School Principals' Technology and Transformational Leadership Practices for Spreading the Adoption of an Artificial Intelligence in Education (AIED) Policy

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בקרב מנהלי בתי ספר להפצת אימוץ מדיניות בינה מלאכותית בחינוך

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Abstract

Spreading the adoption of an Artificial Intelligence in Education (AIED) policy calls for school principals to serve as boundary spanners communicating technology and transformational leadership practices. This qualitative study aims to examine the leadership practices that school principals communicate for spreading the adoption of an AIED policy, an innovation diffusion, during the persuasion stage, within a national program. A bottom-up thematic analysis approach was utilized to analyze qualitative data from semi-structured interviews with 16 elementary and high school principals from four school districts. The analysis surfaced school principals' technology and transformational leadership practices exemplified via their role as boundary spanners: (1) technology leadership practices across internal and external boundaries: (a) building professional capacity through learning opportunities for experimentation with AI tools and communities of practice for AI learning (b) sharing leadership (c) connecting with parents (d) connecting with external partners; and (2) transformational leadership practices within internal boundaries: (a) idealized influence (b) inspirational motivation (c) intellectual stimulation (d) individualized consideration. This research provides a theoretical contribution emphasizing that the spreading of an educational innovation bridging top-down policy adoption with bottom-up stakeholder engagement requires an integrated leadership. Professional development programs should equip principals with specific leadership styles for an AIED policy.

Keywords: School principals, diffusion of innovation, technology leadership, transformational leadership, artificial intelligence in education policy.

Introduction

Education and technology are integral components shaping the future of learning and teaching in the area of Artificial Intelligence (Arar et al., 2023). Artificial intelligence in education (hereinafter 'AIED') enables schools to innovate new learning and teaching practices, providing quality and inclusive education for all, in alignment with the fourth goal of the Sustainable Development Goals (Holzinger et al., 2021). Despite the positive impact of AI on teaching and learning, its adoption is slow in many schools (Cukurova et al., 2023). Specifically, there is an increasing concern about how to spread the adoption of an AIED policy as it depends on teachers' willingness to adopt it (Hazzan-Bishara et al., 2025).

The successful spreading of the adoption of an AIED policy in schools, an innovation diffusion, is determined by the leadership of the school and teachers' support from their social context (Benavides et al., 2020). Diffusion is the "process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p. 35). Accordingly, the school principal communicates technology and transformational leadership practices between stakeholders across internal and external boundaries to influence teachers' motivation, emotions, and behaviors toward adopting it (Alzouebi et al., 2025). The school principal's communication is deemed central to fostering an educational environment conducive to the successful adoption of AI technology, as principals are uniquely positioned at the boundary between the school organization and its external environment (Dedering & Pietsch, 2025).

The adoption of an AIED policy in complex educational systems calls for a holistic approach integrating top-down and bottom-up processes (Witthöft et al., 2024). As the Israeli education system is highly centralized and follows a top-down approach to digitizing teaching and learning in schools, there is an urgent need to understand innovation adoption from a bottom-up perspective (Nir et al., 2024). Since teachers' mobilization is key to the successful adoption of innovation diffusion within a bottom-up approach (Gosselin et al., 2022), this study focuses on Roger's (2003) persuasion stage, during which teachers' attitudes are formed and influenced by social encouragement. Therefore, the research question that has prompted this qualitative study is: Which leadership practices do elementary and high school principals communicate to spread the adoption of an AIED policy, an innovation diffusion, during the persuasion stage, within a national program?

Literature Review

AI has rapidly emerged as a transformative force across diverse sectors worldwide, with an AIED policy initiative signaling its rising prominence for revolutionizing learning and teaching (Cheng & Wang, 2023). Despite these benefits, research indicates that teachers often exhibit resistance to AI adoption (Cukurova et al., 2023) while other studies suggest that ease of use, usefulness and teachers' social environment influence the adoption of AI technologies (López-Costa et al., 2025). Therefore, addressing the second stage, persuasion, based on Roger's Diffusion of Innovation Theory, an effective spreading of the adoption of an AIED policy entails school principals' encouragement of social interaction between internal and external stakeholders via the communication of technology and transformational leadership practices.

In recent years, it has become increasingly clear that innovation is a complex phenomenon embracing several academic disciplines, requiring, therefore, leadership that follows a both/and approach (Hojeij, 2024; Kwan, 2020; Smith, 2010). Marks and Printy's (2003) research highlighted the benefits of integrating transformational and instructional leadership to maximize school leadership effectiveness to achieve better educational outcomes. Accordingly, an integrative leadership approach has become more prevalent in educational research emphasizing the importance of addressing first and second-order change (Gudito & De Jesus, 2024).

This study proposes that technology and transformational leadership practices complement and reinforce each other, as structural practices must be combined with transformative behaviors. As

technology leaders, school principals are responsible for building professional capacity, creating a supportive climate, and encouraging collaboration with external partners (Banoğlu et al., 2023; Dexter & Richardson, 2020; Richardson & Sterrett, 2018). Alongside technology leadership, transformational leadership is essential for fostering technology integration in schools (Schmitz et al., 2023). As transformational leaders (Bass, 1990), school principals offer a sense of purpose and act as a model of the change process (i.e., idealized influence), inform teachers about high expectations and communicate important aspects in a comprehensible manner (i.e., inspirational motivation), foster teachers' creativity, critical thinking, and problem-solving (i.e., intellectual stimulation), and pay attention to each teacher (i.e., individualized consideration).

Research Context

This study was conducted in the context of an AIED policy, a flagship initiative of the Israeli education system, representing a pioneering global effort. During the "AI Month", a national large-scale effort, elementary and high school principals were required to foster basic AI competencies among teachers and students alike. The AIED policy is based on a top-down authoritarian relationship with school principals instructed to use only AI tools approved by the Ministry of Education and to participate in built-in activities (Israeli Ministry of Education, 2024).

Methodology

Research Method

This qualitative study explored the leadership practices that school principals communicated for spreading the adoption of an AIED policy, an innovation diffusion, within a national program (Gibbs, 2018). The researchers utilized a phenomenological design because it is instrumental in exploring a complex phenomenon, spreading of the adoption of an AIED policy, encompassing a deep understanding of school principals' leadership practices (Sims, 2024).

Research Population

The study participants were 12 elementary and 4 high school principals (14 women and 2 men) who spread the adoption of an AIED policy within a national program. The selection of participants comprised both purposeful and snowball sampling (Etikan et al., 2016). The participants represent four school districts: Tel-Aviv (31%), Center (25%), South (38%), and North (6%), contributing to the understanding of under-examined phenomenon. On average, elementary (75%) and high-school (25%) principals had 13 years of experience in principalship (range = 1-23).

Research Tools and Procedure

Data were collected between February and May of the 2025 academic year via face-to-face and online semi-structured interviews. A semi-structured interview aligns with the goals of a phenomenological inquiry encouraging rich narratives of school principals' leadership practices and their collaboration with internal and external stakeholders. Specifically, interview continued until data saturation was reached, ensuring the full range of school principals' perceptions of their leadership practices were captured (Cohen et al., 2018). In the interview, school principals were asked questions such as: (1) How do you perceive the AIED policy? (2) What is your role in spreading the adoption of an AIED policy? (3) Which leadership practices do you communicate to spread the

adoption of an AIED policy? (4) Can you provide examples of successful collaborations for spreading the adoption of an AIED policy?

Data Analysis

A bottom-up thematic analysis (Yin, 2016) was employed allowing different leadership styles to emerge inductively from the data. The collected qualitative data were quantified into statements reflecting school principals' technology and transformational leadership practices. Statement counting has been used for analyzing qualitative findings and recognizing themes and sub-themes (Collins, 2021).

Findings and Discussion

The qualitative analysis of data raised two major themes and sub-themes reflecting school principals' statements (n = 159, 100%).

The first theme was technology leadership practices across internal and external boundaries (N = 98, 62%) – elementary and high school principals communicated four technology leadership practices for spreading the adoption of an AIED policy across internal and external boundaries: (A) building professional capacity through learning opportunities for experimentation with AI tools (n = 19) and communities of practice for AI learning (n = 14) while connecting colleagues to meet teachers' needs (58%), allocating time to present to one another (14%), lesson planning preparation (14%), and guiding teachers' interactions through teacher leaders (14%); (B) sharing leadership (n = 27), school principals engaged the expertise of various internal stakeholders for shaping teachers' mindsets for the adoption of an AIED policy: counselors (15%), grade-level (11%) / ICT (37%) / pedagogical coordinators (11%), teacher leaders (19%), and homeroom teachers (7%); (C) connecting with parents (n = 13), school principals collaborated with parents to serve as mentors (31%) and to build partnerships (69%); (D) connecting with external partners (n = 25), school principals engaged professional mentors (28%), education networks (4%), organizational consultants (4%), and experts from the industry (8%) / academia (8%) / ministry (28%) / municipality (20%). Table 1 presents examples of school principals' statements.

Table 1. Examples of school principals' statements according to their technology leadership practices across internal and external boundaries

Theme and Sub-Themes	Example Statements
Technology Leadership Practices Across Internal and External Boundaries	
Building Professional Capacity through learning opportunities for experimentation with AI tools	"I allocated time and allowed teachers to learn how to integrate AI within their teaching during their workday" (SP13).
Building Professional Capacity through communities of practice for AI learning	*Connecting colleagues to meet teachers' needs*

Theme and Sub-Themes	Example Statements
	"We are learning together how AI meets our individual needs" (SP6).
	Allocating time to present to one another
	"At least once a week, subject coordinators showed their educational staff how they generated writing prompts" (SP10).
	Lesson planning preparation
	"During lesson planning meetings, teachers realized that AI could help them. They found lesson planning much easier and began to believe in its potential" (SP13).
	Guiding teachers' interactions through teacher leaders
	"I directed a teacher who is deeply committed to AI integration and she agreed to guide teachers' sessions. Out of 112 teachers, 37 were enrolled for teaching with AI, and it worked wonders" (SP11).
Sharing leadership	"Wisdom resides within a lot of people. My pedagogical coordinator refined teachers' technological pedagogical content knowledge" (SP5).
Connecting with parents	"I asked parents who are passioned about technology to provide AI workshops and their response was overwhelming" (SP16).
Connecting with external partners	"From the very beginning… the instructor from the Ministry was very attentive to us" (SP11).

The second theme was transformational leadership practices within internal boundaries (N = 61, 38%) – elementary and high school principals communicated four transformational leadership practices for spreading the adoption of an AIED policy within internal boundaries: (A) idealized influence (n = 17), serving as a model of change, school principals engaged in different actions for influencing their teachers to use AI tools; (B) inspirational motivation (n = 16), school principals communicated different vision aspects for leveraging AI technology in education; (C) intellectual stimulation (n = 16), school principals encouraged teachers' creativity (25%), critical thinking (69%), and problem solving (6%); (D) individualized consideration (n = 12), school principals provided individualized support to teachers (83%) and students (17%). Table 2 presents examples of school principals' statements.

Table 2. Examples of school principals' statements according to their transformational leadership practices within internal boundaries

Theme and Sub-Themes	Example Statements
Transformational Leadership Practices Within Internal Boundaries	
Idealized influence	*Encouraging teachers' curiosity*
	I think it's important to keep intriguing teachers' curiosity with new " tools, such as ChatGPT" (SP10).
	Leading by personal example
	I delivered an AI lecture to teachers in a witty way giving them an " example of how we should approach it" (SP15).
	Fostering teachers' progress through collaboration
	We held an AI-Hackathon, and at the end, each teacher received a " whistle from me. My message was: 'each one of us is a locomotive, we are all leading this AI-revolution together'"(SP5).
	Bridging top-down vision and teachers' readiness for the adoption of an AIED policy
	From above, I saw the broader picture… there were teachers who were " easy to push forward, and others who, even with a turbo engine, refused to move. Preparing teachers for AIED integration was constant work" (SP8).
Inspirational motivation	*Promoting meaningful and relevant learning*
	The AIED policy is an opportunity to promote more meaningful and " interesting learning for students" (SP9).
	Leveraging personalized learning
	We can reach to each student and adapt to his/her level" (SP14)."
	Preparing students for future labor market
	We have a responsibility to prepare students for their future" (SP5)."
	Elevating marginalized students
	Because our population doesn't come from homes where there is some " kind of economic backing, we need to expose them to the world of the future" (SP5).
	Developing students' critical thinking
	Our main role is to help students think at a higher level" (SP8)."

Theme and Sub-Themes	Example Statements
Intellectual stimulation	*Encouraging teachers' creativity*
	"Teachers constantly hear me say, use AI to be more creative. A homeroom teacher shared she created an app in Claude with her class, where anyone who earns 10 points for bringing all the required materials receives a trophy" (SP2).
	Encouraging teachers' critical thinking
	I truly believe that an AIED policy is beneficial for reflecting on our " pedagogical practice" (SP2).
Individualized consideration	"For me this is a double spreading. I am always there for teachers and students" (SP9).

Findings show that school principals were identified as early adopters demonstrating that diffusion in schools is a process to be achieved through the collective will of diverse stakeholders (Kim et al., 2022; Rogers, 2003). Specifically, technology leadership practices emerged as a dominant leadership style suggesting that the initial stage of an AIED policy adoption requires principals to establish structural and organizational readiness before deeper cultural transformation can occur. Alongside technology leadership, school principals' transformational leadership practices emphasized that emotional and cognitive influence are central for sustaining motivation once technological capacity is in place. Therefore, school principals' dual role represented a synergistic interplay between technology leadership (capacity, structure, and partnership) and transformational leadership (vision, inspiration, and individual support) practices.

School principals' experience shaped the spreading of the adoption of an AIED policy. Five school principals (SP1, SP5, SP9, SP12, SP13) were dominant in their statements exemplifying technology and transformational leadership practices. The research by Alzouebi et al. (2025) exploring the role of school principals in promoting a culture of innovation correlates with our study's findings indicating that experience contributes positively to fostering innovation. Nevertheless, our study calls for an interplay between experience, gender, and transformational leadership practices. In this regard, three female school principals' (SP1, SP5, SP13) statements exemplified that the creation of innovative culture was enhanced by transformational leadership and femininity, aligning with the work by Kawatra and Krishnan (2024). Specifically, in our study, female school principals prioritized inspirational motivation. Similarly, four female school principals' (SP1, SP5, SP12, SP13) statements demonstrated that building professional capacity and creating a supportive organization for learning were facilitated by technology leadership and femininity. Addressing both transformational and technology leadership practices, these female school principals strengthened the integrated perspective in terms of experience, gender, and leadership practices.

Implications

This study suggests implications for theory, policy, practice, and research. Theoretically, school principals' role as boundary spanners communicating leadership practices to bridge top-down policy adoption with bottom-up stakeholder engagement extends Rogers' Diffusion of Innovation Theory (2003). Policy frameworks should pair clear national guidelines with structured autonomy, enabling school principals to adopt an AIED policy in congruence with internal needs. Practically, professional

development programs can cultivate school principals' technology and transformational leadership practices by integrating professional capacity-building with transformational competencies. Future research can explore the differences between elementary and high school principals' technology and transformational leadership practices. Relating to the specific Israeli educational context, further investigation in additional sociocultural settings elsewhere is necessary to generalize the conclusions over broader populations and substantiate their international validity.

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