Integration of Transformative Leadership, Artificial Intelligence, and the TPACK Framework for Efficient Pedagogy: A Documentary Analysis

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Abstract. The poor academic performance of students is a challenge facing the educational systems of several countries, including the United Arab Emirates (UAE). Recent theoretical and technological advances address this challenge. This study developed an integrated leadership framework to guide K–12 school leaders by synthesizing the theories of technological pedagogical content knowledge (TPACK) and transformative leadership with artificial intelligence (AI). A qualitative documentary analysis of authoritative academic literature and national policies was conducted, applying reflexive thematic analysis to extract actionable insights. Three overarching themes emerged: (1) the impact of AI on educational leadership, highlighting AI-enabled data-driven decision-making and personalized learning as catalysts for equity and efficiency; (2) transformational leadership strategies, underscoring the need for vision setting, change management, and teacher empowerment practices; and (3) the role of the TPACK framework in ensuring pedagogically coherent and content-aligned technology adoption. Therefore, a novel TPACK–transformational leadership model that integrates learning organization principles, pedagogical leadership, and transformational change processes is proposed to drive AI integration in schools. This model enhances teaching practices and improves student outcomes. Implications for school leaders include establishing ethical governance structures, ensuring equitable access to AI tools, embedding TPACK-centered professional development initiatives, and managing the digital divide and teacher readiness challenges. A practical roadmap is offered for leaders to responsibly and sustainably harness the potential of AI in rapidly evolving educational landscapes. Although the analysis concerns the educational system in the UAE, the implications apply to other countries.

Keywords: artificial intelligence integration; transformational leadership; TPACK framework; UAE education; documentary thematic analysis

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1. Introduction

Artificial Intelligence (AI) can dramatically transform education worldwide, creating unprecedented opportunities to enhance teaching, learning, and administration (Sposato, 2025). Meanwhile, AI poses considerable challenges because of its limitations and students' and teachers' dependency on its usage (Zhang & Mao, 2023). Effectively integrating AI into education presents complex challenges demanding visionary and informed leadership (Pietsch & Mah, 2024). In particular, the rise of advanced AI tools, such as generative AI, requires educational leaders to implement these innovations in meaningful ways for teaching and learning by using them responsibly rather than allowing technology to outpace school capacity.

In the United Arab Emirates (UAE), integrating AI into education has become a national priority, backed by ambitious government strategies. Improving educational outcomes is a core motivation. Accordingly, UAE education authorities have launched programs to modernize curricula, implement intelligent tutoring systems, and deploy data analytics platforms in schools (Ahmed, 2020; Artificial Intelligence Office, 2021). These initiatives reflect a sectoral imperative in the UAE's education system, wherein school leaders embrace AI tools to personalize learning, optimize operations, and prepare students for a competitive, knowledge-based economy (Alyammahi, 2020).

Despite these proactive measures, the successful adoption of AI in schools ultimately hinges on effective leadership. School leaders in the UAE must align their institutional strategies with national AI ambitions while ensuring that technology serves educational goals rather than overshadowing them. Notably, many teachers feel underprepared for AI integration; they may lack confidence in how to use AI pedagogically or worry about the added complexity. This is where the technological pedagogical content knowledge (TPACK) framework is highly relevant (Kendon & Anselmo, 2022).

By focusing on the overlapping knowledge domains required by teachers, TPACK ensures that the introduction of AI tools enhances teaching and learning. Reportedly, teachers are least confident in their content knowledge about AI, followed by their technical and pedagogical know-how for using AI in the classroom (Kim & Kwon, 2023). This underscores the need for leadership to provide comprehensive support, deploying AI systems and building teachers' capacity (content-wise, technologically, and pedagogically) to use such systems effectively.

The education sector in the UAE presents a fertile yet challenging landscape for AI integration. It is fertile because of ambitious top-down policies and investments (Artificial Intelligence Office, 2018) that have equipped schools with infrastructure and initial guidance. The challenge is regarding cultural and economic diversity, which can make AI implementation a daunting task (Ahmed, 2020). The rationale for this study is based on leadership being the linchpin in translating these opportunities into sustainable improvements in teaching and

learning. It is necessary to examine how UAE school leaders can respond to this mandate by pursuing the following objectives:
1) To explore how vision can be combined with practical strategy.
2) To investigate how frameworks such as TPACK can be leveraged to ensure pedagogically sound technology integration.
3) To analyze how leadership models can evolve to meet the unique demands of an AI-driven educational environment.

Therefore, this study addresses the practical urgency for frameworks guiding the investigation of transformative school leadership in the age of AI for empirical insights, in the context of the UAE and other countries.

2. Literature Review
2.1 School Leadership
In the 21st century, school leadership extends beyond administrative functions and includes guiding innovation and fostering continuous learning. According to Bush and Glover (2003), leadership is a process where influence aimed at the achievement of desired purposes is made during leading. Here, effective leaders articulate a shared vision and align the school structures and activities accordingly (Wilson-Heenan et al., 2023). Modern pedagogical leadership positions the principal as a lead learner, responsible for shaping an environment for students and teachers to thrive (Grice et al., 2024).

This role requires sensitivity to local values and culture, the "internal axis", while adapting to external influences, such as technological trends and national policies. Transformative leadership emphasizes collaborative and participatory activities with creativity, awareness, and reflection (Montuori & Donnelly, 2017) and is under investigation in the UAE (Litz & Scott, 2017). However, a meta-analysis by Robinson et al. (2008) found that transformational leadership had a smaller effect on student outcomes than instructional leadership because of its direct impact on teachers' work and indirect impact on student outcomes.

Leadership in schools must enable schools to function as learning organizations that continually reflect and innovate (Baráth, 2015). Senge's (1990) concept of the *learning organization* emphasizes system thinking, shared vision, and team learning as core disciplines for organizational growth (Kuşcu et al., 2015). Student outcomes improve when leaders establish collaborations along with instructional guidance because this approach empowers teachers through shared responsibility for betterment (Alzahrani & Albeladi, 2023).

A school becomes a powerful learning community through transformational leadership practices, including inspiring vision development, challenging norms, and developing people (AlShamsi, 2016). Leithwood (2021) demonstrated that vision building, collective goal setting, intellectual stimulation, and individualized support are fundamental transformational practices in organizational development. School leaders who practice transformative leadership change school systems to ensure major enhancements through their shared vision and collaborative and continuous learning culture. This supports

educational innovation in teaching methodologies and learning techniques, thereby making learning organizations that continuously adapt and improve (Kareem et al., 2025).

2.2 AI and Transformative Leadership
Fetzer (1990) described AI as a computer program that is intelligent, like humans. This new technology has opened several possibilities for the mitigation and creation of challenges. One of the primary challenges in education is the existing inequality of educational opportunities, inhibiting democratic and equitable access to educational opportunities for all children (Pietersen & Plaatjies, 2023). Through proper usage, AI can alleviate this situation, leading to a utopian educational system (Langeveldt & Pietersen, 2024; Pietersen & Plaatjies, 2023). The impact of AI integration on education has been significant in the higher education sector primarily because of its advantages in the administrative process (Adewale & Ndwandwe, 2025).

Furthermore, compared with traditional instruction or virtual AI, ChatGPT has been identified as the most effective text-based generative AI among preservice teachers for learning self-help strategies for problem behaviors (Kim et al., 2025). In the Middle East, students are interested in using AI and view AI as an opportunity to improve their education (Hamed & Ismael, 2024). In STEM education, AI integration was reportedly complex because of the interplay between AI and non-AI elements for the appropriate learning of STEM concepts (Xu & Ouyang, 2022).

With the advent of new technologies, digital transformations are essential in all organizations, including industry and education. Research on the effect of leadership on digital transformation in organizations has yielded insights relevant to all fields. In business, digital transformation is highly efficient in creating digitally important changes in the organization (Schiuma, 2024). Transformative leadership, with its component of inspirational motivation, has been highly correlated with the success of organizational goals, as seen through employee engagement and job satisfaction (Boudreaux, 2024). In education, transformational leadership has positively affected the adoption of AI instructional tools, enhanced trust levels and minimizing technology resistance in educational settings (Schmitz et al., 2023).

Through motivation, positive inter-relations, shared vision, and healthy work environments, transformational leadership can bring about technology-related innovative transitions in various aspects of the educational process (Sharma & Adeoye, 2024). A deeper focus of school leadership on teaching and learning, and other requirements to facilitate these processes, leads to decision-making and shared ownership of technology initiatives that heavily benefit student outcomes (Robinson et al., 2008). Nevertheless, potential risks and unintended consequences, such as product failures, underperformance of AI tools, and malpractices in assessment, exist and provide opportunities for team problem-solving (Zhang & Mao, 2023). Leaders must safeguard data privacy through

ethical policies to ensure that AI does not worsen the existing inequities through its implementation.

2.3 TPACK and Transformative Leadership

TPACK provides a structure to leaders for understanding and supporting the interplay between technology, pedagogy, and content in their schools. This framework integrates technology and pedagogy with content knowledge for teachers' benefit (Vijayan & Joshith, 2018). Effective AI integration requires visionary leaders to establish change pathways that combine with instructional TPACK models to provide the necessary implementation framework. The TPACK model, defined by Koehler and Mishra (2009), demonstrates how educators need specific knowledge from content, pedagogy, and technology domains to effectively teach technology. Principals' understanding of TPACK helps in the evaluation of AI tool applications in classrooms because they assess technical mastery and pedagogical suitability in addition to curricular adherence (Koehler & Mishra, 2009).

When professional development programs utilize TPACK principles, they address necessary content knowledge along with pedagogical techniques and technological competencies, resulting in substantial improvements in teachers' confidence and capabilities in using educational technologies (Angeli & Valanides, 2009). In addition to individual knowledge of technology, content, and pedagogy, the TPACK framework introduces a combination of knowledge in the three areas, altogether facilitating the effective use of technology in educational practices by schools and teachers (Mishra et al., 2023).

The TPACK and technology acceptance model (TAM) frameworks focus on the teachers' and students' use of technology (Almaiah et al., 2022). Because AI use has limitations related to ethical issues, a measurement tool – the intelligent-TPACK – has been developed to assess teachers' knowledge based on an updated version of the TPACK framework with ethical guidelines (Celik, 2023). Meanwhile, Castéra et al. (2020) found that country context determines differences in factors on TPACK knowledge levels by comparing TPACK knowledge component levels across Asian and European countries.

In the UAE, Mohebi (2025) showed that while teachers used AI for personal learning, automated assessments, and routine work, they found difficulties related to their preparation and ensuring ethical use. With technological integration in their educational practices, well-designed professional development programs enhance teachers' self-efficacy (Joshi, 2023). Furthermore, in the presence of technology, teachers' pedagogical capabilities and support to students are important in their education (AlShamsi, 2021). Professional training and adherence to ethical guidelines and national policies are crucial aspects for the successful integration of technology by schools (Christensen, 2024). School leaders must develop their technological competencies even though they are knowledgeable in non-technological leadership abilities (Depew, 2015). In contrast, school leaders can leverage TPACK leadership assessment tools to

identify strategies to design effective and efficient integration of AI and other technologies for the educational practices of schools (Clausen et al., 2019).

Integrating transformational leadership with TPACK yields a comprehensive model for AI-era education: Transformational leadership provides the "why" and "how" of change management, energizing and mobilizing the school community, whereas TPACK offers the "what" and "how" of instructional integration, ensuring pedagogical coherence and content relevance. In practice, a TPACK-informed transformational leader might articulate a vision such as "enhance personalized learning in science through adaptive AI platforms", inspire staff with it, facilitate co-planning of AI-driven lessons, and establish reflective feedback loops to refine instruction using AI-generated data. This synergy addresses the critical need for a unified leadership framework that is systemically transformative and pedagogically sound to guide schools through the disruptive potential of AI, thereby turning an intimidating challenge into a collaborative journey of continuous improvement.

2.4 National Policies

The UAE Vision 2021 and the National Strategy for Artificial Intelligence 2031 emphasize the role of AI in fostering innovation and boosting educational quality. The UAE's leadership has demonstrated broad support for AI-driven initiatives, positioning the country as a global leader in AI applications (Allen et al., 2025). The UAE's strong commitment to AI in education is underpinned by visionary national policies and a drive to remain globally competitive.

The UAE Vision 2021 called for the development of an innovative education system, preparing students for future labor markets by adopting advanced technologies (Areepattamannil, 2024). Considerably, the UAE National Strategy for Artificial Intelligence 2031 positions AI as a cornerstone of economic and social development (Al Zarooni, 2023). A key objective of the AI Strategy 2031 is to improve student outcomes by leveraging AI-based solutions in schools. For example, the strategy acknowledges that traditional approaches yield unsatisfactory results and mandate the use of AI to bridge gaps in achievement and learning equity.

This high-level vision has catalyzed numerous initiatives by the UAE Ministry of Education (2016) to modernize and "smart enable" the schooling sector. AI tools are being integrated into various teaching, learning, and administration aspects across UAE schools, although the systems are not yet compatible with the Arabic context (Alzahrani, 2022). AI-augmented learning management systems monitor student progress in real time. Intelligent tutoring systems provide personalized instruction and adaptive assessments catering to the needs of individual students (Rizvi, 2023).

Data analytics platforms inform decision-making, such as identifying students who need additional support or tailoring curriculum improvements. In language learning and STEM education, AI-powered applications, such as automated speech tutors or virtual laboratories, offer students interactive, customized

practice beyond what traditional classrooms can easily provide. Such deployments are steps toward the nation's goal of becoming a knowledge-based economy wherein technology and innovation drive educational excellence (AlShamsi, 2016, 2022).

Strategic programs and frameworks bolster these efforts. The Mohammed Bin Rashid Smart Learning Program (launched in the 2010s) laid the groundwork for technology-rich classrooms and e-learning infrastructure in public schools. An ICT engagement framework provides strategies for assessing and continuously improving the use of digital tools in teaching and learning. It emphasizes ongoing teacher training, regular self- and peer evaluations of technology use, and ethical considerations in ICT, ensuring that meaningful educational progress is achieved through technology adoption. Reportedly, the Ministry of Education (2023) released a comprehensive "Teacher's guide for using digital educational platforms" that offers guidelines for teachers on integrating digital tools into lesson delivery, collaboration, assessment, and student performance monitoring.

The guide helps teachers maximize learning accessibility through technology, for instance, by providing on-demand, flexible, individually tailored instruction and resources and fostering effective communication among all stakeholders (teachers, students, and parents) via digital platforms (Bond & Bedenlier, 2019). Moreover, the "Framework for transitioning to smart schools" (MOE, 2016) outlines specific strategies for school leaders to manage the shift from traditional to AI-enabled "smart" schooling. It advises leaders to leverage existing best-practice frameworks, adopt proven approaches from pioneering schools, build consensus on implementation strategies, and conduct periodic progress evaluations. This framework also encourages schools to learn from one another and seek support from institutions with advanced expertise, highlighting a collaborative approach to innovation.

3. Gaps in Knowledge
Critical gaps in knowledge remain in practice and research. In the abovementioned research findings and theories, while teachers' perceptions and effective use of AI can be examined through technology-integration models, leadership styles, and potential usefulness of AI, to our knowledge, no unifying research using these factors has been conducted. This, being a complicated process due to the combination of three major concepts for one purpose, requires a guiding framework, which is the focus of this article. The AI Strategy 2031 explicitly identifies poor student performance as a challenge that needs to be addressed through AI integration in schools. Many educators are not completely prepared for AI-enhanced teaching; teachers often lack confidence in the technological and pedagogical knowledge required to integrate AI into their classrooms (Kim & Kwon, 2023).

Despite the global interest in AI for education, limited empirical research focuses on AI integration in K-12 schools in the context of the UAE. Most existing literature on AI in education leadership is from Western or higher education settings, leaving a contextual gap in understanding how Emirati school leaders

navigate AI-driven change (Alyammahi, 2020). Additionally, comprehensive frameworks bridging AI adoption with educational leadership practices are lacking, which leads to fragmented implementation efforts (Almuhanna, 2024). Most studies address technological integration or leadership strategies separately, with few having attempted to integrate these perspectives. No prior research has combined the TPACK framework with transformational leadership theory in a unified model for AI in schools. In this critical gap, TPACK offers a structured approach to technology in pedagogy, and transformational leadership guides organizational change; however, they have not been jointly examined in the context of AI in schooling (Ahmad & Mohebi, 2025).

4. Aim of the Study

This study contributes to a deep, context-specific understanding of AI integration in school leadership. The research is guided by three research questions:

1. What is the impact of AI on educational leadership in the UAE, as understood from existing literature and policy documents?
2. How do current leadership frameworks and practices address the challenges and opportunities presented by AI in schools?
3. How can the TPACK framework be integrated with transformative leadership and AI to inform strategic leadership decisions that enhance student performance?

This study proposes a novel conceptual framework integrating transformational leadership principles with the TPACK model by addressing these research questions and offering school leaders a practical guide for navigating AI integration.

5. Methodology

5.1 Research Design and Data Sources

This study employed a qualitative, theoretical research design grounded in documentary analysis, treating existing texts, policies, academic articles, and reports as primary sources of data. Following the Ahmed (2010) model, documents were selected and examined to build understanding rather than test predetermined hypotheses.

To support the methodological foundation, Bowen (2009) described document analysis as a systematic process for reviewing documents through which data are examined to elicit meaning, gain understanding, and develop empirical knowledge. Adopting an inductive approach akin to grounded theory, this study allowed themes to emerge from the data, providing flexibility to capture unexpected insights while focusing on the transformational leadership and TPACK frameworks. This method functions similarly to a qualitative systematic review, providing breadth without the logistical constraints of fieldwork (Butler et al., 2016).

A comprehensive corpus of authoritative documents was curated through searches on Web of Science, Scopus, ScienceDirect, Wiley, Taylor & Francis, and Google Scholar using the keywords "artificial intelligence", "school leadership",

"TPACK", etc. Sources included UAE national policy documents (Vision 2021; AI Strategy 2031) (Dafri, 2023), Ministry of Education guidelines, international leadership standards, peer-reviewed research on AI in schools, UNESCO and OECD reports, and case studies of AI adoption in K–12 settings. Initially, 50 documents were collected and filtered for relevance using the inclusion criteria focusing on the impact of AI on leadership, pedagogical innovation, and technology-integration models.

The exclusion criterion was the use of leadership or technology without AI. This process resulted in 14 documents and ensured that each source directly addressed the research questions. These steps were used to design qualitative and theoretical research based on documentary analysis by treating existing texts, policies, academic articles, and reports as primary data.

5.2 Data Analysis

Thematic analysis, as articulated by Braun and Clarke (2006), was used to interpret the document content through six recursive phases: familiarization, coding, theme generation, review, definition, and interpretation. The initial familiarization involved detailed reading and note-taking to identify recurring concepts such as "change management", "teacher readiness", and "ethical governance". Then, a combined deductive–inductive coding scheme was applied, allowing planned codes (e.g., "Transformational Leadership", "TPACK Application") and emergent codes (e.g., "Parent Engagement with AI") to coalesce.

Codes were clustered into three overarching themes: transformative leadership in AI, AI-driven pedagogical innovation, and leadership frameworks and TPACK, each with sub-themes reflecting specific data dimensions. Themes were rigorously reviewed against the corpus to ensure distinctiveness and representativeness, with ethical and equity concerns folded into relevant sub-themes and not standalone categories. Finally, the themes were interpreted per the research questions and existing theory, informing the development of an integrated leadership model combining transformational leadership principles with TPACK-guided processes (Khan, 2014).

The methodology prioritized transparency and reflexivity, inclusion criteria, coding decisions, and iterative refinements to bolster credibility. This approach delivered a robust, context-sensitive foundation for understanding and guiding AI integration in school leadership by harnessing documentary analysis as described by Ahmed (2010), Bowen's (2009) framing of document analysis, and thematic analysis per Braun and Clarke (2006). This thematic structure guided the organization of the findings, ensuring a cohesive and evidence-backed presentation of the results.

5.3 Validity and Reliability

Multiple document types, policy texts, peer-reviewed studies, and framework reports were triangulated to ensure credibility and consistency, cross-verifying themes surfaced across different sources. Authoritative materials (official government documents and academic articles) were prioritized over informal

content to reduce inaccuracies. Reflexivity was practiced throughout the analysis: The researcher, familiar with the UAE education sector, continually questioned personal biases and documented all analytic decisions (Berger, 2015).

In addition, two research assistants with over 15 years of practical experience in the field of education and backgrounds in pedagogical leadership supported the initial inductive coding process to cluster descriptive and NVivo codes before the data were imported into NVivo for coding and theme generation. The researchers and experts engaged in intercoder comparisons and peer debriefing sessions. They confirmed that emerging themes were grounded in the data rather than preconceived notions. These combined steps bolster trustworthiness, making independent analysts likely to reach comparable conclusions.

5.4 Ethical Considerations

No consent or confidentiality issues were encountered, while relying solely on publicly available documents and literature eliminated human-participant risks. All sources are in the public domain, and proper attribution was maintained to uphold scholarly integrity. This study is theoretical and based solely on publicly available documents and did not require institutional review board approval, in line with institutional ethical guidelines. The researcher's positionality, being embedded in the UAE context, was transparently acknowledged and managed through the objective reporting of the methods and findings. No sensitive or classified data were collected. Overall, the study posed minimal ethical risk, with ethical rigor ensured through accurate citation practices and a commitment to impartial analysis.

6. Findings

Documentary analysis revealed that AI profoundly reshapes school leadership by equipping principals with real-time data analytics, enabling agile decision-making, personalized learning, and enhanced inclusivity. Nonetheless, AI poses challenges, as it demands strategic leadership responses, such as digital equity, teacher readiness, and ethical governance. Effective leaders frame AI adoption around clear educational goals, invest in comprehensive professional development, cultivate collaborative learning communities, use continuous feedback loops, align with policy frameworks, and uphold ethical standards.

Integrating transformational leadership practices with TPACK-guided approaches is a powerful model for sustainable AI integration. Specific themes and sub-themes emerged from the process of clustering initial descriptive and NVivo codes into broader categories. The categories were further refined through multiple reviews by the researcher and the two experts to produce the sub-themes and the paraphrased representation of recurring ideas from the documentary sources. The aim was to provide illustrative examples of how the raw textual data were captured during the collaborative inductive coding process, and even before being clustered into themes and sub-themes. Table 1 summarizes the key themes and sub-themes derived from the thematic analysis.

Table 1: Emergent themes and sub-sub-themes from the documentary analysis

Theme	Sub-themes	Paraphrased representation
Transformative leadership in AI	Visionary leadership and management of change	"AI is changing how schools plan"; "Leaders must set a clear vision for AI use"; "We must be proactive, not reactive"
	Teacher empowerment and professional development	"Teachers feel more confident after AI training"; "Workshops help us understand AI tools"; "Leaders provide resources and professional development"
	Collaborative culture and communication	"We share AI practices in staff meetings"; "Collaboration is key to adoption"; "Peer learning helps us implement AI"
	Ethical and inclusive leadership practices	"Leaders must ensure ethical AI use"; "Data privacy should be protected"; "AI should benefit all students, not create exclusion"
AI-driven pedagogical innovation	Enhanced personalized and adaptive learning	"AI helps personalize lessons"; "Students get instant feedback"; "Adaptive tools support individual learning"
	Data-driven instructional decision-making	"AI analytics is used to adjust teaching"; "Dashboards highlight learning gaps"; "Data help leaders guide instruction"
	Inclusive education support (special needs and diverse learners)	"AI tools support students with special needs"; "Translation features help diverse learners"; "AI helps weaker students catch up"
	Stakeholder engagement (students and parents) by using AI tools	"Parents receive AI-generated reports"; "Students engage more with adaptive platforms"; "AI strengthens school–home communication"
Integrating TPACK into leadership	Strategic technology planning aligned with content and pedagogy	"Leaders align AI with curriculum goals"; "Technology should match pedagogy"; "AI must support subject outcomes"
	Building teacher AI competencies (TPACK-based professional development)	"AI could be integrated across subjects and support interdisciplinary projects"; "Professional development should link pedagogy and tools"; "Hands-on workshops help teachers"
	Continuous feedback and cycles of reflective improvement	"Leaders need to reflect on AI use weekly"; "Feedback from leaders improves practice"; "Reflection shows what works and what does not"
	Policy and framework alignment (linking school practice with national/UNESCO AI guidelines)	"Leaders follow the government's AI strategy and the Ministry of Education's guidelines"; "UNESCO AI ethics guide our use"; "Policies support responsible adoption"

6.1 Impact of AI on Educational Leadership
AI dashboards and analytics transform administrative oversight into data-driven leadership. Principals now leverage platforms that aggregate attendance, performance, and behavioral metrics, further enabling early identification of at-risk students and timely interventions (Janahi & Obeidat, 2025; Mahisha et al., 2024). According to Janahi and Obeidat (2025), "*AI-driven administrative tools automate administrative functions such as admissions processing, enrolment management, and financial aid monitoring*" (p. 9). This automation allows institutions to optimize resources and focus on academic innovation. Predictive tools forecast enrolment trends and guide resource allocation, freeing leaders from routine

scheduling and reporting tasks (Sunday et al., 2025). Moreover, AI-driven personalization, through intelligent tutoring systems, improves mastery in core subjects by adapting to each student's pace, ultimately closing achievement gaps, especially in diverse classrooms in the UAE (Chen, Chen, & Lin, 2020).

Reportedly, AI-augmented instruction enhances problem-solving skills and supports gifted learners and those with special needs through tailored enrichment and assistive applications, thereby fostering equity and inclusion (Chen, Chen, & Lin, 2020). However, unequal access to devices and connectivity risks widens the digital divide, requiring leaders to secure provisions such as device lending programs and extended laboratory hours.

6.2 Leadership Strategies and Frameworks

Transformational leadership behaviors correlate strongly with successful AI integration. Leaders co-constructing a vision, for example, "AI-powered personalized reading improvements by 15% in 2 years", gain greater teacher commitment by aligning technology use with tangible outcomes (SchoolSims, 2025). Comprehensive professional development, structured around the TPACK domains, is required, as shown in Table 2.

Workshops blend hands-on technological training with pedagogical strategies and content alignment to build teacher efficacy and sustain adoption (Chiu et al., 2023). Establishing AI-focused professional learning communities fosters peer mentorship, in which educators share best practices and troubleshoot challenges collectively (Chen, Xie et al., 2020). Continuous feedback mechanisms, surveys, focus groups, and AI usage allow leaders to adjust and improve tools and support systems so that they remain responsive to classroom practices. Celebrating success through recognition programs motivates staff and reinforces a culture of innovation.

Table 2: Leadership action framework for integrating transformational practices with TPACK-informed strategies for AI integration in schools

Strategic action for AI integration	Description and study rationale
Articulate a shared vision for AI	Develop and communicate a clear vision of how AI will enhance teaching and learning in schools. Involve teachers and stakeholders to ensure buy-in and collective ownership. A shared vision provides direction and motivation, aligning the use of AI with educational values and goals (Harris & Jones, 2016).
Invest in professional development (TPACK-focused)	Provide ongoing training and workshops to build the technological, pedagogical, and content knowledge of teachers for AI integration. The TPACK framework identifies specific areas in which teachers need support and tailors' professional development accordingly. Effective professional development increases teacher efficacy in using AI tools (Kim & Kwon, 2023) and ensures that pedagogically sound AI is used.
Foster collaborative learning communities	Create forums (e.g., professional learning community meetings, peer coaching, and demo sessions) for teachers to share experiences and best practices with AI tools. Mentorship is encouraged, in which tech-savvy teachers support others. Collaborative communities build collective expertise through teamwork and help solve implementation challenges (Hwang et al., 2020).
Establish continuous feedback mechanisms	Set up systems to regularly gather feedback from teachers and students on AI initiatives (e.g., surveys, suggestion boxes, and reflection meetings). Use AI system data analytics to evaluate what works. Plan adjustments based on feedback to iterate and improve. This reflective practice helps fine-tune AI integration and promptly addresses issues (Harris & Jones, 2016).
Recognize and celebrate innovations	Acknowledge successful AI-integration efforts, for instance, highlight a project in newsletters, give certificates or commendations to teachers who tried a new AI-enhanced lesson, or showcase AI-aided student achievements. Celebrating success builds a positive culture around innovation, motivating staff to continue the exploration of AI (Fullan, 2016).
Ethical and equitable AI use	Proactively address ethical concerns, such as data privacy, algorithmic bias, and student access. Develop school policies (or adapt national ones) to govern AI usage, for example, guidelines on data protection and rules to ensure that all students have access to AI tools. By promoting equity (providing devices or alternatives for those without access) and ethics, leaders ensure that AI benefits everyone and mitigates the risks of widening the digital divide. This aligns with responsible leadership in technology (Mentis, 2022).

6.3 Ethical Governance and Policy Alignment

UAE school leaders align AI initiatives with national frameworks, Vision 2021, AI Strategy 2031, and the Smart Learning Program to access funding and ensure coherence with ministerial objectives (Chen, Chen, & Lin, 2020). Guided by UNESCO and OECD recommendations, they develop local policies governing data privacy, acceptable use, and algorithmic fairness. Ethical stewardship involves educating teachers, students, and parents about the benefits and risks of AI, reinforcing trust and transparency in data handling.

Altogether, these interrelated strategies help school leaders transform their institutions in the AI era. Several UAE case examples in the data illustrated these in action. For example, a school's leadership team set a goal of personalized learning through AI (vision), ran weekly training sessions on their new AI platform (professional development), encouraged teachers to observe each other's

AI-based lessons (collaboration), held monthly review meetings with student progress reports generated via the AI system (feedback), publicly praised teachers who tried new AI activities (celebration), and issued a clear policy on data use and screen time (ethics). Over a year, this school saw notable improvements in student engagement and a shift in teaching practice, which validated these strategies.

6.4 Integrating TPACK into AI-Integration Transformational Leadership: Contextual Framework

A contextual framework is proposed that illustrates how transformational leadership and TPACK can be integrated for successful AI adoption in schools by drawing together the above findings. The TL-TPACK-AI framework views the school as a system in which various inputs, processes, and outputs interact. Figure 1 depicts the integrated leadership framework. This system-based model shows how TPACK-guided leadership inputs drive AI-integration processes and improve teaching and learning outputs.
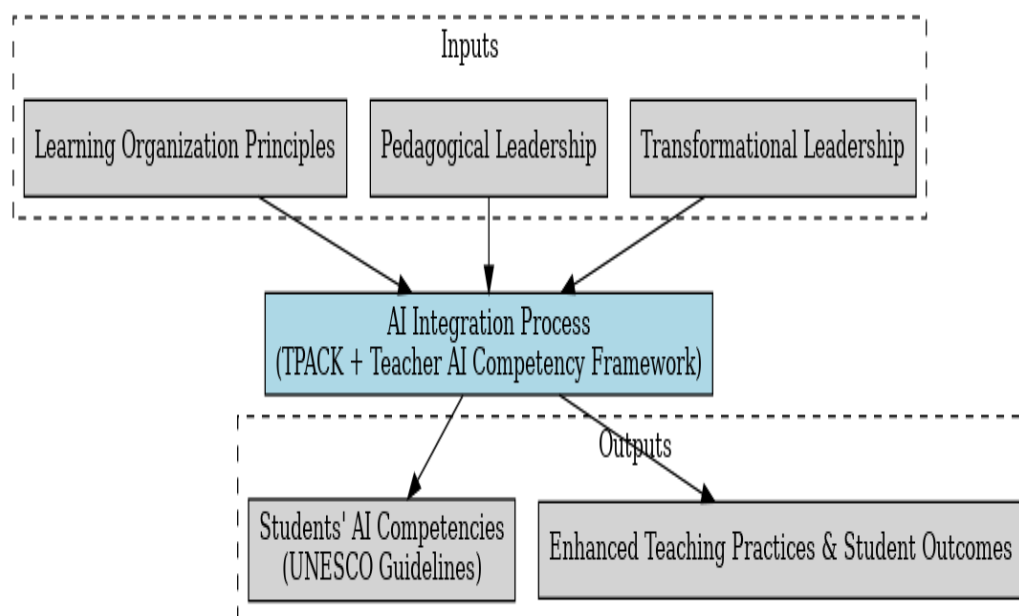

Figure 1: Hypothesized framework of transformative leadership for successful AI integration in schools

Figure 2 depicts a more in-depth presentation of each of the components within the three-component model shown in Figure 1. The individual factors crucial for each component of the system – input, process, and output – are all depicted, as they comprise the integrated model for AI in schools through transformative leadership and the TPACK framework.
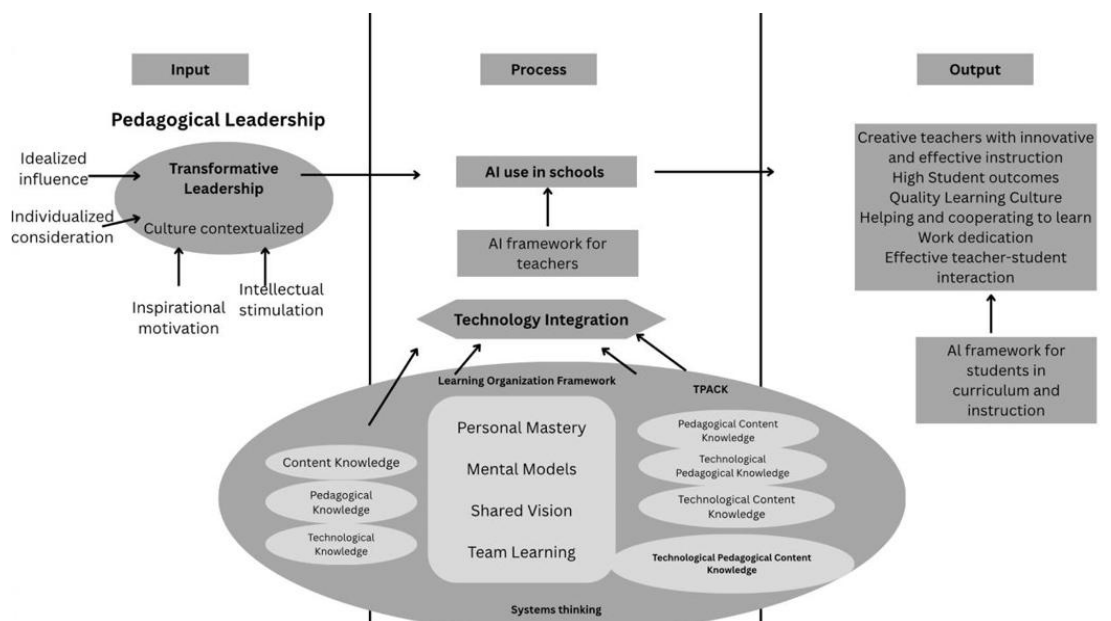
Figure 2: Contextualized framework of transformative leadership for successful AI integration in schools

As seen in Figures 1 and 2, the framework consists of three main components:

- **Inputs:** These are the foundational leadership elements and organizational factors a school has for AI integration. The inputs in this framework include transformational leadership, pedagogical leadership, and learning organization framework. Transformational leadership provides vision, inspiration, and a change-oriented mindset. Pedagogical leadership focuses on teaching and learning outcomes (keeping AI integration tied to the pedagogical purpose). Learning organization principles (Senge, 1990) contributes to a culture of continuous improvement and innovation openness. These inputs form leadership capacity and context readiness. A leader who embodies these inputs will be ready to holistically champion AI integration.

- **Process:** The AI-integration process guided by TPACK and relevant competency frameworks is the core of the framework. Herein, the day-to-day actions of implementing AI occur, influenced by leadership inputs. The UNESCO ICT Competency Framework for Teachers, which now includes AI competencies, was specifically incorporated as part of the process — guiding what skills teachers should develop in the AI era (e.g., understanding AI basics and using data responsibly). Combined with the TPACK model, the process involves leaders facilitating technology integration to maintain a balance between technological opportunities and pedagogical/content needs. In practice, this might involve the strategies outlined in Table 2: providing training (developing teacher competencies), restructuring teaching methods (e.g., personalized pedagogy enabled by AI), and maintaining alignment with curriculum standards (content). Leaders act as **change agents**: They allocate resources (such as choosing AI platforms suitable to their context), set up support structures

(professional development, collaboration), and continuously monitor progress.

- **Outputs:** These are the desired process outcomes. The outputs of this framework include enhanced teaching practices, improved student outcomes, and the implementation of AI competencies for students. Enhanced teaching practices refer to teachers effectively using AI tools along with traditional methods, leading to more differentiated and data-informed instructions. Improved student outcomes can be academic (better test scores and deeper understanding) and skills-based (critical thinking, problem-solving, and even AI-related skills). Moreover, student AI competencies are explicitly mentioned as an output, aligning with the idea that part of educating in the AI era is to equip students with knowledge and skills to use AI responsibly and creatively. UNESCO's recent initiatives emphasize student competencies in AI (e.g., understanding AI ethics, basic coding, and data literacy). A transformative leader's efforts create an environment in which students are passive recipients of AI-driven teaching and active learners gaining future skills.

The systemic view of the framework means that feedback exists. For instance, outputs (such as improved student performance data) are stored back into the process (informing the leader where to adjust strategy) and into inputs (successful outcomes can reinforce the vision and culture, inspiring further innovation). It is a continuous growth cycle. In conclusion, this integrated framework provides a *mental model* for school leaders: They should nurture the right leadership qualities and school culture (inputs), engage in strategic, TPACK-aligned AI implementation (process), and aim for holistic educational improvements (outputs).

The framework synergizes the strengths of transformational leadership (vision, empowerment, and change management) with the TPACK structure, ensuring that the use of technology is instructionally effective. It is contextualized for the UAE (or similar contexts) by including global competency frameworks and alignment with national policy goals (e.g., the output of student competencies fits the UAE's focus on future skills).

7. Discussion
The findings leading to the development of the novel integrated TL-TPACK-AI framework are discussed below as per the three objectives raised in the introduction:
1. To explore how vision can be combined with practical strategy.
2. To investigate how frameworks such as TPACK can be leveraged to ensure pedagogically sound technology integration.
3. To analyze how leadership models can evolve to meet the unique demands of an AI-driven educational environment.

7.1 Combining Vision with Practical Strategies

The role of school leadership in the AI era is far more expansive than traditional administrative oversight. School leaders must act as visionaries, facilitators, and ethical guardians in harnessing the transformative potential of AI (Pietsch & Mah, 2024). This indicates that leaders need a deep understanding of educational technology and the pedagogical principles for effective teaching and learning beyond budget management or instruction supervision.

They guide the adoption of AI (Ahmed, 2020) and ensure that it serves as a tool for inclusivity, empowerment, and excellence rather than reinforcing outdated inequities (Pietersen & Plaatjies, 2023). This responsibility was captured by integrating visionary, change-oriented transformational leadership with a pedagogy-focused TPACK-grounded strategy, ensuring that leaders keep student learning at the center of AI initiatives.

A key theme is that leadership strategies must evolve continuously along with AI technologies. Leaders cannot remain static with the advancements in AI tools; they must be adaptable, learning about new applications and their implications. For example, the emergence of AI tutoring systems or AI-driven content creation tools may require leaders to update teacher training programs or revise acceptable-use policies.

Therefore, the soft skills of leadership—building trust, fostering collaboration, and addressing fears—have become increasingly vital (Schmitz et al., 2023). The introduction of AI can provoke anxiety among teachers (fear of being replaced or not understanding the technology) and parents (concerns over data privacy or screen time). Effective leaders approach these human concerns with empathy and transparency, facilitating open dialogues and providing reassurance through action (such as piloting a low-stakes approach or demonstrating its benefits).

Research on digital transformation leadership echoes that leaders with a proactive and empathetic digital mindset drive successful implementations of AI in schools (Pietsch & Mah, 2024). In practice, this could involve a principal running informational sessions for parents on how a new AI app works and safeguards student data, or a principal mentoring a hesitant teacher one-on-one to build confidence.

7.2 Leveraging Frameworks such as TPACK to Ensure Pedagogically Sound Technology Integration

The dual nature of AI in education is another critical aspect—its tremendous potential to enhance learning versus its capacity to disrupt or even harm if misused. School leaders are the linchpins in navigating this balance. They must champion AI for its strengths (e.g., personalization, efficiency, and engagement) while being vigilant about its pitfalls (e.g., over-reliance on automation and threats to student privacy) (Mishra et al., 2023). Leaders maintaining this equilibrium while staying true to core educational values (equity, inclusivity, and holistic development) are best positioned to successfully steer their schools in an AI-driven world, reducing student–teacher gaps and improving students' motivation to learn (Almaiah et al., 2022). The integrated framework embodies

this balance: The transformational leadership side ensures an AI vision that aligns with values and ethics, and the TPACK side ensures that the vision is pedagogically sound (AlShamsi, 2021; Alzahrani & Albeladi, 2023; Sharma & Adeoye, 2024; Zhang & Mao, 2023). One without the other could tip the balance. A leader purely excited about technology might adopt AI without safeguards, whereas one who is overly cautious might hinder innovation.

7.3 Evolution of Leadership Models to Meet the Unique Demands of an AI-Driven Educational Environment

This study's qualitative, UAE-focused approach has filled the void of context-specific insight. It has extended the application of transformative leadership (Litz & Scott, 2017) to a multi-theory framework to operationalize the nation's educational promises. Known theories (transformational leadership and TPACK) apply and complement each other in the UAE setting and highlight nuances, such as emphasis on national policy alignment and cultural factors in leadership decisions. In this study, practical guidance is offered that future school leaders and policymakers in the UAE (and similar contexts) can use by proposing a tailored framework and strategies. The framework serves as a bridge between high-level vision and on-the-ground practice, which was previously lacking in the empirical literature of this region, and paves the way for research at various levels in different countries (Alyammahi, 2020).

7.4 Limitations of the Study

One limitation of this study is the reliance on publicly available documents because documents unavailable online could not be included. A second limitation is that there may be gaps in the knowledge reviewed since a few documents could not be reviewed. Third, some of the documents reviewed may be biased toward certain technology or theoretical perspectives, which could have unknowingly influenced this study.

8. Conclusion

School leadership in the AI era demands innovative, adaptable, and ethically conscious leaders. This study highlights how AI is reshaping the educational landscape and how, in response, leadership approaches must evolve to integrate technological opportunities with a pedagogical vision. Critical gaps have been addressed by developing a contextualized framework that combines transformational leadership with the TPACK model, demonstrating a path for leaders to systematically and holistically guide AI integration in schools.

School leaders can leverage AI as a powerful tool for educational excellence and equity by focusing on building a shared vision, investing in teacher capacity, fostering collaboration, and upholding ethical standards. The insights from the UAE context imply that the potential of AI can be harnessed to personalize learning, improve outcomes, and prepare students with competencies for the future, with supportive policies and a clear strategic approach. Crucially, a leader's role is to ensure AI enhances, rather than disrupts, the core values of education.

Although this research is theoretical, it provides a foundation for practice and future studies. The limitations of the proposed framework include its basis in existing documents and literature (without field implementation); thus, it should be tested and refined in real school settings. Nonetheless, the study contributes a novel meaning of a combined approach, with a timely synthesis of ideas. This has led to the creative generation of a guiding framework when educational systems worldwide, including in the UAE, are striving to adapt to rapid AI-driven changes. School leaders can steer their institutions through this technological revolution by proactively embracing a transformative, TPACK-informed leadership approach, ensuring that the outcome is a richer, more inclusive learning experience for all students.

9. Recommendations

Educational leadership training (e.g., for principals or aspiring leaders) should include dedicated modules on AI, digital literacy, and technology leadership. The study recommends designing professional development and certification programs that can equip school leaders with the knowledge and skills to effectively manage AI integration and balance technology, pedagogy, and content (much as the integrated framework suggests). This could involve workshops on emerging AI tools, case studies of successful AI implementation, and guidance on changes in management strategies in tech-rich environments.

Furthermore, future research should explore how AI technologies influence school culture, relationships, and communication dynamics between teachers and students. Questions such as "Does the use of AI foster more collaboration or isolation among teachers?" or "How do AI tools affect the student–teacher relationship?" merit investigation. Understanding these social and psychological impacts will help leaders create school environments in which AI improves human connections.

Long-term studies should be conducted over multiple years to track the effects of AI integration on student learning outcomes, teacher development, and school performance. Such longitudinal research would provide deep insights into how AI-driven changes sustain or evolve and inform leaders about the long-term benefits and challenges of AI in education. Similarly, there is a pressing need to develop and refine ethical guidelines for the use of AI in schools. Clear frameworks will help school leaders navigate these challenges, for instance, by providing checklists for evaluating AI tools for bias or protocols for protecting student data—and ensure that ethical standards at all levels are adhered to in AI adoption.

Moreover, further studies should examine how AI can better support diverse learners, including students with special educational needs and those with different learning styles. Although AI holds promise for personalized support (e.g., reading apps for dyslexic students or communication aids for autistic students), research is required to guide its effective tailoring and document outcomes for these groups. These recommendations spur continued inquiry and capacity-building such that educators and leaders can responsibly and completely

leverage the benefits of AI. By addressing these areas, the UAE and global education system can move toward a future where AI is integrated thoughtfully, guided by strong leadership and robust research, ultimately enriching the learning experiences of all students.

Therefore, several key directions for future research and leadership development in AI-enhanced education are recommended. Long-term studies are needed to examine how AI impacts student outcomes, teacher development, and school performance over time, offering valuable insights into the sustainability and evolution of AI-driven practices. The development of ethical guidelines to help school leaders navigate issues such as data privacy and algorithmic bias is equally important, ensuring the responsible adoption of AI technologies.

Leadership training programs should include dedicated modules on AI, digital literacy, and technology leadership, incorporating practical tools such as workshops, case studies, and strategies for managing change in tech-rich environments. Further research should explore the influence of AI on school culture and interpersonal dynamics, examining whether these tools foster collaboration or lead to isolation among teachers, and how they affect student–teacher relationships. Finally, more attention should be given to how AI can support diverse learners, including those with special educational needs or varying learning styles, through personalized and adaptive tools.

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