training.	- *"I often feel lost when my child asks about AI-related topics. A training program would help me guide them better."* - *"Without proper training, I fear I might give my child the wrong advice about AI."*	70	70
Provision of AI educational resources	Development of accessible, easy-to-understand materials on AI for parents, including guides, online platforms, and interactive learning tools.	- *"There aren't many easy-to-understand resources for parents about AI. We need something simple yet informative..."* - *"If we had more AI learning materials, I'd feel more confident in helping my child."*	65	65
AI curriculum integration in education	Inclusion of AI-related topics in school curricula to equip children with essential knowledge, fostering early awareness and competency.	- *"If AI was introduced in schools, children would have a better grasp of its applications and risks."* - *"Teaching AI in schools means children will be prepared for future careers that rely on AI."*	50	50
Child data protection regulations	Policies ensuring secure handling and protection of children's personal data, with stringent measures against unauthorized data use.	- *"I don't know how safe my child's personal data is when using AI apps. There should be clear policies in place..."* - *"Companies should be transparent about how they use our children's data."*	60	60
More equitable internet access	Expanding internet coverage to underserved areas to ensure equal access to AI learning resources, bridging the digital divide.	- *"We struggle with poor internet connectivity, making it hard to access AI learning platforms for our children."* - *"If internet access was more reliable, my child*	55	55

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		could benefit more from online AI tools."		
School-community partnerships	Collaboration between schools and communities to facilitate AI literacy initiatives through joint training programs and parent engagement.	- *"Workshops or discussions involving parents and schools would help us understand how to use AI in education effectively."* - *"If schools and local organizations worked together, more parents could be educated about AI."*	45	45
Public awareness campaigns on AI	Nationwide campaigns to educate the public about AI's benefits and risks through media, social platforms, and public events.	- *"There's so much misinformation about AI. A national campaign would help clear doubts and promote responsible AI use."* - *"If people understood AI better, they wouldn't fear it as much."*	40	40
AI-based content supervision	Implementation of AI-driven parental control tools to monitor children's online content and prevent exposure to harmful materials.	- *"I worry about the kind of AI-generated content my child sees. We need better parental control options."* - *"AI can be useful, but without proper content supervision, it may expose children to inappropriate material."*	50	50

The policy proposed by parents, as outlined in Table 4, underscores key policy strategies deemed essential for enhancing their readiness to integrate AI into parenting and child education. Insights from in-depth interviews with 100 parents reveal a predominant emphasis on digital literacy training (70%), highlighting an urgent need for structured educational programs that equip parents with foundational AI knowledge. The overwhelming support for digital literacy training highlights a fundamental recognition among parents that readiness is not innate but must be cultivated through structured, accessible learning opportunities. Unlike passive awareness campaigns, hands-on training equips parents with both technical competencies and interpretive frameworks to engage critically with AI tools. Moreover, such training functions as an empowerment mechanism, transforming passive users into informed co-educators who can make pedagogically sound decisions. In resource-limited contexts, these programs can bridge systemic digital divides by elevating parental agency and digital confidence.

In parallel, 65% of parents advocate for the provision of AI educational resources, underscoring the necessity for accessible, comprehensible materials that can effectively support their children's AI-related learning experiences. Another widely endorsed strategy (50%) involves the integration of AI education into school curricula, signaling parental recognition of the importance of fostering digital competencies from an early age. Privacy and security considerations also feature prominently, with

60% of parents stressing the need for robust child data protection regulations. This concern reflects growing anxieties regarding the management of children's personal data by AI-powered applications, emphasizing the necessity for comprehensive regulatory frameworks to enhance data security and ethical AI implementation.

Furthermore, equitable internet access (55%) emerges as a significant policy priority, particularly for families in underserved regions where limited connectivity poses barriers to AI-driven educational tools. Similarly, school-community partnerships (45%) are identified as a strategic mechanism to bolster AI literacy among parents, leveraging collaborations between educational institutions and local communities to facilitate knowledge-sharing and resource distribution. Public awareness campaigns on AI (40%) are proposed as a means to mitigate widespread misinformation and cultivate a more informed public perspective on AI's benefits and risks. Concurrently, AI-based content supervision (50%) is viewed as a critical safeguard to ensure that children interact with AI in a secure and educationally enriching manner.

To synthesize the findings from Sections 4.1 to 4.3, a visual model was constructed to illustrate the interrelationships between parental readiness, perceived challenges, and proposed policy strategies. This diagram aims to capture the thematic and structural links across quantitative and qualitative results, providing an integrative framework for understanding parental engagement with AI in educational settings.

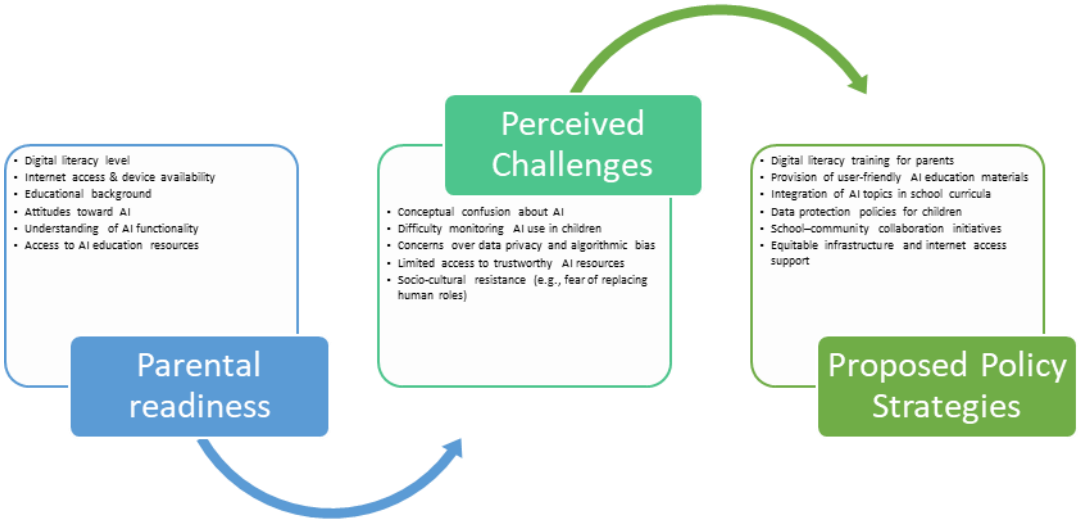

Figure 3. Thematic Map of The Relationship Between Parents' Readiness, Challenges, And Policy Strategies In AI Adoption For Child Education

As depicted in Figure 3, foundational factors such as digital literacy, internet access, and attitudinal trust contribute to varying levels of parental readiness. These are often mediated by key challenges—conceptual confusion, monitoring difficulties, data privacy concerns, and socio-cultural resistance—that obstruct meaningful AI integration. The outer tier of the model represents targeted policy strategies proposed by parents, including digital literacy training, accessible AI resources, and stronger data governance, all of which aim to mitigate the barriers and foster more equitable and responsible AI adoption.

5. Discussion

5.1. Parental Readiness for AI Integration in Family Life and Child Education

The integration of artificial intelligence (AI) into child education necessitates a nuanced understanding of parental readiness, which is contingent upon a constellation of interrelated variables, including perceptions of AI's pedagogical value, concerns regarding its risks, demographic

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determinants, and levels of trust in AI-driven systems (Alnasib, 2023). The present study substantiates these dimensions, revealing that despite widespread access to technological infrastructure, substantive gaps persist in AI literacy, digital training, and parental confidence. Quantitative analyses highlight a pronounced deficiency in AI comprehension ($M = 2.85$, $SD = 0.76$), even in the presence of high levels of technological access ($M = 3.75$, $SD = 0.68$) and internet availability ($M = 3.80$, $SD = 0.75$). The observed correlation between education level and AI comprehension ($r = 0.58$, $p < 0.01$) reinforces prior scholarship underscoring the role of formal education in enhancing AI literacy.

Concerns about AI's implications—particularly regarding data security, privacy breaches, and the erosion of human oversight—remain a formidable impediment to parental adoption (Zhang et al., 2025). Anxiety surrounding AI's potential to supplant traditional pedagogical methodologies and disrupt parent-child engagement further exacerbates resistance to adoption (Berghea et al., 2024). Regression analysis affirms these findings, demonstrating that apprehensions about AI's negative ramifications exert a statistically significant inverse effect on AI adoption readiness ($\beta = -0.48$, $p < 0.01$). Conversely, structured digital literacy interventions and access to AI-related educational resources serve as robust predictors of AI adoption behavior (Von Winckelmann et al., 2024).

Qualitative assessments further contextualize these statistical insights, illustrating that 40% of parents possess no foundational knowledge of AI, while 35% maintain a rudimentary understanding yet lack the requisite competencies for application in educational settings. Merely 15% actively incorporate AI-powered tools into their children's learning experiences, underscoring a conspicuous disconnect between AI awareness and its practical implementation. While 50% of parents acknowledge AI's potential educational benefits, 60% exhibit reservations regarding its broader implications, aligning with extant literature that delineates ambivalent parental attitudes toward AI integration (Bajwa et al., 2024). Gender disparities also emerge as a salient factor, with female respondents expressing heightened ethical concerns regarding AI's role in educational contexts (Haley et al., 2024).

Digital literacy initiatives play an indispensable role in bridging these deficits. Community-based training programs and AI-focused digital literacy curricula have demonstrably improved parental AI literacy and engagement (Choudhary & Bansal, 2022). However, the current study underscores the limited scope of such initiatives, with only 20% of parents reporting participation in digital literacy training, while 80% remain devoid of formal AI instruction. Research suggests that targeted digital literacy training can significantly bolster AI adoption rates and equip parents with the necessary competencies to facilitate their children's engagement with AI-enhanced learning tools (Pudjiadi et al., 2024).

The study's findings underscore the imperative for structured AI literacy initiatives designed specifically for parents, particularly in socioeconomically diverse communities with limited exposure to AI. Integrating AI education into adult learning frameworks may ameliorate prevailing misconceptions and enhance comprehension (Karan & Angadi, 2023; Moksin et al., 2024). Public education campaigns should proactively address parental anxieties, as empirical evidence suggests that targeted interventions effectively mitigate concerns and promote AI adoption (Berghea et al., 2024). Furthermore, the development of intuitive, parent-centric AI learning platforms may foster sustained engagement and bolster confidence in AI integration (Olari et al., 2023).

Recent comparative studies across high-income countries (HICs) and low- and middle-income countries (LMICs) further illustrate the contextual disparities in parental readiness for AI integration in child education. In HICs such as China, Finland, and Canada, structured AI policies and well-developed digital ecosystems enable greater parental engagement, with AI tools in early childhood education (ECE) commonly used for personalized learning, developmental monitoring, and real-time assessment (Bajwa et al., 2024). Parents in these contexts, particularly those with higher educational

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attainment, are more likely to perceive AI as a beneficial extension of traditional pedagogy and report fewer barriers to adoption (Berghea et al., 2024; Xia, 2024).

In contrast, LMICs such as Indonesia continue to face multifaceted challenges—including infrastructural gaps, policy fragmentation, and cultural apprehensions—that constrain parental readiness (Adiyono et al., 2025; Al-Zahrani & Alasmari, 2025). Financial constraints, digital inequality, and lack of culturally responsive tools remain primary impediments to responsible AI adoption (Oyetade & Zuva, 2025). Furthermore, studies have shown that both maternal and paternal education levels in LMICs are critical predictors of early learning support, reflecting the compound influence of socio-economic conditions on AI readiness (Jeong et al., 2017). These findings reaffirm that AI integration must not rely on technological availability alone, but must also address the human, cultural, and policy dimensions that shape parental engagement in diverse global contexts.

5.2. Key Challenges Parents Face in Understanding and Managing AI in Child Education

The integration of artificial intelligence (AI) into educational technologies presents both opportunities and obstacles for parents navigating their children's digital learning environments. While AI offers personalized learning pathways, its complexity introduces barriers to effective parental oversight. These barriers include knowledge deficits regarding AI functionality, challenges in monitoring children's AI usage, data privacy concerns, and limited access to educational resources. Addressing these challenges is crucial for fostering responsible AI engagement in child education.

Findings from in-depth interviews indicate that 45% of parents lack an understanding of AI concepts, impeding their ability to guide their children’s responsible AI use. Similarly, 40% struggle to monitor AI-powered applications, raising concerns about screen time and content quality. Data privacy concerns are pronounced, with 55% of parents uncertain about how AI-driven platforms collect and use their children's data. Moreover, 50% report difficulty accessing user-friendly AI literacy resources, while 35% express skepticism about AI’s role in education. Additional challenges include limited access to technology (30%), difficulties in providing digital guidance (60%), and regulatory uncertainties (42%), which contribute to parental hesitation regarding AI adoption in education.

A fundamental barrier to parental AI engagement is a lack of foundational digital literacy. Studies by Su (2025), Kasinidou et al. (2024), and Matthee et al. (2017) emphasize that many parents struggle to comprehend AI’s educational implications. Cheng & Wang (2023) argue that AI’s technical complexity exacerbates parental reluctance, while Matthee et al. (2017) highlight the challenges of assessing the educational value of AI-based tools. Parental oversight is further complicated by technoference—the disruption of parent-child interactions due to digital distractions (Glassman et al., 2021). Limited knowledge and ineffective monitoring mechanisms prevent parents from distinguishing between educational AI applications and potentially harmful content. Previous studies suggest that privacy concerns heighten parental hesitancy, particularly regarding algorithmic bias and opaque data-handling practices (Charisi et al., 2020; Solyst et al., 2023).

Socioeconomic disparities also shape AI adoption. Li & Zaki (2024) highlight how lower-income households face systemic barriers in accessing high-quality AI-driven learning tools. Jabali & Ayyoub (2024) indicate that younger, scientifically trained parents exhibit higher AI engagement, though Heffner & Hakimi (2021) find that AI skepticism persists due to fears of diminished critical thinking and social skills. Regulatory gaps further exacerbate parental uncertainty, underscoring the need for robust ethical guidelines (Bakhadirov et al., 2024; Fabijanić Gagro, 2024).

The findings underscore the need for AI literacy programs tailored for parents. Collaborative efforts between policymakers, educators, and developers are essential to providing accessible,

comprehensible resources. AI developers should enhance parental control tools, enabling effective monitoring and assessment of children's AI engagement. Stricter data privacy regulations are also required to ensure transparency and safeguard children's digital information. Governments should implement inclusive digital policies to bridge socioeconomic gaps in AI access. Additionally, structured AI-assisted learning models should be promoted to balance technological and traditional educational methodologies. Addressing regulatory gaps through standardized AI guidelines will provide parents with the necessary legal and ethical assurances to facilitate informed AI adoption.

Emerging cross-national evidence affirms that parental challenges in engaging with AI-integrated education are shaped not only by technological access but also by deep-rooted psychological, ethical, and socio-technical dynamics. In high-income contexts such as Hong Kong and parts of Western Europe, parents generally hold favorable attitudes toward AI in early childhood education, but report persistent concerns regarding children's overdependence on automation, lack of transparency, and the erosion of emotional engagement in AI-mediated interactions (Kurian, 2025; Su, 2025). In LMICs, these concerns are compounded by digital divides and infrastructural limitations, where AI tools often fail to accommodate local languages, cultural values, or socio-economic realities (Jackaria et al., 2024). Ethical anxieties—particularly surrounding bias, surveillance, and data privacy—are pervasive across both contexts but are more acute in under-regulated environments lacking strong child data protection policies (Iryna, 2025; Mouta et al., 2024). These findings echo the study's identification of anxiety, monitoring difficulties, and mistrust as central barriers to parental AI engagement, and emphasize the urgent need for inclusive, culturally responsive, and ethically grounded AI literacy interventions for families globally.

5.3. Proposed Policy Strategies for Enhancing Parental Readiness for AI Adoption in Child Education

This study highlights the necessity of structured policy strategies to enhance parental readiness for AI integration in child education. The most critical need identified was digital literacy training (70%), demonstrating that parents acknowledge AI literacy as essential for guiding children effectively. Additionally, 65% of parents advocated for AI-focused educational resources, emphasizing the demand for accessible, structured materials. AI curriculum integration within formal education (50%) was also a priority, reflecting an awareness of the importance of early AI exposure.

Concerns regarding privacy and security were significant, with 60% of parents emphasizing the need for robust child data protection regulations. Equitable access to internet infrastructure (55%) was seen as essential for AI adoption, particularly in underserved communities. School-community partnerships (45%) were identified as an effective approach to promoting AI literacy, while public awareness campaigns (40%) were recognized as critical for addressing misinformation. AI-based content supervision (50%) was also highlighted as necessary for ensuring safe AI interactions for children.

The findings underscore the urgency of structured policy interventions to support responsible AI adoption. The emphasis on digital literacy training aligns with research highlighting that parental digital illiteracy can hinder children's engagement with AI-driven learning tools (Kimmons & Hall, 2018). Similarly, the demand for AI educational resources corresponds with findings that a lack of accessible AI materials limits parental involvement in AI-mediated education. The call for AI curriculum integration supports global efforts advocating for early AI education to foster digital competencies. Privacy concerns, highlighted by 60% of parents, align with studies emphasizing the ethical and security risks of AI-driven applications. Regulatory measures play a fundamental role in shaping parental perceptions of AI adoption, as structured policies enhance trust in AI technologies while addressing data security concerns (Shwedeh et al., 2024). Institutional policies requiring AI literacy programs for educators further reinforce parental readiness by demonstrating a commitment

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to ethical AI integration (Salha et al., 2025). Public awareness initiatives, such as targeted educational programs and community-based training, have been shown to improve AI literacy among parents by bridging knowledge gaps and building confidence in AI-driven education. Trust and transparency in AI policies, particularly in data privacy and content supervision, foster parental confidence in AI adoption. Large-scale public awareness campaigns and school-community collaborations further contribute to mitigating misinformation and promoting informed decision-making regarding AI (Bajwa et al., 2024).

These findings have significant implications for policymakers, educators, and technology developers. The strong parental preference for digital literacy training and AI educational resources underscores the need for nationwide AI literacy programs targeting parents. Structured training modules and accessible materials are essential interventions for bridging the AI knowledge gap and enhancing parental agency in AI-mediated child education.

Integrating AI literacy into formal curricula is essential for equipping children with foundational digital competencies. Policymakers should consider revising educational frameworks to ensure AI literacy is introduced early. Parental concerns about data privacy further necessitate the implementation of stringent AI data governance policies to ensure ethical AI adoption. Equitable internet access remains a challenge in AI education accessibility. Governments should prioritize investments in digital infrastructure to bridge technological divides, particularly in marginalized communities. School-community partnerships can serve as effective mechanisms for disseminating AI literacy by leveraging collaborations between educational institutions, local organizations, and technology firms. Furthermore, large-scale public awareness campaigns are crucial in combating misinformation and fostering a well-informed parental demographic. Trust and transparency in AI policies significantly shape parental attitudes, reinforcing the necessity of clear communication about AI functionalities and ethical safeguards (Berghea et al., 2024). AI-based content supervision remains vital for ensuring a secure and pedagogically enriching AI learning environment. Developers should integrate advanced parental control functionalities into AI applications, enabling parents to regulate and monitor their children's digital interactions. AI policies that emphasize ethical considerations, security measures, and equitable access to AI resources will further enhance parental confidence and preparedness (Gaur et al., 2024).

Recent global initiatives emphasize the need to expand AI literacy policies beyond the school to include parents as critical stakeholders in digital transformation. Frameworks such as the AI Citizenship Framework (Hossain, 2025) and Digital Inclusion (Owens et al., 2023) highlight how parental engagement must be supported not only through access and infrastructure, but also through structured curricular pathways and pedagogical tools. For instance, in high-income countries, curricular strategies that embed AI literacy into cross-disciplinary learning—paired with home-based programs like STEM Play & Learn—have been effective in increasing parental confidence and involvement (Alcala et al., 2024; Bosarge, 2024). By contrast, parental AI literacy in LMICs remains fragmented, with gaps in training, awareness, and institutional outreach (Casal-Otero et al., 2023). Although countries like Indonesia demonstrate growing awareness of AI in education, national-level programs to engage parents remain underdeveloped, highlighting a significant equity divide in AI literacy access.

To address these disparities, scholars advocate for culturally responsive, modular AI literacy programs that engage both educators and families through collaborative mechanisms. Studies by Chklovski et al. (2021) and Yue Yim (2024) suggest that co-learning models—where parents and children engage together in real-world problem-solving using AI—may serve as powerful tools to bridge literacy and trust gaps. Moreover, recent reviews call for more inclusive frameworks that recognize parents as co-educators in the AI literacy process, urging the design of localized interventions, community-led workshops, and policy guidelines that are adaptable to varied socio-

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economic realities (Funa & Gabay, 2025; Liu & Ding, 2025). Embedding such strategies within school-community partnerships could accelerate AI readiness and foster a more resilient ecosystem for ethical and equitable AI adoption in child education across global and local contexts.

6. Limitations and future research

This study advances the discourse on policy strategies aimed at fostering parental readiness for AI adoption in child education; however, several limitations merit consideration. First, the reliance on self-reported data introduces potential biases, including social desirability effects and variability in respondents' AI literacy. To mitigate these concerns, future research should employ a multimodal approach, integrating observational studies, expert evaluations, and experimental interventions to enhance the validity and robustness of findings. Second, the study's demographic scope is constrained, limiting the generalizability of its conclusions. While the targeted sample facilitated an in-depth exploration of parental perspectives within a defined context, expanding the research to encompass diverse socio-economic, cultural, and geographic populations would yield a more comprehensive understanding of AI readiness across different educational landscapes. Comparative studies examining policy efficacy in varied contexts would be particularly valuable. Third, the cross-sectional nature of this study captures a temporal snapshot of parental attitudes but does not account for longitudinal shifts influenced by policy implementation and technological evolution. Future research should employ longitudinal methodologies to assess how sustained exposure to AI literacy initiatives and evolving regulatory frameworks impact parental engagement over time.

Further inquiry should emphasize interdisciplinary collaborations among policymakers, educators, and technologists to refine AI governance strategies. Additionally, research should critically examine ethical considerations, including algorithmic bias, child data governance, and equitable AI access, ensuring that policy interventions promote responsible and inclusive AI integration in child education.

7. Suggestions and practical implications

Enhancing parental readiness for AI adoption in child education necessitates a structured, multi-faceted approach. Developing AI literacy programs tailored to diverse parental backgrounds is imperative. Accessible educational resources, including interactive modules and applied workshops, would equip parents with the competencies to navigate AI technologies effectively. Integrating ethical AI principles and data privacy education into these initiatives would mitigate concerns regarding algorithmic biases and digital security vulnerabilities, fostering informed parental engagement. A robust regulatory framework is essential to balance technological advancement with safeguarding children’s rights, particularly regarding data privacy and equitable AI access. Public-private collaborations can facilitate standardized AI policies that remain adaptable to emerging technological developments. Longitudinal assessments of policy effectiveness would refine best practices and optimize AI’s long-term pedagogical impact.

The integration of AI into education must align with pedagogical objectives and sociocultural contexts. AI-assisted learning should incorporate dynamic, personalized trajectories while preserving parental agency. Strengthening partnerships between schools, communities, and policymakers is crucial for cultivating AI literacy as a shared responsibility. Involving parents in AI curriculum development ensures alignment with diverse educational values, reinforcing an ethical and equitable AI adoption framework that maximizes learning outcomes while minimizing risks.

8. Conclusion

This study examines the readiness of Indonesian parents to integrate artificial intelligence (AI) into their children's education within the broader socio-technological landscape that shapes digital literacy, socio-economic disparities, and cultural attitudes toward AI-enhanced learning. Findings

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reveal significant deficiencies in parental AI comprehension, persistent concerns about data security, and systemic challenges in overseeing children's digital engagement. While internet infrastructure is relatively stable, the lack of pedagogically sound, user-friendly AI resources—exacerbated by inadequate structured training—poses a major barrier to equitable AI adoption in education.

Parental attitudes toward AI are ambivalent, reflecting optimism for its potential to personalize learning alongside apprehensions about algorithmic bias, ethical risks, and the erosion of traditional pedagogical interactions. These concerns highlight the urgent need for an integrated digital literacy framework that enhances technical proficiency while clarifying AI governance, fostering confidence in its educational applications, and ensuring adherence to ethical standards in data management.

Bridging these gaps requires a collaborative effort from policymakers, educational institutions, and technology developers to create a regulatory and infrastructural ecosystem that supports responsible AI adoption. This includes tailored training initiatives, robust data protection policies, and expanded digital infrastructure to bolster parental AI literacy. Recognizing parents as central agents in AI-facilitated education, this study contributes to the discourse on AI adoption by critically analyzing the intersection of technological innovation and human adaptability in educational contexts.

Declarations

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Data Availability Statement. The data supporting this study's findings are available from the corresponding author upon reasonable request.

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