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Pre-service School Leaders' Perceptions about AI and Student Learning

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Abstract:
This study explored how pre-service school leaders in Lebanon conceptualize artificial intelligence (AI) in education, its impact on student learning, and their readiness to lead AI integration in schools. Drawing on semi-structured interviews with twenty Master's students enrolled in an Educational Leadership program, the study identified three major themes: conceptualizations of AI, perceived impact on student learning, and leadership readiness. Findings revealed a wide range of understandings—from vague or administrative interpretations to more pedagogically grounded views of AI as an instructional partner. While participants acknowledged AI's potential to personalize and engage learners, they also expressed concerns about student dependency, inequitable access, and the digital divide. Leadership preparation was perceived as insufficient, with participants reporting a lack of formal training and describing a school culture marked by resistance to digital innovation. These findings underscore a significant disconnect between global AI discourse and local leadership training, calling for more transformative and digitally fluent leadership preparation in fragile education systems.

Keywords: *artificial intelligence, educational leadership, student learning, digital readiness, Lebanon*

1. Introduction

The global proliferation of artificial intelligence (AI) is reshaping the landscape of education, influencing not only how students learn but also how schools are led and managed. From adaptive learning platforms to AI-powered data dashboards, the technology holds significant promise for transforming teaching and learning processes (UNESCO, 2021). However, the degree to which education systems are prepared to harness AI varies significantly, particularly in contexts marked by infrastructural and policy limitations (Yu & Guo, 2023).

In Lebanon, the educational system has been severely strained by compounded crises, including political instability, economic collapse, and deteriorating public infrastructure (Ghamrawi et al., 2020; Al Maalouf & Al Baradhi, 2024). These systemic challenges have curtailed the digital transformation of schools, and in many cases, deprived school leaders and teachers of even basic technological tools (Al Baradhi et al., 2025). While global discourse increasingly frames AI as a present and pressing concern for schools, in Lebanon it is often still perceived as aspirational or disconnected from the daily realities of public education (Kharroubi et al., 2024).

Within this fragile context, the role of school leaders becomes pivotal. Leadership is widely recognized as a catalyst for educational change, particularly in guiding schools through innovation and reform (Ghamrawi, 2010a, 2010b; 2011). Importantly, research has shown that the foundational beliefs, mindsets, and professional identities of school leaders are shaped during their pre-service preparation, which serves as a critical period for cognitive and ideological formation (Shal et al., 2018a, 2018b). Yet in Lebanon, school leadership training remains largely conventional (Ghamrawi & Al-Jammal, 2013a, 2013b, 2013c, 2013d), with limited emphasis on equipping future leaders to respond to the demands of AI-enhanced learning environments (Doumat et al. 2022).

Existing scholarship in the Lebanese context has mostly focused on the perceptions of in-service principals or teachers regarding ICT use and digital learning (Ghamrawi, 2013a, 2013b, 2013c, 2013d; 2013d; Ghamrawi et al., 2013, 2015, 2016, 2018). However, little is known about how pre-service school leaders—those currently enrolled in leadership preparation programs—understand the role of AI in student learning, or whether they perceive it as a near-term priority within their local educational landscape.

This study addresses this gap by exploring how pre-service school leaders in Lebanon conceptualize artificial intelligence in education, particularly its implications for pedagogy, equity, and leadership practice. Understanding their perceptions offers insight into the readiness of the next generation of school leaders to navigate the complexities of AI integration and lead future-oriented schools in a digitally unequal context. It was guided by the following research question: How do pre-service school leaders in Lebanon perceive the role of artificial intelligence in shaping student learning?

2. Literature Review

2.1 AI and Education

Artificial intelligence (AI) has evolved from a theoretical innovation to a practical force reshaping educational systems worldwide. Its applications in education—such as intelligent tutoring systems, adaptive learning platforms, automated assessment tools, and learning analytics—have enabled more personalized, responsive, and scalable forms of instruction (Zawacki-Richter et al., 2019; VanLehn, 2011). These AI-driven systems provide real-time feedback, identify learning gaps, and support differentiated instruction, particularly in resource-constrained contexts where personalized support may otherwise be unavailable (UNESCO, 2021).

The promise of AI lies not only in improving instructional delivery but also in advancing equity and inclusion. Adaptive technologies can support learners with diverse needs, bridge gaps in access, and foster individualized learning trajectories. UNESCO's guidance on AI in education emphasizes the importance of ethical implementation, focusing on transparency, equity, and the central role of teachers in maintaining pedagogical integrity (UNESCO, 2021). Meanwhile, evidence from global initiatives demonstrates that AI-powered platforms, including AI tutors and chatbots, have shown measurable gains in student outcomes, even among underserved populations (Financial Times, 2024).

Despite these advancements, the integration of AI in education remains uneven. Zawacki-Richter et al. (2019) note that while high-income countries are pioneering AI-driven learning ecosystems, many low- and middle-income countries face infrastructural, policy, and pedagogical barriers that limit AI deployment. A key constraint is the lack of institutional readiness and digital literacy among educators and administrators. Research also shows that educators' perceptions significantly influence the success of AI integration. Studies indicate that perceived usefulness, ease of use, and institutional support are key predictors of AI adoption in educational settings (Zhang et al., 2023; Runge, 2025).

However, most of the existing literature has concentrated on teachers' readiness and perspectives, with limited empirical attention to school leaders. This is a critical gap, as school leaders are pivotal in setting the vision for innovation, shaping the school climate, and facilitating the conditions necessary for meaningful technology adoption (Bai et al., 2021). Moreover, school leaders' mindsets toward AI—whether as enablers or skeptics—significantly impact how such technologies are received and embedded within institutional practices (Zhao, 2021).

In particular, there is a striking absence of research on how pre-service school leaders conceptualize AI and its role in student learning. These individuals, often enrolled in formal leadership preparation programs, are in a formative stage of developing beliefs and dispositions that will shape their future leadership practice. Whether they perceive AI as a current reality, a future possibility, or an irrelevant trend has implications for how educational institutions will be led into the digital age. This study seeks

to address this gap by exploring how pre-service school leaders in Lebanon understand and engage with AI in the context of student learning.

2.2 School Leadership and Digital Reform

As education systems navigate the rapid pace of technological change, school leaders are increasingly positioned as key agents in driving digital reform. Effective leadership is no longer confined to traditional instructional domains but is being redefined by a capacity to lead innovation, navigate digital transitions, and promote technologically enhanced learning environments (Zhao, 2021). Central to this shift is the recognition that digital transformation in education is not a mere technical adjustment but a profound cultural and pedagogical reorientation that demands visionary leadership (Bai et al., 2021).

Research indicates that leadership mindsets—especially openness to change, risk tolerance, and strategic thinking—significantly shape how digital reforms are interpreted and implemented at the school level (Zawacki-Richter et al., 2019). Leaders who frame digital tools as catalysts for equity, personalization, and innovation are more likely to foster inclusive learning environments that leverage AI and other technologies effectively (UNESCO, 2021). In contrast, those who view digital reform through a managerial or compliance-oriented lens often adopt superficial, tool-based solutions that fail to disrupt outdated pedagogies or enhance teaching and learning (Zhao, 2021).

A growing body of international research also underscores the importance of distributed leadership models in advancing digital transformation. School principals who cultivate professional agency among teachers and promote collaborative inquiry tend to generate stronger institutional buy-in for technology integration (Zhang et al., 2023). However, in many under-resourced or highly centralized systems, including Lebanon, school leadership tends to be top-down, focused on administrative control rather than visionary change (Runge, 2025). This results in a narrow adoption of technology and missed opportunities for deeper pedagogical shifts.

Furthermore, Bai et al. (2021) argue that digital reform efforts frequently fail not because of technical limitations but due to leadership inertia and a lack of strategic vision. The success of AI integration, for example, depends largely on whether school leaders are able to reimagine traditional educational structures and promote cultures of experimentation and innovation. Without this mindset shift, AI risks being framed as a threat rather than an opportunity, thereby limiting its transformative potential in schools.

In the context of the Global South, the literature points to a concerning gap between global discourse on AI-enabled education and the readiness of national leadership structures to engage with such paradigms. Studies of Arab education systems have shown that many school leaders remain hesitant or skeptical about the pedagogical value of AI, often due to limited exposure, insufficient training, and deeply entrenched bureaucratic norms (Zawacki-Richter et al., 2019). This hesitancy is compounded by infrastructural limitations, policy uncertainty, and a prevailing focus on crisis management rather than long-term innovation (UNESCO, 2021).

2.3 Pre-service Leadership Preparation

In this study, pre-service leadership preparation refers to the formal academic and professional preparation of individuals enrolled in a Master's in Educational Leadership program, prior to their appointment as full-time school leaders. These pre-service leaders are expected to acquire the knowledge, skills, and dispositions necessary to guide schools through evolving educational demands. However, literature suggests that such preparation programs often fall short of equipping future leaders with the competencies required to navigate contemporary digital and pedagogical shifts (Darling-Hammond et al., 2017; OECD, 2019).

Traditional leadership preparation programs, especially in developing and crisis-affected contexts like Lebanon, tend to emphasize bureaucratic management, instructional supervision, and policy compliance, with minimal integration of content related to digital innovation, AI technologies, or 21st-century skills (Boujaoude & Baddour, 2022; Boujaoude & Faour, 2024). As Kennedy (2014) notes, the effectiveness of any professional development—pre-service or in-service—is contingent on its ability to align with real-world practice and anticipate future challenges. Yet many programs continue to rely on legacy models that overlook the rapid digital transformation of schooling environments.

Moreover, Ghamrawi (2016) argue that educational leadership programs in Lebanon remain misaligned with global standards, lacking structured pathways to develop adaptive leadership, technology integration, or system thinking. This is especially concerning given the increasing complexity of school leadership roles, which now demand data-informed decision-making, digitally literate leadership, and the capacity to lead professional learning communities in virtual and hybrid settings (Timperley et al., 2007; Leu & Ginsburg, 2011).

Despite mounting international evidence that leadership development should foreground digital fluency, systems change, and innovation (Darling-Hammond et al., 2017), there is a persistent lag in local program curricula. This misalignment results in a gap between policy rhetoric on educational transformation and the actual capabilities of those preparing to lead such transformation. The findings of this study thus aim to investigate how enrollees in Lebanon's MA programs perceive artificial intelligence in education, and whether their preparation fosters the cognitive and professional readiness to lead schools into a digital era.

2.4 Theoretical Framework

This study is anchored in two intersecting theoretical traditions—Transformative Learning Theory (Mezirow, 1991) and the Distributed Leadership Paradigm (Spillane, 2006)—which together offer a robust conceptual foundation for interrogating how pre-service school leaders in Lebanon make sense of artificial intelligence (AI) and its pedagogical implications. These frameworks serve not merely as interpretive tools but as critical prisms through which to examine the epistemological and institutional conditions under which leadership mindsets toward AI are cultivated or constrained during formal preparation.

Transformative Learning Theory, rooted in adult learning scholarship, posits that deep learning occurs when individuals critically examine their assumptions and undergo perspective transformation through disorienting dilemmas, dialogic reflection, and experiential engagement (Mezirow, 1991). In the context of AI integration in education, this theoretical stance compels us to interrogate whether leadership preparation programs in Lebanon provide the cognitive dissonance, dialogic spaces, and future-facing curricular content necessary to provoke such epistemic shifts. Rather than framing knowledge about AI as a technical add-on, transformative learning suggests that belief change and pedagogical reorientation are central to preparing leaders who can reimagine their roles within digitally mediated educational landscapes.

However, transformative learning is not enacted in isolation but is embedded in social and institutional contexts—thus necessitating a complementary leadership lens. Distributed Leadership Theory challenges traditional, hierarchical models by conceptualizing leadership as a distributed practice enacted through interaction among actors, tools, and organizational routines (Spillane, 2006). It emphasizes collective agency, the situational emergence of leadership tasks, and the interdependence between individual cognition and systemic structures. Applied to digital reform and AI implementation, this framework underscores that effective integration is not the result of individual charisma or positional authority, but rather of leaders' ability to build collaborative capacity, foster shared responsibility, and lead adaptive change within complex systems.

The convergence of these two frameworks allows for a multi-dimensional understanding of pre-service leaders' meaning-making around AI. On one hand, it foregrounds the need for critical self-reflection, identity transformation, and dispositional readiness. On the other, it situates these internal processes within broader organizational and policy environments that either enable or inhibit distributed leadership for digital innovation. Particularly in the Lebanese context—where leadership is often top-down, programmatic content is legacy-driven, and exposure to AI remains peripheral—this dual-theoretical anchoring is essential for capturing the dialectic between mindset formation and institutional reproduction.

This study, therefore, conceptualizes pre-service school leaders' perceptions of AI not as isolated beliefs, but as emergent constructions shaped by their preparation experiences, socio-political imaginaries, and the epistemological framing of technology within leadership education. The transformative and distributed frameworks jointly guide the analytical inquiry into how these perceptions are formed, the extent to which they are grounded in critical digital fluency, and whether they reflect the capacity to envision and lead AI-integrated school systems.

3. Method

3.1 Research Design

This study employed a qualitative interpretive research design to explore how pre-service school leaders conceptualize artificial intelligence (AI) in relation to student learning. The interpretive paradigm is particularly suited to inquiries that seek to understand individuals' subjective meanings, situated experiences, and evolving cognitive frames within complex social settings (Creswell & Poth, 2018; Tisdell et al., 2025). Given the emergent and highly contextual nature of AI integration in education—especially in under-researched contexts such as Lebanon—this design enabled a nuanced examination of how future leaders perceive technological change and its implications for schooling.

3.2 Participants and Data Collection & Analysis

Twenty pre-service school leaders participated in this study, all of whom were enrolled in a Master's program in Educational Leadership at a public university in Lebanon. To minimize potential bias and power dynamics, participants were purposefully selected from course sections not taught or directly supervised by the researcher. This ensured that none of the participants were subject to the researcher's academic evaluation. All participants met the criteria of being pre-service school leaders—individuals engaged in formal preparation for leadership roles but not yet serving in official school leadership capacities. Their selection provided an opportunity to examine emerging leadership mindsets during a formative stage of professional development.

Data were collected through semi-structured interviews, which provided a flexible yet focused means of eliciting participants' evolving beliefs about AI and its relevance to educational practice. Interviews centered around key prompts such as: What do you understand by artificial intelligence in education?; How do you see AI impacting student learning?; and To what extent do you feel prepared to lead AI integration in schools? Probing questions followed participants' responses to uncover deeper assumptions, experiences, and influences shaping their views. All interviews were audio-recorded with participants' consent, transcribed verbatim, and anonymized to ensure confidentiality.

Data analysis followed Braun and Clarke's (2006) thematic analysis framework, involving a recursive process of coding, categorizing, and synthesizing emergent themes. NVivo 12 software was used to manage and organize the data, allowing for systematic tracking of patterns and interpretive memos. The coding process was both inductive and theory-informed, guided by literature on AI in education, leadership development, and technology adoption. Credibility was ensured through peer debriefing with two academic colleagues and member checking with five participants to verify thematic interpretations.

This methodological approach provided a robust lens through which to examine how pre-service leaders in Lebanon interpret AI's educational implications and assess their own readiness to engage with digital transformation in schools.

3.3 Findings

The thematic analysis generated three overarching themes, each composed of three sub-themes. These themes represent the pre-service school leaders' perceptions regarding the integration of Artificial Intelligence (AI) in student learning and leadership readiness. Frequencies reflect the number of participants whose responses aligned with each sub-theme. Table 1 below presents a summary of these themes, sub-themes, and sample code words.

Table 1. Thematic Analysis of Data

Theme	Sub-Themes	Frequency	Illustrative Code Words
1.Conceptualizations of AI in Education	1.1 Limited or Vague Understanding 1.2 AI as Administrative Aid 1.3 AI as Instructional Partner	17 12 9	"robots and automation," "something technical," "not clear yet" "organizing data," "automated reports," "time-saving tool" "personalized learning," "student support," "interactive tools"
2. Perceived Impact on Student Learning	2.1 Potential to Personalize and Engage 2.2 Concerns about Student Dependency and Disengagement 2.3 Equity and Access Challenges	14 11 13	"tailored learning," "engaging tools," "motivating" "lazy students," "too dependent," "less thinking" "not all schools can," "internet is weak," "only private schools"
3. Leadership Readiness and Confidence	3.1 Lack of Formal Preparation in AI Integration 3.2 Self-Initiated Learning and Curiosity 3.3 Perceived Leadership Hesitance or Resistance	20 10 16	"we never studied this," "not in our courses," "unfamiliar" "I searched online," "follow AI blogs," "interested to learn" "principals are scared," "they don't trust AI," "too traditional"

Theme 1: Conceptualizations of AI in Education

The participants in this study revealed varied and evolving understandings of artificial intelligence (AI) in the context of education. Their responses clustered into three sub-themes: limited or vague understanding, AI as an administrative aid, and AI as an instructional partner.

1.1 Limited or Vague Understanding

A majority of pre-service school leaders exhibited an uncertain or superficial grasp of AI's meaning and applications in education. For many, AI remained an abstract concept, often associated with futuristic or generalized technological advancements. P3 stated, "I think AI means robots helping in classrooms, but I don't know exactly how it works." Similarly, P11 noted, "AI is something advanced—I guess it automates things—but it's not something I fully understand yet." Several participants relied on non-

educational associations, drawing from media portrayals rather than professional training. P6 remarked, "To be honest, when I hear AI, I think of sci-fi movies, not schools." This vagueness highlights a critical gap in the leadership preparation curriculum and suggests that AI has not yet been positioned as a core element of educational discourse among future school leaders.

1.2 AI as Administrative Aid

A second group of participants viewed AI primarily through the lens of school administration and organizational efficiency. They associated AI with data management, reporting, and workflow optimization. P5 explained, "AI can help in managing attendance, grading, and generating student progress reports faster." Likewise, P14 shared, "It seems useful in reducing paperwork and organizing student files." These participants emphasized AI's potential to support decision-making and reduce administrative burden, though they generally stopped short of engaging with AI's instructional or pedagogical capacities. As P1 put it, "AI is more like a smart assistant for school operations, not really for teaching itself." This view underscores a narrow interpretation that positions AI as a tool for institutional convenience rather than a transformative force in student learning.

1.3 AI as Instructional Partner

A smaller yet noteworthy segment of participants demonstrated a more pedagogically informed view of AI. These pre-service leaders identified AI as an instructional partner capable of supporting personalized learning, student engagement, and differentiated instruction. P8 expressed, "AI can be used to give each student exercises based on their level and track their improvement." Echoing this, P17 noted, "There are apps and platforms that use AI to respond to students instantly, which helps them feel more involved." P20 emphasized its equity potential: "It can help weaker students catch up if used correctly." These participants articulated a more integrative perspective, recognizing AI as an asset in addressing diverse learner needs and enhancing classroom experiences. However, they also acknowledged that such uses of AI require pedagogical awareness and technical support, both of which were seen as largely absent from their preparation programs.

Theme 2: Perceived Impact on Student Learning

Participants' responses revealed both optimism and caution in their perceptions of AI's potential to influence student learning. Their views were organized into three sub-themes: AI as a tool for personalization and engagement, concerns about dependency and student disengagement, and apprehensions related to equity and access.

2.1 Potential to Personalize and Engage

Several participants expressed enthusiasm about AI's capacity to transform the student learning experience by enabling individualized pathways and fostering active engagement. P2 remarked, "AI can adapt to the level of each student. If someone is ahead or behind, it gives them the right material." Similarly, P12 shared, "With AI, students get quick feedback and interactive activities—it's more interesting than just listening to the teacher." The perception of AI as a partner in learner-centered education was evident in P15's reflection: "It allows students to explore at their own pace, which increases motivation." These participants envisioned AI as a facilitator of autonomy, creativity, and engagement, especially for students who struggle in traditional learning environments. However, this optimistic perspective was often tempered by caveats about its current feasibility in Lebanon's public school system.

2.2 Concerns about Student Dependency and Disengagement

Despite acknowledging AI's potential, many participants voiced concerns about unintended consequences—particularly the risk of over-reliance on technology, leading to reduced critical thinking or interpersonal interaction. P9 warned, "If students use AI for everything, they might stop thinking for themselves." P4 echoed this caution: "They could become passive and just wait for answers from the machine." Another participant (P18) noted, "I worry that students might lose focus or motivation if they don't have a real human connection in the classroom." These reflections revealed an underlying tension

between innovation and preservation of traditional pedagogical relationships. Participants feared that without careful teacher mediation, AI could displace human connection and hinder the development of higher-order skills.

2.3 Equity and Access Challenges

The third sub-theme focused on systemic barriers to equitable AI integration. Several participants emphasized the digital divide as a major obstacle, particularly in under-resourced public schools. P1 asserted, "Many of our students don't even have electricity or internet at home—how can we talk about AI?" P7 reflected similarly: "If only a few schools can afford it, then AI will just increase the gap between rich and poor students." These concerns extended beyond infrastructure to encompass broader issues of fairness, inclusion, and the risk of exacerbating educational inequality. P10 shared, "Even if AI can help students learn better, it won't matter if most schools can't access it." This sub-theme highlighted a widespread recognition among participants that technological innovation without systemic equity risks deepening existing divides rather than closing them.

Theme 3: Leadership Readiness and Confidence

Across the dataset, participants conveyed significant uncertainty about their readiness to lead AI integration in schools. While some expressed curiosity and initiative, most articulated a lack of formal preparation and perceived a broader climate of resistance among school leaders toward technological change. This theme comprises three sub-themes: lack of formal preparation, self-initiated learning, and perceived leadership hesitance.

3.1 Lack of Formal Preparation in AI Integration

All twenty participants reported that their academic coursework in the Master's in Educational Leadership program had not meaningfully addressed AI or digital innovation. P5 stated bluntly, "We never talked about AI in class—not even once." Others highlighted that while general leadership principles were covered, the program lacked specificity in digital leadership. "We are being prepared to manage buildings, not lead innovation," commented P3. P14 added, "Everything is about rules and regulations. No one mentioned how AI can support students." The prevailing sentiment was that leadership preparation remained anchored in bureaucratic, non-digital paradigms, rendering future leaders ill-equipped to respond to the rapidly evolving technological landscape in education.

3.2 Self-Initiated Learning and Curiosity

Despite the absence of formal instruction, several participants demonstrated individual initiative in exploring AI's potential. Ten participants reported engaging with AI-related content through online platforms, webinars, and informal peer discussions. P11 shared, "I started following AI in education channels on YouTube. That's how I learned about tools like ChatGPT." Similarly, P6 noted, "We're not taught about it, but I've experimented with AI apps to see how they work." This sub-theme reflects a grassroots interest among pre-service leaders to understand emerging technologies, even in the absence of institutional guidance. However, as P16 cautioned, "My knowledge is scattered. I don't know how to apply it as a leader without a roadmap." These expressions of curiosity underscore a desire for structured, practice-oriented digital leadership preparation.

3.3 Perceived Leadership Hesitance or Resistance

Sixteen participants described the existing leadership culture in schools as largely resistant to AI integration. Many attributed this to fear of change, lack of digital competence, or systemic inertia. P8 observed, "Most principals still think technology is a distraction. They don't see it as part of learning." P19 echoed this sentiment: "There's a fear that AI will replace teachers, so leaders avoid the topic altogether." This hesitance was also linked to generational divides and a perceived disconnect between school realities and digital reform narratives. P17 noted, "There's a gap between what's happening globally and what our leaders are willing to accept." These perceptions suggest that without significant shifts in leadership mindsets and institutional culture, AI integration is likely to face friction at the school level.

4. Discussion

The findings of this study offer important insights into how pre-service school leaders in Lebanon conceptualize artificial intelligence (AI) and its role in education, revealing a complex interplay of curiosity, caution, and systemic unpreparedness. While participants demonstrated initial awareness of AI's instructional potential, this was frequently undermined by vague conceptualizations and a conspicuous absence of formal preparation. These results underscore the persistent gap between global educational innovations and local leadership readiness, especially in crisis-affected and digitally unequal contexts like Lebanon.

The first theme—Conceptualizations of AI in Education—illustrates a foundational disjuncture between global AI discourses and local understanding. Most participants held limited or superficial notions of AI, often conflating it with automation or administrative efficiency rather than as a pedagogical partner. This echoes findings by Zawacki-Richter et al. (2019), who highlight the disparity between AI's theoretical capabilities and educators' practical interpretations. The minority of participants who identified AI as a tool for personalized instruction did so based on personal curiosity rather than programmatic exposure, suggesting that existing leadership curricula do little to build critical digital fluency. The literature confirms that without guided engagement, AI remains peripheral in leadership imagination (Zhao, 2021; Bai et al., 2021).

The second theme—Perceived Impact on Student Learning—demonstrates that participants are simultaneously optimistic and wary. They acknowledged AI's potential for personalization and motivation, consistent with global evidence on adaptive learning technologies improving student outcomes (UNESCO, 2021; Zhang et al., 2023). However, concerns about over-reliance, disengagement, and loss of human connection were prevalent, mirroring Zhao's (2021) cautionary framing of uncritical techno-adoption. Notably, participants' equity concerns align with UNESCO (2021) and Runge (2025), who emphasize the digital divide as a critical barrier to AI inclusion. In Lebanon, where even electricity and internet access remain unstable (Ghamrawi et al., 2020), such apprehensions are not merely theoretical but grounded in lived educational inequalities.

The third theme—Leadership Readiness and Confidence—raises urgent questions about the adequacy of pre-service leadership preparation. The complete absence of structured learning on AI or digital innovation within participants' formal training reflects broader critiques of legacy-based educational leadership programs in Lebanon (Ghamrawi & Al-Jammal, 2013a; Boujaoude & Baddour, 2022). Despite some self-initiated learning efforts, participants expressed a lack of confidence and conceptual tools to lead AI integration, reinforcing Mezirow's (1991) claim that perspective transformation requires intentional dissonance and structured reflection. Moreover, the perception of existing school leaders as hesitant or resistant to digital change confirms earlier findings about the managerial and risk-averse leadership culture in Arab public education systems (Runge, 2025; Kharroubi et al., 2024).

When situated within the framework of Transformative Learning Theory (Mezirow, 1991), these findings suggest that pre-service leadership programs in Lebanon do not provide sufficient epistemic disruption or dialogic engagement for rethinking school leadership in AI-mediated contexts. Similarly, from a Distributed Leadership lens (Spillane, 2006), the findings indicate that leadership development remains individualized and hierarchical, with little scaffolding for collective inquiry or collaborative innovation.

Taken together, these insights reinforce the view that AI-readiness in schools is not merely a matter of infrastructure or tool acquisition but a deeper issue of professional disposition, curricular design, and institutional culture (Zhang et al., 2023; Bai et al., 2021). If Lebanon is to move toward AI-integrated schooling, leadership preparation must shift from compliance-based management to adaptive, digitally literate, and equity-driven leadership formation. As the findings of this study demonstrate, the seeds of such transformation lie not only in policy reforms but also in reimagining how future leaders are taught to lead.

5. Conclusion

This study examined how pre-service school leaders in Lebanon conceptualize artificial intelligence in education, perceive its impact on student learning, and assess their own readiness to lead its integration in schools. The findings reveal a notable disconnect between the global discourse surrounding AI-enhanced education and the realities of leadership preparation in a crisis-affected, digitally constrained context. Participants' understandings of AI were largely vague or administrative in nature, with only a minority recognizing its instructional potential. While they acknowledged AI's capacity to personalize learning and foster engagement, they also expressed valid concerns regarding student dependency, equity, and digital access.

Critically, the study underscores a profound lack of formal preparation for digital leadership within existing academic programs, forcing aspiring leaders to rely on self-initiated learning amidst broader institutional hesitance. These insights point to an urgent need for leadership development programs to embed critical digital fluency, adaptive mindsets, and transformative pedagogies as core components.
Future research should explore how leadership education in similarly fragile or under-resourced systems can be restructured to prepare school leaders for AI-mediated educational futures. Longitudinal studies tracing how pre-service leaders evolve into practicing principals would also shed light on the long-term impact of their initial conceptualizations and preparedness on actual leadership practice in AI-integrated schools.

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