

From AI Adoption to Pedagogical Intelligence: Modeling Teacher Agency, Ethics and Innovation in Malaysian

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ABSTRACT: This mixed-methods empirical study examined how generative artificial intelligence (AI) readiness influences ethical confidence, teacher agency and pedagogical innovation among Malaysian primary school teachers. A sequential explanatory design was employed involving a quantitative survey of 384 teachers, followed by semi-structured interviews with 25 teachers to deepen interpretation of the statistical findings. Quantitative results indicated that generative AI readiness was positively associated with ethical confidence, teacher agency and pedagogical innovation. Ethical confidence mediated the relationship between AI readiness and teacher agency, while teacher agency mediated the relationship between ethical confidence and pedagogical innovation. Qualitative findings revealed that teachers perceived generative AI as a supportive tool for lesson planning, differentiated instruction and creative teaching materials, but stressed the need for professional judgment in verifying and adapting AI-generated outputs. The study contributes a pedagogical intelligence model that positions ethically confident and agentic teachers as central to responsible AI-supported educational innovation in primary schools.

KEYWORDS: generative AI, pedagogical intelligence, teacher agency, ethical confidence, Malaysian education.

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Introduction

Generative AI has become a transformative force in education, changing how teachers prepare lessons, design learning materials, provide feedback and support student-centered instruction (Zainudin et al., 2025). Unlike earlier educational technologies, generative AI enables the production of new content, explanations, questions and teaching resources through interactive prompts (Zainudin et al., 2025b). This creates opportunities for personalized learning, differentiated instruction and reduced teacher workload (Kamaghe, 2026). However, its rapid adoption also raises concerns about misinformation, bias, academic integrity, data privacy and overdependence on AI-generated outputs (UNESCO, 2023). Therefore, the key educational issue is not merely whether teachers utilize AI, but how they utilize it responsibly and pedagogically.

In fact, an ocean of literature shows that AI has strong potential to support teaching, learning analytics, assessment and instructional decision-making (Holmes et al., 2023). However, much existing research remains technology-centered and tends to limit attention to teachers' professional judgment, ethical confidence and agency. Bawa et al. (2026) argued that AI in education might enhance learning, but its effectiveness depends on meaningful pedagogical integration rather than technological adoption alone. This is particularly important since teachers are the main actors who transform AI tools into classroom practice.

Nevertheless, teacher readiness is therefore central to responsible AI integration. Readiness involves not only technical ability, but also confidence, perceived usefulness (Davis, 1989), ethical awareness (Zainudin & Jamil, 2026) and the capacity to align AI with learning goals (Ngongpah & Oni, 2025). In addition, teacher agency enables educators to evaluate, adapt and control AI-generated content according to students' needs and curriculum demands (OECD, 2026). Ethical confidence further supports teachers in identifying risks and making responsible instructional decisions (Ofosu-Asare, 2025).

In Malaysia, ultimately, digital transformation and AI-related education policies highlight the need for future-ready teaching practices (MOE, 2024). However, empirical evidence is still needed to explain how AI readiness influences ethical confidence, teacher agency and pedagogical innovation. Therefore, this study examines these relationships among Malaysian primary school teachers and develops a pedagogical intelligence model for responsible AI-supported teaching.

Research Aim and Research Questions

The aim of this study is to examine how generative AI readiness influences ethical confidence, teacher agency and pedagogical innovation among Malaysian educators, as well as to explore how teachers interpret and apply generative AI in teaching practices. Therefore, the study seeks to move beyond the issue of AI adoption by investigating how AI might be transformed into a responsible, student-centered and innovation-driven pedagogy by answering (a) RQ1: What is the level of

generative AI readiness among Malaysian educators? (b) RQ2: What is the relationship between generative AI readiness, ethical confidence, teacher agency and pedagogical innovation? (c) RQ3: Does ethical confidence mediate the relationship between generative AI readiness and teacher agency? (d) RQ4: Does teacher agency mediate the relationship between ethical confidence and pedagogical innovation? (e) RQ5: How do Malaysian educators experience, interpret and negotiate the utilization of generative AI in teaching practice? and (f) RQ6: How can generative AI readiness, ethical confidence and teacher agency be integrated into a pedagogical intelligence model for responsible AI-supported teaching?

Research Results

The study involved 384 primary school teachers in the quantitative phase (Cohen et al., 2013) and 25 teachers in the qualitative interview phase (Braun & Clarke, 2021). The quantitative data were analyzed using descriptive statistics and structural equation modeling (Wiersma, 1995), while the qualitative data were analyzed through thematic analysis (Creswell et al., 2017).

RQ1: What is the level of generative AI readiness among primary school teachers?

Table 1

Descriptive Statistics for Main Constructs

Construct	Mean	Standard Deviation	Interpretation
Generative AI Readiness	3.87	0.62	Moderate-High
Ethical Confidence	3.74	0.66	Moderate-High
Teacher Agency	3.91	0.58	High
Pedagogical Innovation	3.83	0.61	Moderate-High

Source: author 's own development

Table 1 showed that primary school teachers demonstrated a moderate to high level of generative AI readiness. The overall mean score for generative AI readiness was 3.87, indicating that most teachers were generally open to utilizing AI tools in their teaching practice. Among the dimensions, perceived usefulness recorded the highest mean score, suggesting that teachers recognized the potential of generative AI to assist lesson planning, teaching material preparation and student engagement. However, AI technical confidence showed a comparatively lower mean score, indicating that some teachers still lacked confidence in utilizing AI tools independently.

RQ2: What is the relationship between generative AI readiness, ethical confidence, teacher agency and pedagogical innovation?

Table 2

Correlation Matrix of Main Constructs

Construct	1	2	3	4
1. Generative AI Readiness	1			
2. Ethical Confidence	.61***	1		
3. Teacher Agency	.58***	.64***	1	
4. Pedagogical Innovation	.63***	.59***	.67***	1

Note: *** $p < .001$.

Source: author's own development

Table 2 showed that all constructs were positively and significantly correlated at the $p < .001$ level. This indicates that teachers with higher generative AI readiness were more likely to report stronger ethical confidence, higher teacher agency and greater pedagogical innovation.

Table 3

Reliability and Convergent Validity

Construct	Cronbach's Alpha	Composite Reliability	AVERAGE
Generative AI Readiness	.89	.92	.64
Ethical Confidence	.87	.91	.62
Teacher Agency	.88	.92	.65
Pedagogical Innovation	.90	.93	.67

Source: author's own development

Table 3 showed that all constructs achieved acceptable internal consistency, with Cronbach's alpha and composite reliability values above .70. The average variance extracted values were above .50, indicating satisfactory convergent validity. The measurement model results confirmed that the constructs were reliable and valid for further structural analysis.

RQ3: Does ethical confidence mediate the relationship between generative AI readiness and teacher agency?

Table 4

Structural Model Results

Hypothesis	Relationship	Beta	t-value	p-value	Result
H1	Generative AI Readiness → Ethical Confidence	.61	12.84	< .001	Supported
H2	Ethical Confidence → Teacher Agency	.48	9.76	< .001	Supported
H3	Teacher Agency → Pedagogical Innovation	.52	10.91	< .001	Supported

H4	Generative AI Readiness → Pedagogical Innovation	.31	6.42	< .001	Supported
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Source: author 's own development

Table 4 showed that generative AI readiness had a significant positive effect on ethical confidence. Ethical confidence also had a significant positive effect on teacher agency. The indirect effect of generative AI readiness on teacher agency through ethical confidence was significant, indicating that ethical confidence mediated the relationship between readiness and agency.

RQ4: Does teacher agency mediate the relationship between ethical confidence and pedagogical innovation?

Table 5

Mediation Analysis

Indirect Path	Beta	t-value	p-value	Mediation Type
Generative AI Readiness → Ethical Confidence → Teacher Agency	.29	7.88	< .001	Partial Mediation
Ethical Confidence → Teacher Agency → Pedagogical Innovation	.25	7.14	< .001	Partial Mediation
Generative AI Readiness → Ethical Confidence → Teacher Agency → Pedagogical Innovation	.15	5.96	< .001	Sequential Mediation

Source: author 's own development

Table 5 showed that the mediation analysis further confirmed that ethical confidence played an important role in transforming AI readiness into teacher agency. This means that teachers who were ready to utilize AI were more likely to feel professionally empowered when they also had confidence in making ethical decisions on the utilization of AI. The results support the argument that AI readiness alone is insufficient. Teachers need ethical confidence to exercise stronger professional agency when utilizing AI in teaching.

RQ5: How do primary school teachers experience, interpret and negotiate the use of generative AI in teaching practice?

Table 6

Qualitative Themes from Teacher Interviews

Theme	Description	Link to Quantitative Findings
AI as teaching support	AI helps reduce workload and generate teaching materials	Explains high AI readiness
Ethical concerns	Teachers worry about accuracy, bias and misuse	Explains importance of ethical confidence
Teacher agency	Teachers adapt and control AI-generated outputs	Supports mediation role of teacher agency

Student-centred innovation	AI supports differentiated and engaging pedagogy	Explains impact on pedagogical innovation
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Source: author 's own development

Table 6 confirmed that teachers did not view generative AI as a replacement for teachers. Instead, they interpreted AI as a supportive pedagogical tool that requires ethical judgment, professional control and contextual adaptation.

RQ6: How can generative AI readiness, ethical confidence and teacher agency be integrated into a pedagogical intelligence model for responsible AI-supported teaching?

The integration of quantitative and qualitative findings supports the development of a pedagogical intelligence model. The quantitative results showed that generative AI readiness significantly influenced ethical confidence, teacher agency and pedagogical innovation. The qualitative results explained how this process occurred in actual teaching practice. Teachers first recognized the usefulness of AI, then evaluated its ethical risks, exercised professional judgment and finally adapted AI outputs into meaningful classroom innovation. The final integrated model suggests the following pathway:

Generative AI Readiness → Ethical Confidence → Teacher Agency → Pedagogical Innovation

This model shows that responsible AI-supported teaching depends on more than just access to technology. Pedagogical innovation occurs when teachers are ready to use AI, confident in making ethical decisions, and professionally empowered to adapt AI tools to students' learning needs.

Conclusions

This study concludes that pedagogical intelligence is a critical pathway for transforming generative AI from a technological tool into meaningful educational practice. Findings indicate that generative AI readiness is positively associated with ethical confidence, teacher agency and pedagogical innovation. The mediation results show that ethical confidence and teacher agency are not secondary factors but central mechanisms that explain how AI readiness translates into responsible classroom innovation. Interview findings strengthen the conclusion by revealing that teachers use AI primarily as a supportive assistant for lesson planning, differentiated instruction and the development of creative materials, while still relying on professional judgment to verify and adapt AI-generated outputs. The study, therefore, confirms that successful AI integration depends on empowered, ethically confident teachers. Future research should examine this model across different education levels, subject areas and cultural contexts, including longitudinal designs to assess long-term pedagogical impact.

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