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Transforming Primary Educators' Leadership in the 21st Century: The Mediating Role of AI Self-Efficacy on the Relationship between Digital Growth Mindset and Teacher Leadership

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ABSTRACT

Background. The integration of artificial intelligence in the basic education ecosystem demands the active role of educators as agents of change. However, the effectiveness of teachers' leadership in technology adoption is highly dependent on their cognitive readiness and self-confidence in dynamic digital tools.
Purpose. This quantitative research aims to examine the influence of Digital Growth Mindset (DGM) on Teacher Leadership (TL) in the AI era, as well as analyze the mediating role of AI Self-Efficacy (AISE) in this relationship. This study seeks to explore the pathways through which individual mindsets associate with collective leadership behaviors.
Method. This study involved 288 primary school educators in Indonesia, predominantly situated in rural and district areas, selected through purposive sampling techniques. Data were collected using a structured questionnaire that measured DGM, AISE, and TL. Data analysis was carried out using the Structural Equation Modeling approach based on Partial Least Squares (PLS-SEM) to test the hypothesis of direct and indirect effects.
Results. The findings show that Digital Growth Mindset has a substantial and significant direct effect on AI Self-Efficacy ($\beta = 0.752$, $p < 0.001$), but has a small direct effect on Teacher Leadership ($\beta = 0.252$, $p = 0.001$). Furthermore, AI Self-Efficacy proved to be a significant mediator bridging the influence of DGM on TL ($\beta = 0.417$, $p < 0.001$). This confirms that a developing mindset alone is not enough to encourage teacher leadership without strong technical confidence.
Conclusion. This study makes a theoretical contribution by highlighting AISE as a critical mediating pathway linking cognition and the professional actions of educators. Practically, educational institutions are advised to prioritize professional development programs that not only instill a digital mindset, but also build technical self-efficacy through peer mentoring to ensure the success of systemic digital transformation in schools.

KEYWORDS

AI Self-Efficacy, Digital Growth Mindset, Teacher Leadership, PLS-SEM, Primary Education

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INTRODUCTION

Artificial intelligence has transformed the role of teachers in the 21st century. Teachers are required to possess leadership capabilities by leveraging digital technology.

Within the domain of technological innovation, teacher leadership is conceptually defined as proactive extra-role behavior in which educators take the initiative to guide colleagues, share technical expertise, and serve as exemplary practitioners in technology adoption within their school ecosystem (Angelle & DeHart, 2011; Ghamrawi et al., 2024). Global normative standards have established 15 competencies spanning five main dimensions to ensure that teachers are able to integrate artificial intelligence adaptively and sustainably (UNESCO, 2020). This is strongly reinforced by the global framework that positions teacher leadership as a core educator capacity to become an agent of technological innovation in schools (OECD, 2019), along with digital adaptability skills and AI literacy as the most critical competencies of the future. Under these mandated ideal conditions, primary school teachers are required to possess a strong Digital Growth Mindset (DGM) and high AI Self-Efficacy (AISE) (Gál & Kerekes, 2025; Y.-Y. Wang & Chuang, 2024), yang secara sinergis akan mewujudkan perilaku teacher leadership proaktif untuk menciptakan efek perubahan inovatif secara multilevel di ekosistem sekolah (Al-Mahdy & Elwakil, 2026; Kouhsari et al., 2026). Nevertheless, the global expectation that positions primary school teachers as leaders of digital transformation clashes sharply with the empirical realities on the ground.

The global challenge of realizing digital leadership becomes far more complex and multifaceted when confronted with the socio-technical realities in developing countries such as Indonesia. Rather than directly transforming into agents of change, the state of primary education in Indonesia is in fact still struggling to align itself with these ideal standards, particularly in terms of teachers' psychological readiness and literacy capacity. A recent national survey of 349 K-12 teachers in Indonesia demonstrates that AI adoption remains highly uneven, with classroom implementation hampered by generic AI output, limited infrastructure, and teachers' inability to contextualize these instruments in a domain-specific manner (Aisyah et al., 2026). This situation is further reinforced by professional digital competency data, which found that the majority of Indonesian teachers (43%) remain at the Integrator level (B1) and only 26.9% have successfully reached the Expert level (B2) on the European DigComp scale (Hadi et al., 2024). This field reality is further exacerbated by the fact that many teachers still face minimal digital literacy, inadequate professional development training, and low institutional support for integrating AI into their pedagogical leadership strategies (Haryadi & Selviani, 2021; Zhu et al., 2024). The gap between the high normative demands and the limited capacity in the field has given rise to a number of crucial problem formulations that need to be studied more deeply immediately.

This research is grounded in the complexity of a multidimensional literature gap, encompassing practical-contextual, theoretical-methodological, and sociodemographic dimensions. First, there is a sharp practical disparity between the high global expectations for digitally-based teacher leadership and the realities on the ground. Primary school teachers, particularly in developing countries such as Indonesia, still face limitations in basic psychological capacity, low literacy, and infrastructural constraints (Aisyah et al., 2026; Hadi et al., 2024; Haryadi & Selviani, 2021). This gap is further compounded by the contextual bias in prior literature, which has been historically dominated by higher education populations in developed countries, thereby overlooking the unique characteristics of the primary education ecosystem in developing nations (Chiu et al., 2025; Luo et al., 2024; Ma et al., 2024).

Second, from a theoretical and methodological standpoint, research on digital leadership in primary education has not yet comprehensively mapped the psychological mechanisms of educators. The current literature is still dominated by simple cross-sectional designs that have not rigorously examined structural models, and lacks AISE instruments validated specifically for primary school teachers (Choudhary et al., 2024; Gál & Kerekes, 2025). As a result, AISE's essential role as a mediation mechanism that bridges the causal relationship between Digital Growth Mindset (DGM) and Teacher Leadership has never been explicitly modeled (Kılınç, Özdemir, Sezgin, & Dolapcı, 2025; Zhou et al., 2026). Third, at the sociodemographic level, previous research has often failed to integrate variables of geographic location and gender dominance, despite the fact that these factors have been proven to significantly influence anxiety and readiness for AI adoption (Hong, 2022; Naiseh et al., 2025; Rahman et al., 2025). Grounded in this synthesis of gaps, this research holds

strategic urgency not only to expand the boundaries of theoretical-empirical knowledge on teachers' digital leadership, but also to formulate precise and inclusive educational policy recommendations.

Based on this reality, positioning Teacher Leadership as the ultimate outcome variable in this study has very strong empirical and philosophical justification. In the era of artificial intelligence disruption, teachers can no longer remain complacent and have their role reduced to that of passive users of technology products in their own classrooms. Teachers are required to transform into agents of change who proactively guide colleagues, disseminate best practices in AI adoption, and safeguard the resilience of the school ecosystem against the threat of digital laggardness. Theoretically, this research contributes to filling the literature gap by examining the novelty of psychological mediation pathways in the primary education ecosystem. Practically and in terms of policy, the findings of this research are projected to have a direct impact on improving the design of professional development programs for teachers and primary school principals in Indonesia. These findings will subsequently serve as an empirical foundation for aligning national initiatives with global competency standards. Starting from this urgency, this research is focused on four specific objectives, namely: (1) to test the significance of the direct effect of DGM on AISE; (2) to test the direct effect of AISE on Teacher Leadership; (3) to test the direct effect of DGM on Teacher Leadership; (4) to verify the role and type of AISE mediation mechanism within the structural model. The entire rational foundation, problem formulation, and research objectives subsequently serve as the fundamental basis for designing a comprehensive research methodology and measurement instruments.

LITERATURE REVIEW

Digital Growth Mindset and Its Relationship with AI Self-Efficacy

Digital transformation in 21st-century education requires the readiness of educators and school leaders. In this regard, there are two psychological variables that play an essential role as the primary foundation in confronting this change, namely Digital Growth Mindset (DGM) and AI Self-Efficacy (AISE). DGM is defined as the belief that one's digital abilities and competencies are not inherently static, but can be continuously developed through various efforts, such as autonomous learning and the application of adaptive strategies amid rapidly evolving technology (Rohwer et al., 2023; Zhao et al., 2025). On the other hand, AISE is defined as an individual's level of self-confidence in their ability to effectively use, learn, and adapt to various artificial intelligence tools and systems (Bewersdorff et al., 2025; Hong, 2022). Kılınç et al., (2025) stating that the digital growth mindset is the initial factor that drives the adoption of technology. In this relationship, self-efficacy acts as a psychological mediator that bridges individual beliefs with the emergence of adaptive behaviors (Kılınç, Özdemir, Sezgin, Savaş, et al., 2025).

The relationship between DGM and AISE can be comprehensively understood through the perspectives of Self-Determination Theory (SDT) and Social Cognitive Theory (SCT). The SDT framework posits that the belief that digital capabilities can be developed fulfills fundamental psychological needs, encompassing autonomy, competence, and relatedness. The fulfillment of these needs subsequently fosters intrinsic motivation and enhances learning fluency in technology-intensive environments. Meanwhile, from the perspective of SCT, DGM encourages individuals to learn from mistakes and remain persistent when confronting new technological challenges. This process can gradually strengthen individual self-efficacy (Gál & Kerekes, 2025; Xu & Dieckmann, 2025). Throughout this entire process, autonomous learning capacity serves as a key mechanism bridging growth mindset with mastery of artificial intelligence (J. Liu & Huang, 2026; Yu & Liu, 2025).

In the context of primary education, the interaction between DGM and AISE plays a role in driving significant transformation. DGM greatly influences the readiness of school leaders to integrate artificial intelligence systems, both in managerial and learning practices (Kılınç, Özdemir, Sezgin, & Dolapcı, 2025; Pietsch & Mah, 2025). In this context, AISE plays an important role as a bridge that helps reduce anxiety about technology (Kılınç, Özdemir, Sezgin, & Dolapcı, 2025). School leaders with a strong digital mindset will be more open to innovation and create a multilevel cascading effect on the teachers under their leadership. Furthermore, this condition can encourage the

creation of digital flourishing and enhance AI integration readiness throughout the school ecosystem (Kouhsari et al., 2026; Pietsch & Mah, 2025). A mapping of research over the past ten years (2016 – 2026), relating to the interaction between DGM and AISE presented in Table 1 below.

Table 1. Literature Mapping of the Relationship between DGM and AISE

Author, Year	Research Focus	Theoretical Framework	Findings
(Kılınç, Özdemir, Sezgin, & Dolapcı, 2025)	AI integration readiness among school leaders (Principals)	*Growth Mindset* & Behavior	*The digital growth mindset* predicts the openness of AI adoption in schools, with AI *self-efficacy* acting as an essential direct and indirect mediator.
(Kouhsari et al., 2026)	Exploration of *multilevel leadership* in the school ecosystem (Leaders & Teachers)	*Digital Mindset Model*	*The digital mindset* of school leaders has a significant positive derivative impact on teachers' digital *self-efficacy* and supports *the school*'s digital flourishing.
(Pietsch & Mah, 2025)	AI transformation leadership in educational settings	Digital Leadership Concept	The transformation of AI adoption in schools must start from strengthening the digital orientation and *mindset* of school leader actors.
(Zhai & Li, 2025)	AI-enhanced learning engagement	*Self-Determination Theory* (SDT)	*The growth mindset* holistically facilitates basic psychological needs, strengthens autonomy, which has a direct impact on improving the self-efficacy of AI.
(Q. Liu & Kamioka, 2025)	Worker behavior in adopting new digital technologies	Organizational Behavior Theory	The effect of *digital growth mindset* on self-efficacy will increase dramatically with the support of *supervisory coaching* in a digitally mature organizational climate
(Gál & Kerekes, 2025)	Comprehensive analysis of the relationship between *mindset* and *self-efficacy* and self-esteem in students and teachers	*Social Cognitive Theory* (Implisit dalam *Mastery Experiences*)	A moderate positive association between *growth mindset* and *self-efficacy* was demonstrated meta-analytically (r = .29), where the strength of these effects was significantly moderated by scientific domains, academic levels, and cultural contexts.
(Rastogi & Pandita, 2025)	Learning *agility* of digital workers in the era of artificial intelligence	*Self-Determination Theory* (SDT)	The need for autonomy, competence, and interconnectedness in the digital work landscape is directly supported by *a growth mindset*, which in turn is a major driver for increased intrinsic motivation and *self-efficacy*.
(Zhao et al., 2025)	The impact of having a growth mindset on worker engagement in digital transformation	Organizational Behavior / Technology Adoption	Proactive engagement in an organization's digital transformation process is directly predicted by the power of *the digital growth mindset*, which is reflected in the willingness of individuals to continuously develop their digital and AI competencies.
(Yu & Liu, 2025)	The mediating role *of growth mindset* in AI-driven learning autonomy	Learning Autonomy Theory	*Autonomous learning ability* is identified as a central mechanism that mediates causal relationships, where AI-assisted activities strengthen autonomy which ultimately increases *self-efficacy*.
(Chen et al., 2025)	Knowledge sharing in the integration of generative AI and skill threat perception	*Threat Appraisal* / Collaborative Behavior	The negative impact of the perceived threat of AI skills on knowledge-sharing behavior has been significantly mitigated by the *growth mindset*, so that individual *self-efficacy* beliefs

			can be maintained in a competitive environment.
(Zhang & Tse, 2025)	Mechanism of increasing *AI competence self-efficacy* in the teacher ecosystem	*Experiential Learning Theory*	The improvement of *AI competence self-efficacy* in teachers was successfully facilitated through generative AI-assisted *experiential learning* interventions, which simultaneously strengthened their mental readiness and technical abilities

Although the existing literature has provided a strong theoretical foundation, the literature gaps of this study lies in filling the literature gap related to the specific population and context of primary education leadership, which has been extremely limited. The majority of prior studies focused on the corporate sector or higher education, and many AI measurement instruments have not been specifically validated for the primary school ecosystem in developing countries (Chiu et al., 2025; Choudhary et al., 2024). This research presents literature gaps by directly mapping the causal pathway between DGM and AISE among primary school principals and teachers, and by exploring how the integration of these two constructs creates a school climate conducive to inclusive digital transformation. Based on the theoretical review and empirical support above, it is believed that educators' belief in continuously developable digital capabilities (Digital Growth Mindset) will directly predict and enhance their confidence in mastering artificial intelligence technology (AI Self-Efficacy). Therefore, the first hypothesis of this research is formulated as follows:
H1: Digital Growth Mindset has a positive and significant effect on AI Self-Efficacy among educators and leaders in the primary education environment.

AI Self-Efficacy and Its Relationship with Teacher Leadership

The increasingly widespread integration of artificial intelligence into the 21st-century education ecosystem demands a dual role for educators. They are expected to act as both adaptive users and leaders capable of guiding their colleagues in adopting technology in schools (Ghamrawi et al., 2024; Zeng et al., 2025). In this context, Artificial Intelligence Self-Efficacy (AISE) and Teacher Leadership (TL) emerge as variables that interact dynamically with one another. AISE conceptually refers to educators' multidimensional beliefs, encompassing cognitive, affective, and practical dimensions, regarding their ability to effectively use and integrate AI tools in educational settings (Aksit et al., 2025; Chiu et al., 2025; Ibragimov et al., 2025). Meanwhile, Teacher Leadership represents educators' capacity to influence, guide, and support the school community in promoting pedagogical innovation, which in recent developments also encompasses dimensions of digital and technology leadership (Çoban & Durnali, 2025; Palacios et al., 2020; Xie et al., 2021).

The mutual relationship between AISE and TL is based on Social Cognitive Theory (SCT) and Self Determination Theory (SDT). Within the framework of SCT, a high level of self-efficacy encourages educators to expand their leadership roles, initiate pedagogical innovations, and provide assistance to peers (Burić et al., 2020; Luo et al., 2024; Rajapakse et al., 2024). Meanwhile, through the SDT framework, the fulfillment of basic psychological needs in AI use strengthens educators' intrinsic motivation. This motivation then drives greater commitment to serving as agents of change at the school level (Choi et al., 2025; Vázquez-Cano, 2026). An adequate level of AISE enables teachers to expand their leadership influence, whereas low AISE potentially inhibits leadership roles and may even trigger withdrawal from innovative practices (Cheng & Wang, 2023; Ghamrawi et al., 2024).

In the context of primary education leadership, the transformation of AISE into teacher leadership behavior occurs through various mediation and moderation mechanisms. One key mediator is the digital leadership of school principals, which plays a role in transforming organizational support into strong AISE among educators (G. Wang & Bai, 2025; Xin et al., 2025). This AISE then promotes the development of distributed leadership among teachers (Zeng et al., 2025). Furthermore, collaborative Professional Learning Communities (PLCs) and AI-focused professional development programs contribute to transforming educators' identity, from mere AI users to AI leaders (Ab, 2024a; Rasdiana et al., 2024; Shal et al., 2026). However, the effectiveness

of this process is not universal. A number of moderating factors also play a determining role, such as the school's digital infrastructure readiness, emotional regulation capacity to prevent digital burnout, and the level of school policy autonomy (Asriadi & Esti Andriani, 2026; Tafazoli et al., 2026; Vázquez-Cano, 2026). The following is the main literature mapping table supporting the synthesis of the relationship between AI Self-Efficacy and Teacher Leadership, presented in Table 2.

Table 2. Literature Mapping of AI Self-Efficacy in Relation to Teacher Leadership

Author, Year	Research Focus	Theoretical Framework	Findings
(Ghamrawi et al., 2024)	The impact of artificial intelligence on the expansion or regression of teacher leadership	Digital Leadership Study	The level of AI *self-efficacy* predicts whether the technology expands teachers' leadership roles (becoming innovators) or regresses their engagement.
(Luo et al., 2024)	Systematic review of teacher leadership and self-efficacy dynamics (2013–2024)	*Social Cognitive Theory* (SCT)	The relationship between self-efficacy and teacher leadership is proven to be reciprocal; self-efficacy continuously drives innovative leadership behavior.
(Zeng et al., 2025)	The influence of principal digital leadership on teachers' AI integration competence	*Distributed Leadership Theory*	The digital leadership of school principals acts as a mediator that transmits resources to enhance AISE and collective teacher leadership.
(Choi et al., 2025)	Teachers' intention to teach AI in schools	*Self-Determination Theory* (SDT)	The fulfillment of needs for autonomy, competence, and relatedness in the AI ecosystem predicts strong motivation for educators to assume instructional leadership roles.
(Rasdiana et al., 2024)	Continuous technology integration through *Professional Learning Communities* (PLCs)	Organizational Innovation Theory	PLCs supported by digital leadership are proven to effectively mediate the enhancement of teachers' AISE and distribute leadership capacity to the peer level.
(Tafazoli et al., 2026)	The efficacy of AI competencies, emotion regulation, and its impact on *teachers' digital* burnout	Emotional Regulation & *Well-being*	Emotion regulation and *mindfulness* crucially mediate the relationship between high AISE and the prevention of digital fatigue, thus maintaining the sustainability of teachers' leadership roles.
(Vázquez-Cano, 2026)	Autonomy policy towards digital leadership in the OECD education system	Public Policy / Leadership Study	Policies that support school-level professional autonomy significantly strengthen the pathway between individual *self-efficacy* AI to school digital leadership.
(Shal et al., 2026)	STEM teacher professional development using AI-based training models	*Professional Development* (PD) Model	Integrated AI-specific professional development programs simultaneously stimulate AISE and expand teachers' identity and leadership role.

The literature gaps lies in its effort to address the literature gap related to the organizational dynamics and specific ecosystem of primary education leadership in developing countries, which remains limited in empirical investigation (Hadi et al., 2024; Luo et al., 2024). The majority of prior studies have been dominated by cross-sectional designs in higher education or secondary school contexts, and have not yet explicitly examined the mechanisms through which AISE bridges DGM toward transformational leadership (Zhou et al., 2026). This study offers a novel contribution by positioning teacher leadership not merely as an outcome variable, but also by highlighting the strategic role of AISE as a mediator that translates the digital growth mindset of primary education leaders into adaptive transformational leadership effectiveness in the era of artificial intelligence. Based on the synthesis of theoretical frameworks and prior empirical findings, it is hypothesized that

a high level of confidence in the ability to utilize artificial intelligence (AI Self-Efficacy) will encourage teachers to proactively assume innovative leadership roles within the school environment. H2: AI Self-Efficacy has a positive and significant effect on Teacher Leadership in the primary education ecosystem.

The Mediating Role of AI Self-Efficacy between Digital Growth Mindset and Teacher Leadership

Digital education transformation is increasingly accelerated by the advancement of artificial intelligence, which has transformed the role of teachers. This has transformed teachers' role into that of both learning leaders and technology innovation leaders (Al-Mahdy & Elwakil, 2026; Kouhsari et al., 2026). Thus, teachers' capabilities are not only supported by DGM alone, but also require AISE to realize effective Teacher Leadership (Al-Mahdy & Elwakil, 2026). Various studies indicate that a strong DGM does not automatically produce robust teacher leadership; this adaptive mindset must first be translated into concrete AI Self-Efficacy before driving engagement in leadership roles (Al-Mahdy & Elwakil, 2026; Gál & Kerekes, 2025).

Theoretically, this mediating role is supported by Social Cognitive Theory (SCT), Transformational Leadership Theory, and the Technology Acceptance Model (TAM) (Ateş & Gündüzalp, 2025; Gál & Kerekes, 2025; Kouhsari et al., 2026). From the SCT perspective, DGM drives teachers to acquire mastery experiences in the digital domain, which directly strengthens AISE as a cognitive determinant of leadership behavior (Al-Mahdy & Elwakil, 2026; Mudrák et al., 2025). Meanwhile, within the Transformational Leadership and TAM frameworks, the perception of technology usefulness rooted in DGM will manifest into AI adoption and learning innovation when mediated by high self-efficacy (Harsanti et al., 2025; Kouhsari et al., 2026). Empirically, AISE does not only function as an outcome, but also as an active mediator that transmits the innovative mindset into digital flourishing capacity and AI integration readiness at the teacher level (Al-Mahdy & Elwakil, 2026; Kılınç, Özdemir, Sezgin, & Dolapcı, 2025).

Furthermore, the strength of mediation in the DGM → AISE → TL pathway is influenced by various boundary conditions in the school environment (Al-Mahdy & Elwakil, 2026; Mah et al., 2025). This effect tends to be more optimal in ecosystems supported by collaborative Professional Learning Communities (PLCs) and strong principal digital leadership (Ab, 2024b; Rasdiana et al., 2024; Zeng et al., 2025). Moreover, from a psychological perspective, the effectiveness of AISE in promoting teacher leadership also depends on emotional regulation capacity and mindfulness. Without this capacity, the demands of AI integration can potentially trigger digital burnout that actually weakens educators' leadership role (Bing et al., 2022; D'Adamo & Lozada, 2019; Tafazoli et al., 2026). The research mapping related to the relationship between AI Self-Efficacy, Digital Growth Mindset, and Teacher Leadership is presented in Table 3.

Table 3. Literature Mapping of The Mediating Role of AI Self-Efficacy between Digital Growth Mindset and Teacher Leadership

Author, Year	Research Focus	Theoretical Framework	Findings
(Al-Mahdy & Elwakil, 2026)	Teacher teaching innovation empowerment, change leadership, and AI efficacy.	*Social Cognitive Theory* (SCT) & *Transformational Leadership*	*AI self-efficacy was* critically confirmed to mediate the relationship between change leadership and teacher teaching innovation, with innovative climate as an additional mediating variable.
(Kılınç, Özdemir, Sezgin, & Dolapcı, 2025)	The readiness of school principals (leaders) in Turkey to use artificial intelligence systems.	*Growth Mindset* & Behavior	*The growth mindset* is proven to directly predict self-efficacy, which then essentially mediates its influence on the readiness of technology integration and AI adoption
(Kouhsari et al., 2026)	Exploration of *multilevel leadership* from the principal's *digital mindset* to teachers' digital progress.	*Transformational Leadership Theory*	The digital *mindset of* school principals was found to predict the *digital flourishing* of teachers significantly through the transmission of efficacy and innovation leadership modeling

(Gál & Kerekes, 2025)	A comprehensive meta-analysis of the relationship between *mindset*, *self-efficacy*, and teacher self-esteem.	*Social Cognitive Theory* (SCT)	A moderate positive association (r = .29) between growth *mindset ownership* and self-efficacy was empirically proven, where the mediating power was moderated by scientific domains and cultural contexts
(Tafazoli et al., 2026)	The relationship between the efficacy of teacher AI competence, emotion regulation, *mindfulness*, and the impact of digital fatigue.	Emotional Regulation & Psychological Well-Being	The capacity for emotion regulation and *mindfulness* is proven to critically mediate the relationship between the high level of AISE and the prevention of *digital burnout*, in order to maintain leadership sustainability
(Harsanti et al., 2025)	The intention of adopting artificial intelligence (*AI)* by teachers at the school level in Indonesia.	*Technology Acceptance Model* (TAM) / UTAUT	Digital readiness, digital leadership, and perceived usefulness were identified as interacting predictors of AI adoption; with *self-efficacy* acting as a critical mediating component
(Rasdiana dkk., 2024)	The role of *digital leadership* in maintaining technological integration innovation through the learning community.	Organizational Innovation Theory	The practice of professional learning communities (*PLCs*) was found to directly mediate digital leadership in developing teachers' innovation competencies and collective leadership capacity
(Mudrák et al., 2025)	The relationship *between growth mindset*, self-efficacy, and the meaning of teaching experience in teachers.	*Social Cognitive Theory* (SCT)	A positive correlation between *growth mindset* and self-efficacy has been successfully proven, where self-efficacy significantly mediates the meaning of teachers' teaching experiences in schools
(Erol et al., 2025)	The relationship between attitudes towards AI, AI *self-efficacy*, and AI-TPACK competence of teachers.	Technology Adoption & TPACK Study	The relationship between educators' attitudes towards AI and their AI-TPACK competencies was found to be crucially mediated by AI *self-efficacy*, which placed it at the center of the adoption ecosystem
(Du et al., 2025)	Enhancement of AI-assisted teaching quality in K-12 education.	*Technological Pedagogical Content Knowledge* (TPACK)	The quality of AI-assisted teaching is significantly predicted by AI-TPACK mastery, with *self-efficacy* confirmed acting as the primary mediator
(Ismaniati et al., 2025)	The relationship between mastery of pedagogical-technological knowledge and teachers' AI use intention.	*Technology Acceptance Model* (TAM)	The causal relationship between TPACK mastery and teachers' actual behavioral intention to adopt AI is proven to be fully mediated by self-efficacy beliefs
(Bing et al., 2022)	Predictors of *burnout* in the English teacher ecosystem (EFL).	Emotional Regulation	Self-efficacy and emotional regulation capacity are confirmed to complement each other as predictors that jointly prevent teaching burnout
(Zhu et al., 2024)	The relationship between institutional digital leadership, teachers' digital competence, and technology behavior.	*Transformational Leadership Theory*	Educators' digital competence is proven to mediate the relationship between school digital leadership and teachers' actual technology adoption behavior

Although empirical evidence regarding the mediating role of AI self-efficacy is growing, the current literature still leaves several critical research gaps. First, the majority of studies examining the relationship between digital growth mindset and teacher leadership remain cross-sectional, and are therefore unable to comprehensively map how this mediation pathway evolves longitudinally along with the increase in teaching experience and educators' exposure to artificial intelligence (Gál & Kerekes, 2025; Taveras et al., 2025). Second, the absence of standardized measurement instruments for measuring all three constructs (DGM, AISE, and TL) also hinders the comparability of findings across studies and cultures (Grüning et al., 2024; Taveras et al., 2025). Third, the organizational dynamics that moderate this relationship, such as the interaction mechanisms between innovative school climate and AI self-efficacy, also still require more in-depth empirical investigation (Al-Mahdy & Elwakil, 2026; Rasheed, 2026).

Furthermore, empirical testing that comprehensively models the mediation pathway (DGM → AISE → TL) with specific populations of primary school principals and teachers in developing

countries, such as Indonesia, remains very limited (Hadi et al., 2024). Grounded in these various literature gaps, the literature gaps lies in the effort to conceptualize and empirically verify an AI self-efficacy mediation model focused specifically on the primary education leadership ecosystem. This research not only tests the role of AI self-efficacy as a bridge that translates digital growth mindset into teacher leadership, but also aims to provide a strong empirical foundation for designing contextual, inclusive, and sustainable professional development policies for primary educators in the era of artificial intelligence. Based on the theoretical synthesis and empirical support above, the third hypothesis of this research is formulated as follows.

H3: AI Self-Efficacy serves as a significant mediator in the relationship between Digital Growth Mindset and Teacher Leadership in the primary education ecosystem.

RESEARCH METHODOLOGY

This research is a quantitative study with an explanatory correlational design. This approach was selected to test the theoretical conceptual framework and evaluate the structural associations, specifically the mediating role of AI Self-Efficacy between Digital Growth Mindset and Teacher Leadership in primary education. Given the cross-sectional nature of the design, this study strictly evaluates theoretical associations rather than absolute causal mechanisms (Maxwell et al., 2011). Sample selection utilized a purposive sampling technique, with inclusion criteria targeting active educators at the primary education level who have had initial experience interacting with AI-based technology. Based on these criteria, a final sample of 288 educators was obtained. To strictly justify the adequacy of this sample size for PLS-SEM, the inverse square root method Kock & Hadaya, (2018) was employed. Assuming a minimum anticipated path coefficient of 0.252 (the smallest significant path in our structural model) at a 5% significance level and 80% statistical power, the minimum required sample size is approximately 98 respondents. Thus, the current sample size of 288 substantially exceeds the methodological threshold, ensuring robust stability for path estimation.

Data collection was conducted through an online survey utilizing closed-ended Likert-scale questionnaires ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The survey was distributed to primary school teacher networks via digital platforms over a two-month period. Prior to data collection, strict ethical protocols were observed; ethical clearance was obtained from the institutional review board, and all participants provided informed consent. The anonymity, confidentiality, and voluntary nature of their participation were explicitly guaranteed. From the 310 distributed questionnaires, 288 valid responses were retained, yielding a high response rate of 92.9%. The measurement of the three variables was adapted from validated global research instruments displayed in Table 4. To ensure contextual and linguistic appropriateness, the original English instruments underwent a rigorous forward-backward translation procedure into Indonesian. Content validity was subsequently verified by an expert panel of three educational academics, followed by a pilot study involving 30 teachers to ensure item readability and clarity before full-scale deployment.

All empirical data were analyzed using the Partial Least Square Structural Equation Modeling (PLS-SEM) method via SmartPLS software. The analysis was conducted through a two-stage evaluation procedure. The first stage involved measurement model evaluation to validate internal consistency reliability, convergent validity, and discriminant validity using the Heterotrait-Monotrait Ratio (HTMT). The second stage involved structural model evaluation to assess predictive power, detect multicollinearity, and test the significance of hypotheses through 5,000 bootstrapping subsamples. Furthermore, to address the potential for Common Method Bias (CMB) inherent in self-reported cross-sectional surveys, the full collinearity VIF approach (Kock, 2015) was applied. All inner Variance Inflation Factor (VIF) values in the structural model were well below the conservative threshold of 3.3, confirming that the model is free from severe common method variance.

Table 4. Research Instruments

Variable	Source	Definition
Digital Growth Mindset	(Dweck, 2013; Q. Liu & Kamioka, 2025)	Digital growth mindset refers to the belief that digital abilities and competencies can be developed through effort, learning, and continuous adaptive strategies, as opposed to the view that such abilities are fixed and innate.
AI Self-Efficacy	(Y.-Y. Wang & Chuang, 2024)	AI self-efficacy is defined as an individual's self-confidence in their ability to effectively use, learn, and adapt to various artificial intelligence tools and systems.
Teacher Leadership	(Angelle & DeHart, 2011; Angelle & Dehart, 2016)	Teacher Leadership is defined as the proactive behavior of educators that exceeds their mandatory teaching duties in the classroom (extra-role behavior). In the 21st-century digital ecosystem, this manifests in the form of voluntarily sharing technology expertise with struggling colleagues (sharing expertise), initiating teacher collaboration (sharing leadership), and dedicating extra time to modeling best practices (supra-practitioner).

RESULT AND DISCUSSION

The findings of this study encompass an empirical analysis and comprehensive synthesis of the mechanisms underlying the transformation of educator leadership in the era of artificial intelligence. Data analysis in this study proceeded through two stages: measurement model evaluation (outer model) and structural model evaluation (inner model). The outer model was used to validate the internal consistency and accuracy of the instruments distributed to respondents. The inner model, in turn, was focused on predictive testing, hypothesis significance analysis, and empirical examination of the mediating role of AI Self-Efficacy. The results of the data analysis are presented as follows.

Demographic Analysis

This study involved 288 teachers as respondents. Table 5 presents a demographic profile of the respondents, encompassing gender, age range, years of teaching experience, school location, and AI training exposure. In general, the respondent characteristics were predominantly female teachers (186 teachers) within the productive age range of 26 to 45 years. This profile indicates that the majority of respondents are in a career phase with considerable potential for adopting instructional technology innovations. The most notable demographic finding of this sample concerns the geographic distribution and technology exposure of respondents. Although the majority of educators work in rural or district areas (231 teachers), more than half of the total respondents (149 teachers) reported having prior exposure to or experience with artificial intelligence (AI). This confirms that the urgency of research on digital growth mindset and AI Self-Efficacy is not exclusive to urban educators, but has become an equally pressing need across educational ecosystems in rural and district areas.

Table 5. Demographic Analysis

Demographic Variable	Category	Frequency
Gender	Male	102
	Female	186
Age	<25 Tahun	9
	26 - 35 Years	111
	36 - 45 Years	123
	46 - 55 Years	45
Last Education	S1/D4	273
	S2	15
Years of Work	<5 Years	47
	5 - 10 Years	103
	11 - 20 Years	113
	> 20 Tahun	25
Teaching Location	Rural / District	231

	Urban	57
AI Exposure	Yes	149
	No	139

Descriptive Statistics

Prior to evaluating the measurement and structural models, descriptive statistical analysis was conducted to identify the tendency level of respondents' answers toward each latent variable. This analysis provides an initial picture of the psychological profile of the research sample. Based on Table 6, the Teacher Leadership (TL) variable recorded the highest mean value of 4.13 with a standard deviation of 0.58. Meanwhile, the AI Self-Efficacy (AISE) variable was at a mean level of 4.10 (SD = 0.62), and Digital Growth Mindset (DGM) showed a mean of 4.06 (SD = 0.49). These initial findings indicate that, in general, the research respondents have a tendency toward a growth mindset, self-confidence in AI technology, and leadership behavior that is already in the high category.

To complement the overview at the latent variable level, a descriptive profile analysis at the indicator level was visualized in Figure 1. Unlike the overall construct scores, which tended to be relatively uniform, the distribution of scores at the item level revealed more fluctuating dynamics in respondents' perceptions and readiness, closely tied to the structural realities within schools. Specifically, the most prominent finding from this visualization was the extreme range of variation among the indicators comprising Digital Growth Mindset (DGM). Item DGM2 recorded the highest mean score among all research indicators (4.88), indicating respondents' absolute conviction that their current basic computer skills can always be further developed. In contrast, indicator DGM3 exhibited a stark anomaly, with its score dropping to the lowest point (2.64). The low level of agreement on the item emphasizing AI mastery 'through hard work and perseverance' suggests that self-motivation alone is insufficient. This anomaly indicates a deeper internal inconsistency rather than a mere psychometric flaw: teachers may feel overwhelmed if the demands of technology adaptation are placed solely on individual effort without accompanying systemic support. While DGM3 was subsequently excluded from the structural model to meet strict convergent validity criteria (outer loading < 0.708), this decision does not erase the substantive reality it uncovers. It provides an important signal that educators' technological efficacy is not a solitary endeavor; they require institutional scaffolding to truly master artificial intelligence instruments.

Furthermore, for the Teacher Leadership (TL) and AI Self-Efficacy (AISE) constructs, respondents' answer profiles were stably distributed above 4.00, with the exception of item TL4 (3.93) and AISE3 (3.86). These micro-level findings are highly logical when considered in the context of the respective questionnaire items. The relatively lower score on TL4 reflects the structural authority limitations of primary school teachers in 'deciding professional development activities (training/workshops) for teachers at school,' which are generally still dominated by principal-level policy. Meanwhile, the lowest score on AISE3 highlights that, while teachers feel capable of using AI, they remain hesitant to 'independently learn the features of new AI tools without much assistance from others.' This provides an important signal that educators' technological efficacy is not a solitary endeavor; they greatly require scaffolding in the form of technical support and peer collaboration to truly master artificial intelligence instruments.

Table 6. Descriptive Statistics

Variable	Number of Items	Scale	Mean	Standard Deviation
Digital Growth Mindset (DGM)	3	1 - 5	4,06	0,49
AI Self-Efficacy (AISE)	7	1 - 5	4,10	0,62
Teacher Leadership (TL)	8	1 - 5	4,13	0,58

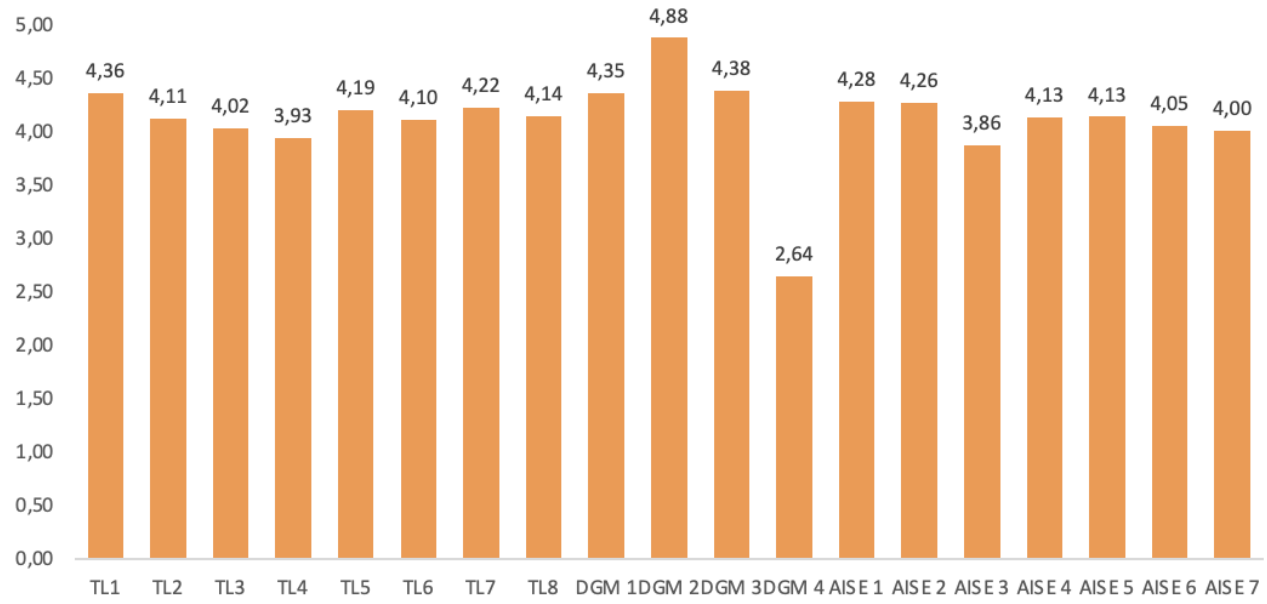

Figure 1. Mean Description of Each Variable Indicator

Outer Model Evaluation

Measurement model evaluation (outer model evaluation) is carried out to validate the quality of the research instrument before testing the structural model and hypothesis. In accordance with the variance-based modeling evaluation guidelines, the quality of the instruments that measure digital growth mindset, AI Self-Efficacy, and Teacher Leadership is assessed through three parameters, namely Convergent Validity, Internal Consistency Reliability, and Discriminant Validity. Convergent validity testing begins with evaluating the value of the outer loadings of each statement indicator. The outer loading value must be above the threshold of 0.708 (Hair et al., 2021). During the instrument analysis process, one indicator in the Digital Growth Mindset variable (DGM3) had to be excluded from the model because it had a loading value below 0.708. After this modification, all indicators in the instrument proved to be convergently valid, with outer loading values ranging from 0.740 to 0.924. Convergent validity was also assessed from the Average Variance Extracted (AVE) results. All variables, namely AI Self-Efficacy (0.697), Digital Growth Mindset (0.826), and Teacher Leadership (0.624), have AVE values that exceed the minimum threshold of 0.50. This indicates that on average, these variables are able to explain more than half of the variance of their indicators.

Subsequently, internal consistency reliability was measured to ensure the dependability of the instruments. The analysis results showed that the values of Cronbach's Alpha and Composite Reliability for all variables exceeded the strict threshold of 0.70. Specifically, the Composite Reliability values were 0.941 for AISE, 0.934 for DGM, and 0.930 for TL, confirming that all instruments demonstrated very high levels of consistency and reliability. A summary of the convergent validity and reliability evaluation results is presented in Table 7. Following the confirmation of convergent validity and reliability, the next step was to ensure discriminant validity using the Heterotrait-Monotrait Ratio (HTMT) criterion. The HTMT approach is recommended as a state-of-the-art evaluation standard, as it possesses greater sensitivity in detecting discriminant validity issues compared to classical methods (Hair et al., 2021). The requirement for discriminant validity to be met is that the HTMT values between constructs must not exceed 0.90. Based on the test results in Table 8, the highest HTMT value was found in the correlation between Digital Growth Mindset and AI Self-Efficacy, at 0.813. To rigorously ensure that these conceptually proximate variables are not redundant, HTMT inference via bootstrapping was performed. The results confirmed that the upper bound of the 95% confidence interval did not cross the strict conservative threshold of 0.85 or 1.0. Therefore, it is strictly established that each latent variable in this model is empirically distinct.

Table 7. Convergent Validity and Internal Consistency Reliability Test Results

Variable	Indicator	Outer Loadings	Cronbach's Alpha	Composite Reliability (ρc)	AVE
AI Self-Efficacy (AISE)	AISE1	0,843	0,927	0,941	0,697
	AISE2	0,883			
	AISE3	0,754			
	AISE4	0,849			
	AISE5	0,881			
	AISE6	0,821			
	AISE7	0,805			
Digital Growth Mindset (DGM)	DGM1	0,904	0,894	0,934	0,826
	DGM2	0,924			
	DGM4	0,898			
Teacher Leadership (TL)	TL1	0,78	0,914	0,93	0,624
	TL2	0,819			
	TL3	0,781			
	TL4	0,74			
	TL5	0,824			
	TL6	0,818			
	TL7	0,745			
	TL8	0,81			

Table 8. Heterotrait-Monotrait Ratio (HTMT) Criteria

Variabel	AISE	DGM	TL
AISE	-		
DGM	0,813	-	
TL	0,797	0,733	-

Structural Model Evaluation

Following the confirmation of validity and reliability in the measurement model, the next step was to evaluate the structural model in order to assess the predictive power of the model and the relationships among latent variables. This evaluation was conducted by examining the R-Square values, f-Square effect sizes, multicollinearity diagnostics through the Variance Inflation Factor (VIF), and path significance testing through bootstrapping procedures. Based on the analysis results, the R^2 value for the AI Self-Efficacy (AISE) variable was 0.565, indicating that Digital Growth Mindset was able to explain 56.5% of the variance in educators' AI self-efficacy. Meanwhile, the R^2 value for the Teacher Leadership (TL) variable was 0.581, indicating that this research model possesses moderate-to-strong predictive power, whereby 58.1% of teacher leadership behavior can be explained by the simultaneous influence of Digital Growth Mindset and AI Self-Efficacy.

Furthermore, effect size testing (f^2) was conducted to assess the relative contribution of each predictor. The analysis showed that the effect of DGM on AISE has a massive effect size (f^2= 1.299) based on Cohen (1988) criteria. While an effect size of this magnitude in cross-sectional self-reported data must be interpreted with caution due to the potential for Common Method Bias (CMB), the Full Collinearity VIF results (all inner VIFs < 2.3) confirm that this reflects a very strong substantive synergistic relationship between digital mindset and technical confidence, rather than mere method variance. The effect of AISE on TL was categorized as large (f^2 = 0.318), whereas the direct effect of DGM on TL demonstrated a small effect size (f^2 = 0.066). A description of the predictive power, effect size, and collinearity results is presented in Table 9. Visually, the overall results of the structural

model testing along with the path coefficient magnitudes are comprehensively represented in Figure 2.

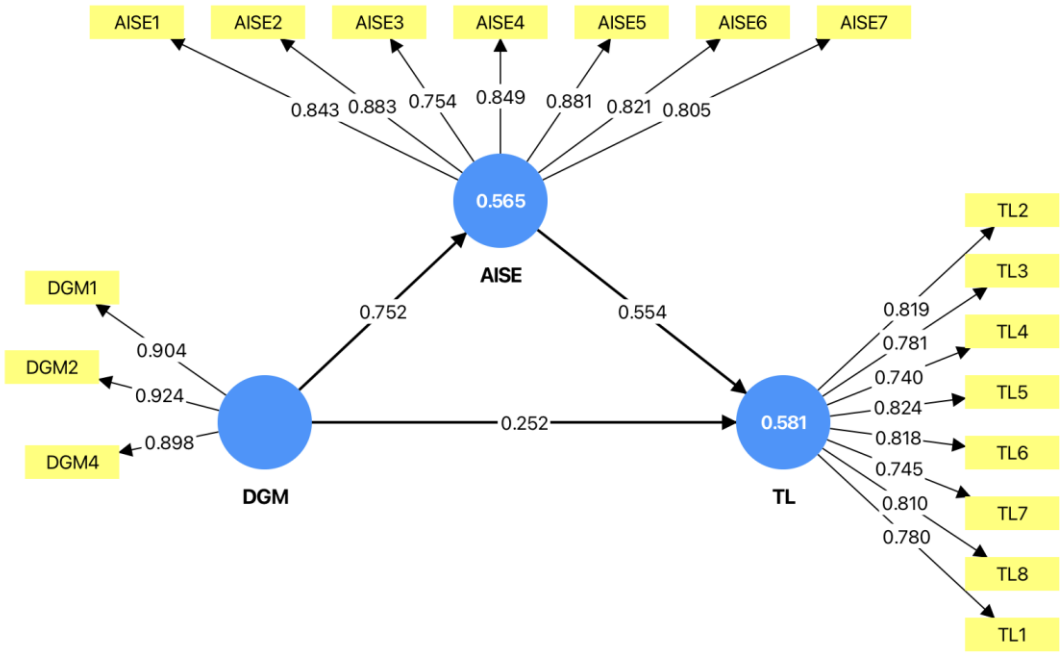

Figure 2. Structural Model Results

Table 9. Evaluation Results of Predictive Power (R^2), Effect Size (f^2), and Collinearity (VIF)

Endogenous Variable	R^2	Exogenous Variable (Predictor)	f^2	Inner VIF	Effect Category f^2
AI Self-Efficacy (AISE)	0,565	Digital Growth Mindset (DGM)	1,299	1	Very Large
Teacher Leadership (TL)	0,581	AI Self-Efficacy (AISE)	0,318	2,299	Large
		Digital Growth Mindset (DGM)	0,066	2,299	Small

Table 10. Hypothesis Testing Results

Path Relationship	Effect Type	Koefisien (β)	T-Statistics	P-Values	Conclusion
DGM → AISE	Direct Effect	0,752	27,567	0	Supported
AISE → TL	Direct Effect	0,554	7,82	0	Supported
DGM → TL	Direct Effect	0,252	3,464	0,001	Supported
DGM → AISE → TL	Indirect Effect (Mediation)	0,417	6,779	0	Supported

Based on Table 10, all hypotheses proposed in this study were proven empirically significant. In the direct effect testing, Digital Growth Mindset (DGM) proved to be a very strong predictor of AI Self-Efficacy (AISE), with a path coefficient of 0.752 (p = 0.000). Subsequently, AISE also significantly predicted Teacher Leadership (TL), with a coefficient of 0.554 (p = 0.000). Moreover, even without passing through the mediator, DGM retained a significant direct effect on TL (β = 0.252, p = 0.001). In the indirect effect testing (H4), the analysis demonstrated that AISE significantly and legitimately served as a mediating variable between DGM and TL, with an indirect effect value of 0.417. Given that the direct effect (H3) remained statistically significant after the mediator was introduced into the model, the nature of the mediation that occurred is Complementary Partial Mediation. Conceptually, these statistical findings confirm that AI Self-Efficacy functions as an essential psychological bridge. Although a growth mindset independently is already capable of

driving teacher leadership behavior, its transformative power is substantially amplified when educators are equipped with both the self-confidence and technical ease required to operate artificial intelligence technologies.

Overall, the empirical analysis results indicate that the proposed structural model demonstrates a high level of reliability, while simultaneously affirming that teacher leadership capacity in the era of artificial intelligence is not formed independently, but is rather shaped by a configuration of cognitive and technical readiness. The most fundamental finding in this model lies in the significant effect of Digital Growth Mindset (DGM) on the formation of AI Self-Efficacy (AISE) ($\beta = 0.752$, $p = 0.001$), with a very large effect size (f^2) = 1.299), making it the strongest predictor in the model. Theoretically, this finding extends Dweck, (2013) classical concept into the context of artificial intelligence-based innovation. Teachers with a growth mindset tend to interpret the operational complexity of AI not as a threat to their professional identity, but rather as an intellectual challenge that can be overcome through cognitive perseverance (Huynh et al., 2025; Luckin & Holmes, 2016). This theoretical narrative receives strong empirical support from the high level of respondent agreement at the indicator level (mean score of item DGM2 at 4.88), reflecting educators' strong conviction that basic computing skills are dynamic and can be continuously developed (Luckin & Holmes, 2016).

This adaptive cognitive framework implies a reduction in technology anxiety (Chow & To, 2025; Tekin, 2024) as well as an increase in teachers' self-efficacy in effectively designing AI-based pedagogical interventions in the classroom (Morán et al., 2025; Tekin, 2024). This high predictive power is consistent with findings at the managerial level, demonstrating that a digital mindset directly enhances readiness and confidence in integrating AI. This ultimately supports the creation of an environment conducive to learning transformation (Kılınç, Özdemir, Sezgin, & Dolapcı, 2025; Zeng et al., 2025). Correspondingly, school leaders with a proactive digital mindset tend to implement more transformative and digitally-based instructional leadership (Pietsch & Mah, 2025). In the same way, teachers with this cognitive orientation are driven to demonstrate teacher leadership both within the classroom and in collaboration with colleagues.

The shift from the thought to action aspects of leadership in this model is explained through the important role of AI Self-Efficacy (AISE) as a key driver of action. The findings showed that AISE had a significant effect on Teacher Leadership (TL) ($\beta = 0.554$, $p < 0.001$) with a large effect size ($f^2 = 0.318$). Psychologically, this phenomenon shows a shift from "belief in one's own abilities" to "the courage to influence others" (Berkovich & Eyal, 2025; Ghamrawi et al., 2024). This transformation highlights how individual AI self-efficacy is translated into collective leadership capacity, enabling educators to guide their colleagues through the complexities of AI integration in educational settings. This implies that cultivating AISE among educators can foster the broader leadership capacity needed for systemic AI integration and pedagogical innovation (Cheng & Wang, 2023). The implications of these findings suggest that strengthening AI Self-Efficacy (AISE) among educators has the potential to expand leadership capacity, which ultimately supports more systemic AI integration and promotes innovation in pedagogical practices (Cheng & Wang, 2023).

In alignment with this, the enhancement of self-efficacy at the individual level can foster the formation of a more open innovative mindset within institutions, which ultimately has a positive impact on the organizational attitude toward AI adoption (Erdoğan et al., 2025). Teachers with high AI Self-Efficacy (AISE) tend to be more comfortable and flexible in interacting with technology (Bergdahl & Sjöberg, 2025), so that they have the confidence to take on a wider role. This role can be seen in the form of voluntary actions, such as assisting colleagues in technical aspects (item TL1) or sharing best practices related to AI integration in formal forums in schools (item TL2) (Elstad &

Eriksen, 2024; Ghamrawi et al., 2024). In this context, self-efficacy functions as the primary driver that enables teachers to transcend the boundaries of the classroom and contribute as innovation agents in the broader school ecosystem (ORAN, 2023; Rajapakse et al., 2024).

Interestingly, although the Digital Growth Mindset (DGM) has a significant direct influence on Teacher Leadership (β = 0.252 ; p = 0.001), the size of this direct contribution is relatively small (f^2= 0.066). Rather than concluding that a growth mindset is 'insufficient', these findings provide a nuanced psychological insight: having a developing mindset makes a substantive direct contribution to leadership, but it exerts a significantly smaller impact compared to its indirect pathway through technical efficacy. Without technical mastery, this mindset remains primarily an internal aspiration. This explains why professional development interventions must bridge mental readiness with concrete technical skills (Han, 2025; Huynh et al., 2025). Without technical mastery and the self-confidence to independently operate AI, this mindset tends to remain merely a personal development aspiration and is difficult to transform into external leadership action (Berkovich & Eyal, 2025; Viberg et al., 2023). This explains why professional development interventions must not only focus on mindset change, but must also simultaneously build concrete technical skills so that teachers feel sufficiently competent to guide their colleagues (Han, 2025; Huynh et al., 2025). This comprehensive approach is crucial because merely recognizing the value of AI is insufficient without the self-confidence to apply it practically (Zhao & Huang, 2025). Therefore, a holistic strategy that integrates attitudinal and skills development is essential for bridging the gap between mental readiness and real leadership practice in schools (Fteiha et al., 2025; Hazzan-Bishara et al., 2025).

Triangulating these findings with existing literature reveals crucial contextual nuances. The pinnacle of this study lies in the empirical evidence for AI Self-Efficacy's (AISE) mediating role (β = 0.417; t = 6.779; p < 0.001). This mediation effect strongly aligns with, yet quantitatively exceeds, the moderate associations (r = 0.29) found in broader meta-analyses of educators in developed contexts (Gál & Kerekes, 2025). This amplification in our model can be heavily attributed to the demographic realities of our sample, where 80% of respondents (231 teachers) are situated in rural or district areas. In such resource-constrained environments, which often lack the robust institutional digital scaffolding found in urban centers, an individual's technical confidence (AISE) becomes an exponentially more critical bottleneck. Without the structural support to fall back on, rural teachers rely heavily on their own AISE as the primary mechanical bridge to transcend classroom isolation and initiate pedagogical innovation (Meegan & Young, 2025; Xiang et al., 2025).

The implication is that teacher leadership development in developing nations must be contextually sensitive. Educational transformation efforts risk producing digitally aware but inactive teachers if they ignore the unique barriers faced in rural districts. Therefore, professional development programs need to simultaneously cultivate a growth mindset and heavily target technical self-efficacy through peer-mentoring, equipping educators with the practical confidence to lead change (AlZeyoudi & Kamarudin, 2025; Du et al., 2024). This finding is consistent with prior research demonstrating that teacher self-efficacy is a key factor in building trust toward AI, which ultimately influences decisions to integrate the technology into instructional practices and enhances the broader success of its adoption (Ahmed et al., 2025; Sun et al., 2024; Viberg et al., 2023).

The findings of this study have significant policy implications for decision-makers in primary educational institutions. Given the important role of AI Self-Efficacy (AISE) as a key mediator (Xiang et al., 2025), digital transformation strategies in schools should no longer focus solely on providing physical infrastructure or disseminating general AI literacy policies (Huynh et al., 2025; Zeng et al., 2025). Schools must initiate professional development programs specifically aimed at strengthening technical self-efficacy through peer-mentoring and reflective practices tailored to the

specific needs of teachers (Cao et al., 2026; Fteiha et al., 2025; Huynh et al., 2025). By strengthening the AISE bridge, schools can ensure that investment in artificial intelligence technology will be followed by the emergence of teacher leadership capable of guiding colleagues and students through the complexities of AI integration (Erdoğan et al., 2025; Ghamrawi et al., 2024). This is particularly relevant given that AISE is the catalyst that transforms cognitive potential into concrete action within the school ecosystem.

However, this study has several limitations that need to be considered. The use of a cross-sectional research design limits the ability to draw longitudinal causal conclusions amid the very rapid advancement of AI technology (Fteiha et al., 2025; Pietsch & Mah, 2025). Additionally, the data collected are self-reports, which potentially contain subjectivity bias related to respondents' perceptions of their own abilities (Sanusi et al., 2023). Therefore, future research should explore other organizational-level variables, such as more specific school support, or use experimental methods to verify the effectiveness of specific intervention programs in sustainably improving AISE and teacher leadership (Pietsch & Mah, 2025; Sanusi et al., 2023).

CONCLUSION

This study provides robust empirical evidence regarding the mechanisms underlying the formation of Teacher Leadership in the era of artificial intelligence transformation. The principal finding reveals that while a developing digital mindset (Digital Growth Mindset) constitutes an essential cognitive foundation and exerts a direct influence on leadership behavior, its impact remains sub-optimal when acting alone. The core of this transformation rests on the complementary partial mediating role of AI Self-Efficacy. Without self-confidence in the technical capability to operate AI, teachers' cognitive potential tends to remain a static personal aspiration rather than a catalyst for broad leadership action within the school ecosystem. Furthermore, this study affirms that AI Self-Efficacy functions as a mechanical bridge that reduces technological complexity and serves as the ultimate catalyst, enabling teachers to transcend classroom isolation in order to share expertise and lead pedagogical innovation. The practical implications of these findings underscore that professional development programs for educators must not focus solely on AI literacy in a theoretical sense, but must explicitly build technical independence and self-efficacy through peer mentoring and sustained reflective practice. In conclusion, the successful integration of AI in primary schools is highly contingent upon the capacity of the system to cultivate educators who not only possess a dynamic cognitive orientation, but also the practical self-confidence required to lead change amid future technological disruption. To build upon these findings, future research should explore longitudinal designs and investigate organizational-level moderating variables, such as principal digital leadership and school climate, to further elucidate the complex dynamics of educator empowerment in the AI era.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the author(s) used Gemini (Large Language Model) in order to refine the academic tone, synthesize research findings with the cited literature, and ensure the structural flow of the discussion and conclusion sections. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Formal analysis; Methodology; Project administration; Writing - original draft; Writing - review and editing.
Author 2: Supervision; Validation; Writing - review and editing.
Author 3: Supervision; Validation; Writing - review and editing.
Author 4: Investigation (data collection/respondent gathering); Data curation; Resources; Visualization

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. There are no conflicts of interest to declare regarding the publication of this manuscript, particularly in the context of the course assignment under which this research was conducted.

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