

PAPER

Teachers' Perceptions and Readiness for Mobile Artificial Intelligence Integration in Elementary Education

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ABSTRACT

The integration of artificial intelligence (AI) with mobile technologies, referred to as mobile AI, has transformed elementary education by providing personalized, interactive, and accessible learning experiences; however, its successful integration is significantly influenced by teachers' perceptions, preparedness, and pedagogical competencies. This study employed a predominantly quantitative descriptive approach, complemented by qualitative data from open-ended questions, to investigate Indonesian elementary school teachers' perceptions and readiness to integrate mobile AI tools. The findings revealed a gap between teachers' positive perceptions and their moderate practical readiness. Personal experience was identified as the strongest predictor of readiness, whereas cognitive understanding and practical ability were significant predictors of perceptions. The structural equation model (SEM) supported these findings and revealed that readiness results from a series of developmental sequences rather than isolated events. This study highlights the need to address both psychological and practical barriers to adoption and offers actionable recommendations for harnessing the transformative potential of mobile AI in elementary education.

KEYWORDS

mobile artificial intelligence (AI) integration, teacher perceptions, artificial intelligence (AI) readiness, elementary education, ethical artificial intelligence (AI) adoption, mobile learning

1 INTRODUCTION

The integration of artificial intelligence (AI) with mobile technologies, termed mobile AI, is transforming elementary education by providing personalized, interactive, and accessible learning experiences that surpass the limitations of traditional classrooms [1], [2]. Unlike desktop-based AI, mobile AI leverages the distinct advantages of mobility and connectivity [3]. Moya and Camacho [3] present a pedagogically informed framework for AI-powered mobile learning, emphasizing its potential beyond mere technical benefits. For instance, the iNaturalist Seek application has

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been employed during scientific nature walks, enabling students to use image recognition technology for plant species identification and integrate fieldwork with AI-enhanced inquiry [4]. Similarly, Zeng et al. [5] demonstrated that a scaffolded mobile AI synchronous drawing tool significantly improved third-grade students' self-efficacy, motivation, and engagement in art education.

The integration of mobile AI in elementary education has gained momentum globally. Aravantinos et al. [6] synthesized 35 empirical studies on AI tools for 4–12-year-olds, highlighting that project-based and constructivist approaches implemented via block-based platforms such as Scratch and Teachable Machine effectively enhance children's engagement and foundational AI concepts. Complementing this, Yim and Su [7] reviewed 46 K-12 studies and underscored the pedagogical value of human–computer collaborative learning and play-based AI tools, such as Google's Teachable Machine and PopBots, for fostering AI literacy and computational thinking. In Türkiye, qualitative evidence from K-12 settings highlights teachers' appreciation of AI for personalized lesson planning and adaptability, despite persistent technical and cultural barriers [8]. Additionally, a study of primary mathematics classrooms in China confirmed that positive teacher attitudes and robust contextual support are critical drivers of AI adoption [9]. These international findings foreground the importance of age-appropriate mobile AI tools and constructivist pedagogies.

The successful integration of mobile AI is significantly influenced by teachers' perceptions, preparedness, and pedagogical skills [10], [11], [12]. However, several challenges persist, including teachers' lack of practical experience with mobile AI tools, insufficient training, curriculum incompatibility, and ethical concerns regarding student data privacy and algorithmic bias [13], [14], [15]. Furthermore, inadequate facilitating conditions, such as unreliable mobile Internet and limited device access, hinder mobile AI engagement, particularly in resource-constrained environments [16], [17]. Filiz et al. [14], also reported that resource barriers, curriculum, and ethical guidelines must be overcome in order for the integration of mobile AI in schools to run smoothly. The increasing focus on AI in primary educational settings highlights a critical juncture where the potential of AI is widely acknowledged; however, its practical and ethical implementation in elementary classrooms remains complex [18].

Based on this background, this study investigated the factors influencing teachers' perceptions and readiness to provide actionable recommendations for effective and ethical mobile AI integration. To address the multifaceted challenges of integrating mobile AI in elementary education, this study draws upon several interrelated theoretical frameworks. These frameworks guide our understanding of how educators' beliefs, competencies, and environments shape their readiness for effective ethical AI integration.

2 THEORETICAL FRAMEWORK

This study draws on six theoretical frameworks to examine the complex and interrelated factors influencing teachers' perceptions and readiness for integrating mobile AI in elementary education. Each framework contributes a distinct yet complementary perspective to understanding psychological, contextual, ethical, and pedagogical readiness. First, the Unified Theory of Acceptance and Use of Technology (UTAUT) [19] provides a foundation for understanding teachers' behavioral intentions in adopting mobile AI. It emphasizes four main constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. These elements explain how external motivations and perceived usefulness influence teachers' willingness to engage with mobile AI technologies.

Second, the framework for the rational analysis of mobile education (FRAME) [20] expands its scope by incorporating the interaction between mobile device affordances, learner attributes, and the surrounding social environment. This model helps contextualize teachers' experiences with mobile AI within institutional, technical, and sociocultural dimensions, especially relevant in resource-limited educational settings. Third, AI literacy [21], [22] addresses the foundational competencies necessary for ethical and informed engagement with AI. These include (1) knowing and understanding AI principles, (2) using and applying AI tools, (3) creating and evaluating AI-enhanced content, and (4) demonstrating ethical awareness. This framework is crucial for ensuring that teachers are not only users of AI but also responsible evaluators of its implications for learning.

Fourth, mobile AI-specific technological pedagogical content knowledge (TPACK) [23], [24] reflects teachers' capacity to design and implement learning experiences that integrate AI with appropriate pedagogy and subject content. This model highlights the need for coherence between technological knowledge, pedagogical methods, and curriculum goals when using mobile AI tools in the classroom. Fifth, the construct of multiple perceptions of mobile AI [25] encompasses teachers' affective and cognitive responses—including personal experience, attitude, willingness, and professional expectations. These psychological factors mediate how external and internal influences translate into practical behavior and intention.

Sixth, mobile AI readiness [26] is conceptualized as a multidimensional outcome consisting of cognition (understanding of AI), ability (technical and pedagogical skills), ethics (awareness of implications), and vision (future-oriented planning). This framework reflects a developmental view of readiness that encompasses knowledge, skill, values, and foresight. Collectively, these frameworks inform the design of instruments used in this study and guide the interpretation of findings. While this section outlines each theoretical contribution individually, the synthesis of these perspectives into a unified conceptual structure—based on empirical findings—is presented in the Discussion.

3 MATERIALS AND METHODS

This study employed a predominantly quantitative descriptive approach, complemented by qualitative data gathered from open-ended questions, to investigate Indonesian elementary school teachers' perceptions and readiness to integrate mobile AI tools. Ethical approval was obtained from the Institutional Ethics Committee of Universitas Islam Negeri Walisongo Semarang (protocol no. 1072/Un.10.3/K/DA.04.10/12/2024). Informed consent was obtained from all participants, who were fully apprised of the study's objectives, procedures, and rights, including the option to withdraw without penalty. Data handling followed the principles of the Declaration of Helsinki to ensure confidentiality.

A purposive sampling strategy was used to recruit 88 elementary school teachers from diverse regions of Indonesia. Participants were required to be actively engaged in digital teaching and have regular access to mobile devices (such as smartphones and tablets) for educational use. The sample comprised 60% female and 40% male teachers, with the following age distribution: 47% aged 30–40 years, 28% aged 41–50 years, 19% under 30 years, and 6% over 50 years, reflecting demographics typical of Indonesian elementary education.

The researchers collected data using an online questionnaire featuring two primary scales. The perception scale was adapted from a study by Losada et al. [25] and included 12 items measuring four dimensions: personal experience, professional

expectations, attitudes, and willingness to use mobile AI. Similarly, the readiness scale adapted from Ozudogru and Durak [26] comprised 12 items that assessed four dimensions: cognitive understanding, practical ability, ethical considerations, and future vision. All items were evaluated on a 5-point Likert scale. Content validity was confirmed by five experts, and reliability was found to be satisfactory (Cronbach's $\alpha = 0.916$ for perceptions and $\alpha = 0.934$ for readiness). Open-ended questions were included to gather qualitative insights into mobile AI usage, barriers, skill requirements, benefits, optimization strategies, and ethical concerns. The survey was distributed via Google Forms through WhatsApp teacher networks over a three-week period.

The researchers utilized descriptive statistics to categorize the levels of AI perceptions and readiness, with mean scores interpreted on a three-tier scale: 1.00–2.33 (low), 2.34–3.67 (moderate), and 3.68–5.00 (high), as per Alkharusi [27]. Additionally, multiple regression and path analyses were performed to identify significant relationships and develop an explanatory model of the complex interactions between teachers' mobile AI readiness and perceptual factors, in alignment with the theoretical framework. Qualitative data were subjected to thematic analysis to identify recurring patterns, thereby adding contextual depth to the quantitative findings. With this established analytical foundation, the subsequent section presents key findings and interpretation of the data.

4 RESULTS

4.1 The gap between positive perceptions and moderate practical readiness

The findings of the descriptive analysis (refer to Table 1) revealed that teachers' perceptions of mobile AI integration were notably high ($M = 3.998$), particularly in terms of attitude ($M = 4.171$) and professional expectations ($M = 4.072$). However, their readiness was slightly lower ($M = 3.820$), with practical ability scoring the lowest ($M = 3.738$). This discrepancy points to a clear gap between beliefs and implementation. Qualitative feedback further reinforced this perspective, with teachers expressing a desire to “streamline lesson planning through AI-generated content” and “engage students through interactive, gamified mobile applications.” Similarly, other teachers noted, “I understand mobile AI concepts, but I struggle with their practical implementation in the classroom,” and “I need more hands-on experience... in authentic teaching contexts.”

Table 1. Level of teachers' perceptions and readiness for mobile AI integration

Category	Dimension	Mean (M)	Std. Dev. (SD)	Classification
Perceptions	Overall	3.998	0.616	High
	Personal experience	3.773	0.778	High
	Professional expectation	4.072	0.698	High
	Attitude	4.171	0.628	High
	Willingness	3.977	0.645	High
Readiness	Overall	3.820	0.619	High
	Cognition	3.848	0.668	High
	Ability	3.738	0.730	High
	Ethics	3.932	0.638	High
	Vision	3.761	0.673	High

4.2 Predictive factors for teachers' perceptions and readiness

The hierarchical regression analysis results (refer to Table 2) indicated that personal experience ($\beta = 0.356, p < .001$) emerged as the most significant predictor of readiness. Conversely, other perception-related factors, including attitude, willingness, and professional expectations, did not achieve significance in the regression model. By contrast, cognitive understanding ($\beta = 0.309$) and practical ability ($\beta = 0.327$) were identified as significant predictors of perceptions, highlighting the importance of knowledge and skills beyond merely positive disposition. This finding suggests that enhancing personal experience through hands-on exposure is likely to improve practical readiness.

Table 2. Hierarchical multiple regression analysis

Dependent Variable	Predictor	β	T	p	R^2	$F(df)/p$
Readiness	Personal Experience	0.356	3.927	<.001	0.563	$F(5, 82) = 21.168, p < .001$
	Professional Expectations	0.140	1.178	0.242		
	Attitude	0.077	0.561	0.575		
	Willingness	0.144	1.096	0.276		
	Age	-0.070	-1.230	0.222		
Perceptions	Cognition	0.309	2.336	0.022	0.572	$F(5, 82) = 21.886, p < .001$
	Ability	0.327	2.719	0.008		
	Ethics	0.037	0.266	0.791		
	Vision	0.037	0.284	0.777		
	Age	0.047	0.830	0.409		

4.3 Structural equation model of AI acceptance and literacy

The structural equation model (SEM) (see Figure 1) corroborated these findings, demonstrating acceptable fit indices (SRMR = 0.069). These fit indices confirmed the internal consistency and structural validity of the proposed adoption pathway.

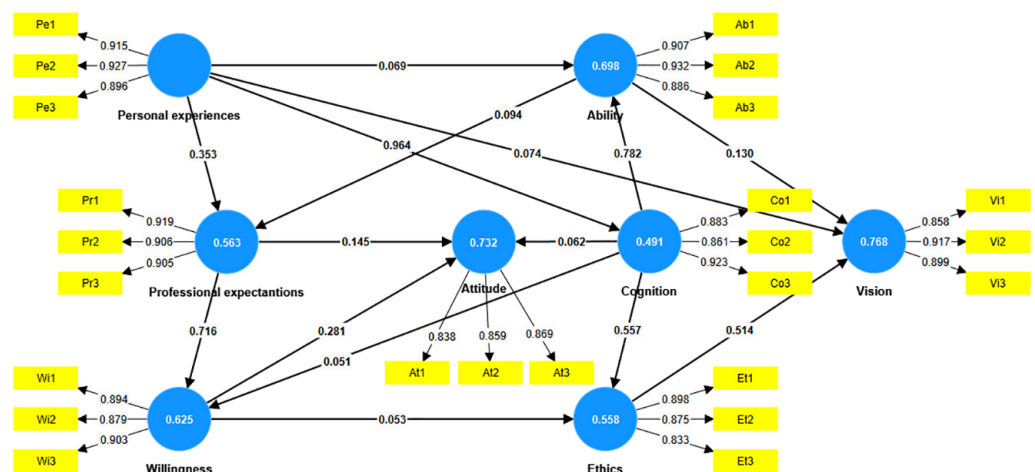


Fig. 1. Structural equation model of mobile AI adoption pathways

Table 3. Direct effects in the SEM of mobile AI adoption pathways

Pathway	β	t	p	f^2	Effect Size
Personal experiences → Cognition	0.701	11.610	0.000	0.964	Large
Personal experiences → Professional expectations	0.535	4.631	0.000	0.353	Large
Personal experiences → Ability	0.202	2.626	0.004	0.069	Small
Personal experiences → Vision	0.179	2.127	0.017	0.074	Small
Cognition → Ability	0.681	8.987	0.000	0.782	Large
Cognition → Ethics	0.618	7.928	0.000	0.557	Large
Cognition → Willingness	0.177	2.060	0.020	0.051	Small
Cognition → Attitude	0.169	2.277	0.011	0.062	Small
Professional expectations → Willingness	0.667	7.145	0.000	0.716	Large
Professional expectations → Attitude	0.332	2.375	0.009	0.145	Small
Ethics → Vision	0.509	4.760	0.000	0.514	Large
Willingness → Attitude	0.448	3.842	0.000	0.281	Medium
Willingness → Ethics	0.190	1.955	0.025	0.053	Small
Ability → Vision	0.296	2.635	0.004	0.130	Small
Ability → Professional expectations	0.276	2.496	0.006	0.094	Small

The direct effects presented in Table 3 reveal that personal experience is a significant antecedent of readiness. It exerted a substantial direct effect on cognition ($\beta = 0.701$, $f^2 = 0.964$, $p < 0.001$) and established notable pathways to professional expectations ($\beta = 0.535$), ability ($\beta = 0.202$), and vision ($\beta = 0.179$). This finding suggests that authentic engagement with mobile technology enhances technical comprehension, pedagogical planning, and the vision of the future.

Furthermore, cognition significantly influenced ability ($\beta = 0.681$, $f^2 = 0.782$, $p < 0.001$), ethics ($\beta = 0.618$), and, to a lesser extent, willingness ($\beta = 0.177$) and attitude ($\beta = 0.169$). This indicates that cognition is central to the model and serves as a pivotal element in developing both capability and ethical discernment. Beyond cognition, professional expectations predicted willingness ($\beta = 0.667$, $f^2 = 0.716$) and attitude ($\beta = 0.332$), confirming that teachers' beliefs about AI's professional utility significantly contributed to their intention to adopt mobile artificial intelligence.

Notably, willingness also functioned as a mediator and predictor, influencing attitudes ($\beta = 0.448$, $p < 0.001$, $f^2 = 0.281$) and ethics ($\beta = 0.190$, $p = 0.025$, $f^2 = 0.053$). These results underscore the motivation to adopt AI transitions into both emotional alignment and moral concern, which is particularly relevant, given the ethical complexities of algorithmic tools in education. Crucially, the strong direct effect of ethics on vision ($\beta = 0.509$, $p < 0.001$, $f^2 = 0.514$) indicated that teachers with a strong ethical understanding of AI were significantly more likely to develop a future-oriented pedagogical vision.

Finally, SEM suggests that readiness stems from developmental sequences (e.g., personal experience → cognition → ethics → vision) rather than isolated events. Similarly, ability contributes to both vision ($\beta = 0.296$, $p = 0.004$, $f^2 = 0.130$) and professional expectations ($\beta = 0.276$, $p = 0.006$, $f^2 = 0.094$), demonstrating that the successful application of mobile AI tools reinforces both future planning and belief systems.

Table 4. Selected indirect effects in the SEM of mobile AI adoption pathways

Mediation Path	β	t	p
Personal experiences → Cognition → Ethics → Vision	0.059	3.745	0.000
Cognition → Ability → Vision	0.086	2.343	0.010
Professional expectations → Willingness → Ethics → Vision	0.065	1.734	0.041
Ability → Professional expectations → Willingness → Attitude	0.082	1.907	0.028
Personal experiences → Professional expectations → Willingness → Attitude	0.056	2.831	0.002
Personal experiences → Professional expectations → Attitude	0.094	1.894	0.029
Personal experiences → Cognition → Attitude	0.054	2.179	0.015
Personal experiences → Cognition → Ability → Vision	0.062	2.278	0.011
Cognition → Willingness → Attitude	0.079	1.760	0.039
Cognition → Ethics → Vision	0.084	3.753	0.000
Ability → Professional expectations → Attitude	0.091	1.899	0.029
Professional expectations → Willingness → Attitude	0.089	3.372	0.000
Willingness → Ethics → Vision	0.055	1.759	0.039

The indirect effects shown in Table 4 offer comprehensive insights into developmental sequences that enhance readiness. For instance, the mediated pathway from personal experience to cognition, ethics, and vision ($\beta = 0.059, p < 0.001$) exemplifies a structured process wherein initial exposure facilitates the acquisition of knowledge, ethical awareness, and strategic thinking. Another significant sequence, from cognition to ability and vision ($\beta = 0.086$), underscored the critical role of practical competence in linking cognitive knowledge with long-term instructional design. Furthermore, the sequence involving professional expectations, willingness, ethics, and vision ($\beta = 0.065$) illustrates how motivational factors interact with ethical judgment to shape vision. The presence of feedback loops, such as the ability to expect and willingness to attitude ($\beta = 0.082$), further accentuates the dynamic nature of the model.

5 DISCUSSION

5.1 Integrating teacher perceptions and readiness within a conceptual framework

The empirical findings of this study substantiate the integrated understanding of mobile AI readiness as a multifaceted developmental construct influenced by interrelated psychological, contextual, ethical, and pedagogical factors. Although teachers exhibited high perceptions of mobile AI, particularly regarding professional expectations and attitudes, their practical readiness was only moderate, revealing a critical implementation gap.

Hierarchical regression and SEM revealed that personal experience was the most significant predictor of readiness ($\beta = 0.356, p < .001$), influencing cognition, ability, and vision. In turn, cognition serves as a pivotal mediating factor linking personal experience with ethical awareness and future planning. These empirical results underscore the importance of experiential learning and the contextual and motivational factors reflected in the FRAME [20] and UTAUT [19] models, respectively.

These findings also align with research highlighting perceived usefulness as a key factor in educators' intentions to adopt AI [28], [29].

The findings also emphasize the role of ethical and cognitive competencies derived from the AI literacy framework [21], [22], particularly the strong path from cognition to ethics ($\beta = 0.618$) and from ethics to vision ($\beta = 0.509$). This confirms that teachers' capacity to think critically about the implications of AI is essential for developing a sustainable and ethically grounded vision for its use.

Although many teachers expressed familiarity with mobile AI tools, gaps in practical application highlight deficiencies in mobile AI-specific TPACK [23], [24]. This observation aligns with the findings of Kitcharoen et al. [30], who noted that despite having positive perceptions, Southeast Asian teachers frequently encounter challenges in aligning AI tools with pedagogical objectives.

To reflect and explain these interconnected pathways, we present an integrated conceptual model (see Figure 2) derived from empirical results, rather than theoretical abstraction alone. The model illustrates how six theoretical frameworks—UTAUT, FRAME, AI Literacy, mobile AI-specific TPACK, Multiple Perceptions, and mobile AI readiness—interact dynamically through four core domains:

- Motivational and normative influences, shaping behavioral intention (UTAUT).
- Contextual conditions, enabling or constraining access and fluency (FRAME).
- Ethical and knowledge-based competencies, informing critical and responsible use (AI Literacy).
- Pedagogical capacity, enabling meaningful instructional design (TPACK).

These domains are mediated by teachers' perceptions, including personal experience and willingness, and culminate in mobile AI readiness as a holistic outcome composed of cognition, ability, ethics, and vision. Importantly, this model emerged directly from the data, confirming that readiness is not a singular attribute but a trajectory shaped by sequential development. For example, SEM revealed indirect paths, such as personal experience → cognition → ethics → vision ($\beta = 0.059, p < .001$), highlighting how readiness evolves through layered, mutually reinforcing dimensions.

In conclusion, the integrated model not only provides a conceptual synthesis but also offers a practical framework for guiding professional development, school policy, and AI literacy initiatives. By embedding the findings within this synthesized theoretical structure, this study contributes to a nuanced understanding of how elementary teachers transition from perception to meaningful AI integration in real classroom settings.

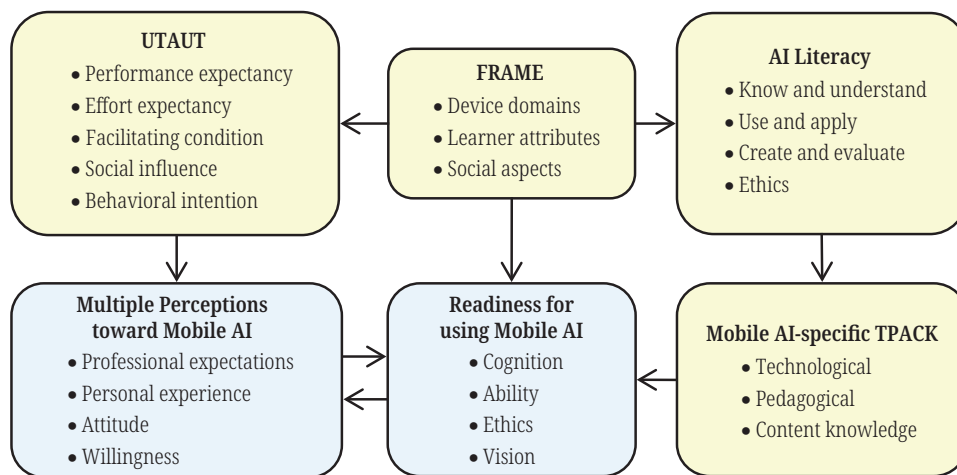


Fig. 2. Integrated conceptual model of teachers' mobile AI readiness

5.2 Ethical concerns around mobile AI integration

The findings of this study indicate that ethical considerations are a pivotal factor influencing teachers' readiness to adopt mobile AI technologies in educational settings. Despite exhibiting a relatively high level of ethical awareness ($M = 3.932$), teachers expressed persistent concerns regarding data privacy, algorithmic bias, and a lack of transparency in AI systems. These concerns not only engender hesitation but also diminish trust and confidence in the pedagogical application of artificial intelligence.

Data privacy has emerged as a predominant concern, particularly in relation to how mobile AI systems collect, store, and utilize sensitive student data such as academic performance, behavior, and emotional responses. Teachers expressed uncertainty regarding data ownership, consent procedures, access control, and the risk of unauthorized use or breaches, which are especially problematic when dealing with young and vulnerable learners. International frameworks, such as UNESCO's Recommendation on the Ethics of Artificial Intelligence [31] and OECD AI Principles [32] underscore the importance of personal data protection, informed consent, secure infrastructure, transparency, human-centered values and fairness to ensure the ethical and safe use of AI in educational contexts. In the absence of clear governance and school-level data policies, teachers may feel unprepared to engage in such technologies, leading to reluctance in adoption [33].

Teachers also expressed concerns about algorithmic bias, recognizing that AI systems trained on non-representative datasets may produce biased or discriminatory outputs. These could manifest in unequal assessments, learning recommendations, or feedback that disadvantaged students based on sex, ethnicity, or socioeconomic status [34]. This perception challenges the fairness and inclusiveness of the AI-supported education. Mitigating these risks requires the use of diverse training data, regular algorithmic audits, and equipping teachers with skills to detect and respond to bias in AI-generated outputs [35], [36]. Furthermore, it is recommended that the use of mobile AI in classrooms should be guided by human inquiry and concluded with human judgment, reflection, and empowerment to preserve teacher agency [37].

Transparency in AI decision-making is another significant issue that affects teacher readiness. Many teachers reported that they did not understand how AI systems generate outputs, which limits their ability to interpret results, identify errors, or explain the rationale to students—a challenge commonly referred to as the “black box” problem. The lack of transparency undermines trust and impedes effective classroom use. To address this, international guidelines advocate AI systems that are explainable, interpretable, and accountable [35], [38]. In addition, developers should provide clear documentation on how AI models work, including their data sources and logic, whereas teachers should receive training to critically evaluate and communicate AI-driven insights [33], [39], [40].

5.3 Practical implications and policy recommendations

The findings of this study reveal a discrepancy between teachers' positive perceptions of mobile AI and their moderate readiness for integration into the classroom. This gap highlights the need for actionable strategies to address both the structural and ethical challenges. Utilizing the UTAUT model, particularly the construct of facilitating conditions, and the FRAME model, which emphasizes ethical awareness, three practical and policy-oriented recommendations were proposed to support responsible and sustainable mobile AI integration.

1. **Implement micro-credential programs for mobile AI pedagogical competency:** Educational authorities and teacher training providers should introduce certified micro-credential programs focused on mobile AI pedagogy. These programs should encompass technical skills, such as prompt engineering, AI-enhanced lesson design, and platform usage, along with ethical competencies, including data privacy, algorithmic fairness, and responsible decision-making [41], [42]. Delivered in flexible, modular formats, such as online badges or hybrid workshops, they serve as scalable and accessible forms of professional development [43]. This approach directly enhances facilitating conditions (UTAUT dimensions) by increasing teachers' technical preparedness and strengthening ethical awareness through structured engagement with ethical challenges in AI use [16], [41].
2. **Develop school-level AI governance protocols and ethics committees:** To institutionalize ethical practices in the use of mobile AI in schools, it is critical to develop comprehensive protocols that include data governance, informed consent, transparency of AI-generated content, and ethical enforcement [41]. Research highlights that the main risks of using AI in education are the misuse of personal data and potential surveillance, necessitating ethical principles, such as algorithmic vigilance, to monitor and prevent the negative impact of algorithms [44], [45]. The involvement of all stakeholders (teachers, school leaders, IT staff, and parents) in the AI ethics committee is strongly encouraged to ensure integrated ethical oversight in decision-making at the school level [46]. This collaboration strengthens ethical awareness and provides a clear operational framework, ensuring that ethical reflection becomes part of daily practice. Additionally, this protocol must be continuously updated as technology develops and new challenges arise, ensuring its relevance and effectiveness in protecting the rights and interests of students and the school community [47].
3. **Launch experiential and ongoing professional development pathways:** Professional development should transition from theoretical workshops to continuous hands-on learning experiences. Teachers should be encouraged to use mobile AI tools, such as Socratic or Curipod, in classroom contexts, engage in peer-to-peer co-design of AI-integrated lessons, and participate in reflective discussions on ethical dilemmas in AI implementation [48], [49]. This practice-based model supports facilitating conditions (UTAUT dimensions) by offering sustained pedagogical and technical support and deepens ethical awareness by enabling teachers to critically examine the implications of AI in real classroom scenarios [50].

These three policy directions provide a robust framework for strengthening teachers' readiness for mobile AI. They simultaneously address external support systems and internal ethical dispositions, ensuring that AI integration into education is pedagogically meaningful, ethically responsible, and practically feasible.

6 LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study identified a significant discrepancy between the perceptions and practices of mobile AI readiness among Indonesian elementary school teachers. Although these educators demonstrate positive attitudes towards mobile AI, they lack the practical competencies necessary for effective classroom implementation. Despite recognizing the potential of mobile AI for personalized learning, real-time assessment, and context-aware instruction, there remains a deficiency in practical

skills. The findings indicate that perception accounts for a substantial portion of the variance in readiness ($R^2 = 0.563$), underscoring the need to address both the psychological and practical barriers to adoption.

The integrated FRAME, TAM/UTAUT, and AI-TPACK models provide a robust theoretical framework. Concurrently, SEM reveals the intricate pathways through which professional expectations influence readiness via cognitive understanding, practical capabilities, and ethical awareness. Key recommendations from the study include comprehensive professional development aimed at building mobile AI-specific TPACK through experiential learning, institutional investments in mobile connectivity and device access, the establishment of ethical frameworks to address data privacy, algorithmic transparency, and equity, and the formulation of policies governing the use of mobile AI. This study offers empirical evidence on the factors influencing mobile AI adoption and presents actionable recommendations. By addressing these barriers, elementary education can harness the transformative potential of mobile AI to create more personalized, engaging, and effective learning experiences. Future research should employ longitudinal designs, investigate various mobile AI applications, and explore students' outcomes.

7 CONCLUSION

This study highlights a significant disparity between perception and practice concerning mobile AI readiness among elementary school teachers in Indonesia. Although these educators possess a positive outlook towards mobile AI, they lack the necessary practical skills for its effective application in educational settings. Despite recognizing the potential of mobile AI for personalized learning, real-time assessment, and context-aware instruction, there is a notable gap in practical competencies. The study's findings demonstrate that perception accounts for a considerable portion of the variance in readiness ($R^2 = 0.563$), emphasizing the need to address both psychological and practical obstacles to the adoption of artificial intelligence.

This study employed the FRAME, TAM/UTAUT, and AI-TPACK models to establish a comprehensive theoretical framework. Simultaneously, the SEM analysis uncovered the complex pathways through which professional expectations shape readiness through cognitive understanding, practical skills, and ethical considerations. The study recommends comprehensive professional development to enhance mobile AI-specific TPACK through experiential learning, investment in mobile connectivity and device access by institutions, the creation of ethical frameworks to address data privacy, algorithmic transparency, and equity, and the development of policies governing mobile AI usage. This study provides empirical insights into the factors influencing mobile AI adoption and offers actionable recommendations. By overcoming the identified barriers, elementary education can fully exploit the transformative potential of mobile AI to foster more personalized, engaging, and effective learning experiences. Future research should adopt longitudinal designs, explore diverse mobile AI applications, and assess student outcomes.

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