

Navigating urgency and innovation: how pandemic-era leadership frames the evolving role of AI in educational leadership

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Abstract

Purpose – This paper examines how pandemic-era leadership lessons inform the current implementation of artificial intelligence (AI) in schools, focusing on adaptive strategies, distributed leadership, and equity-focused decision-making among US school principals during crisis-driven technological change.

Design/methodology/approach – A qualitative approach was employed, drawing on semi-structured interviews with fifty public school principals conducted between 2020 and 2022. Data were coded and analyzed iteratively using distributed leadership theory to identify key themes related to technology integration, professional development and leadership practices in rapidly changing environments.

Findings – Adaptive, distributed leadership and proactive planning for digital equity were vital for effective crisis response and technology implementation. Schools that leveraged collective expertise and flexible structures managed technological transitions more successfully, revealing essential principles for the equitable and ethical adoption of AI in educational practice.

Research limitations/implications – The study is based on reflections from principals in diverse but U.S.-centered settings, which may limit generalizability to other national contexts or roles. Future research should investigate the long-term sustainability of distributed leadership and AI implementation in diverse educational systems and cultural contexts.

Practical implications – Educational leaders should institutionalize distributed leadership structures, invest in ongoing professional development, and prioritize digital access to prepare for AI-driven transformation. Policies and practices should prioritize ethics, equity and the ability to adapt agilely to technological change.

Social implications – Ensuring digital equity and inclusive access to AI-enhanced learning is a central social justice issue amplified by ongoing political and structural challenges. Responsive leadership and systemic equity initiatives are essential to prevent new forms of educational discrimination in AI-enabled schools.

Originality/value – This study offers a unique contribution by systematically connecting pandemic-era crisis leadership, particularly distributed leadership strategies and equity-focused practices, with the contemporary challenges of AI implementation in schools. By analyzing rich qualitative data from a diverse sample of principals navigating urgent technological change, the research advances understanding of how resilient, collaborative leadership models drive successful AI adoption. The findings bridge gaps in existing literature, emphasizing the transformative impact of ethical, adaptive leadership and proactive digital equity and providing actionable guidance for policymakers, practitioners and researchers seeking to foster inclusive educational innovation in rapidly evolving, AI-driven environments.

Keywords Principals, Educational leadership, Crisis leadership, AI leadership

Paper type Research article

Technology is seductive when what it offers meets our human vulnerabilities. – Sherry Turkle (p. 295)

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Introduction

The seismic disruption caused by the COVID-19 pandemic forced educational systems worldwide to rapidly adapt, thrusting technology to the forefront as both a necessity and a challenge. This crisis period not only accelerated the integration of digital tools but also exposed longstanding gaps in access, equity, and preparedness. The shift to remote and hybrid learning models compelled school leaders and educators to rethink established practices, develop new strategies for engaging students, and invest in professional development for emerging technologies. As schools navigated this unprecedented landscape, leaders imagined how technology might be a catalyst for deeper, systemic change (McLeod and Dulsky, 2021). Leaders are now taking these lessons beyond the pandemic to grapple with the next wave of technological transformation: artificial intelligence (AI). With AI poised to revolutionize decision-making, personalized learning, and administrative processes, the experiences and adaptations forged during the pandemic offer valuable insights and a critical foundation for educational leaders to best leverage AI-powered tools while upholding equity, well-being, and the irreplaceable human elements of teaching and leadership.

Recent analyses have highlighted a growing consensus among education leaders and policymakers across the political spectrum that American high schools, and, by extension, educational systems globally, are in urgent need of redesign to meet contemporary demands (Tiwari, 2023). The traditional educational model, established over a century ago, is increasingly seen as inadequate for preparing students with the competencies required for today's economy and for fostering the supportive relationships essential for student well-being and engagement.

The rapid advancement of AI is reshaping the job market, with projections indicating that up to 30% of current work hours in the U.S. could be automated by 2030 (Unuriode *et al.*, 2024). This shift could particularly affect routinized jobs while creating new demands for digital literacy, adaptability, and collaboration with intelligent technologies (Tiwari, 2023). This transformation of the demands and structure of the workforce underscores the necessity for schools to cultivate not only technical skills but also uniquely human capacities such as creativity, emotional intelligence, and the ability to learn and adapt, competencies that will be critical for navigating an AI-driven future (Akun and Greenhow, 2021).

Despite the wealth of commentary on the pandemic's impact and the rise of AI in education, a significant research gap remains. Few studies have systematically connected the insights of school leaders during the COVID-19 era, particularly those related to technology integration, equity, and crisis management, to the evolving implementation of AI in school leadership (For exceptions see: Karaköse *et al.*, 2021; Richardson *et al.*, 2025). Understanding how these lessons can shape, inform, and caution the adoption of AI is crucial for ensuring that this new technology enhances, rather than exacerbates, existing challenges.

While our qualitative dataset does not capture direct implementation of AI tools, it offers a rare, large-scale window into how school leaders navigated urgent, high-stakes technology decisions, equity concerns, and distributed problem-solving during the COVID-19 pandemic. We argue that these crisis-era experiences constitute a critical, and currently underexplored, foundation for anticipating and guiding how leaders will interpret and direct AI use in schools. Thus, the contribution of this study is not an empirical account of AI in practice, but a theoretically and empirically grounded framing of how pandemic-era leadership lessons can inform emerging AI leadership agendas. Further, this study bridges this gap by exploring lessons educational leaders have learned navigating urgent perpetual technological change and exploring how these lessons can inform the evolving role of AI in school leadership. Drawing on qualitative data from school leaders who navigated the pandemic, the study identifies relevant key themes as AI becomes increasingly integrated into educational practice. The following research questions guide this study:

RQ1. What insights have educational leaders learned about navigating urgent challenges and change? How can these insights inform the evolving role of artificial intelligence (AI) in school leadership?

In this sense, we extend existing AI leadership scholarship by foregrounding leaders' prior experiences with technology-driven crisis leadership as a lens for understanding their preparedness and concerns regarding AI, rather than treating AI as an isolated, decontextualized innovation. In the sections that follow, we use experiences and adaptive strategies school leaders formed to navigate crises during the COVID-19 pandemic to explore the emerging opportunities and challenges introduced by AI in educational contexts. We apply these findings to the current context of teaching, learning, and learning with AI to offer recommendations for policy, leadership development, and future research, emphasizing the critical balance between harnessing AI's potential and sustaining the human relationships at the heart of effective educational leadership.

Literature review

Artificial intelligence in educational leadership

The rapid advancement of artificial intelligence (AI) is reshaping the landscape of educational leadership, offering both unprecedented opportunities and complex challenges for school administrators and policy makers (Dangol *et al.*, 2025; Kafa, 2025; Fullan *et al.*, 2023; Richardson *et al.*, 2025). As AI technologies become increasingly integrated into school management and instructional environments, educational leaders are called upon to navigate a new era characterized by data-driven decision-making, enhanced operational efficiency, and evolving ethical responsibilities (Kafa, 2025; Karakose and Tülübaş, 2024; Secăreanu, 2025).

Much of the emerging AI educational leadership literature explores early ideas about the use of AI, outlining potential benefits, ethical risks, and governance challenges without extensive empirical evidence of how school leaders actually encounter or implement AI in their daily work. Empirical studies of leadership decisions about AI policy, planning, and implementation remain infrequent, particularly in K–12 contexts, and often focus on specific tools or technical outcomes rather than leaders' sensemaking, equity concerns, or distributed leadership practices (for an exception see: Kafa, 2025; Richardson *et al.*, 2025). The uneven implementation of AI (Dangol *et al.*, 2025) and gap in research on how leaders are thinking about, incorporating in their own work, and implementing AI programs in classrooms, make for an important moment to use the knowledge we have to support leaders in this new and pressing endeavor. To this end, there is a need for studies that, even if not observing AI directly, situate AI within leaders' existing experiences of technology, crisis, and equity work.

AI presents transformative potential for educational leadership by automating routine administrative tasks, providing actionable insights through predictive analytics, and supporting more personalized and adaptive learning experiences. School leaders are able to leverage AI powered tools to optimize resource allocation, streamline scheduling, and manage communication with students, families, and staff (Fullan *et al.*, 2023; Karakose and Tülübaş, 2024; Secăreanu, 2025). For example, AI-driven platforms can analyze vast datasets to identify students at risk of falling behind, enabling timely interventions and targeted support. This shift from reactive to proactive management is particularly valuable in today's complex educational environments, where leaders must balance multiple priorities and respond to rapidly changing circumstances (Richardson *et al.*, 2015; Tømte, 2024).

AI also enhances capacity for data-driven decision-making, allowing school leaders to base strategies on robust evidence rather than intuition alone (Karakose and Tülübaş, 2024; Secăreanu, 2025). By processing large volumes of data, AI tools can uncover patterns and trends that might otherwise go unnoticed, supporting leaders in identifying areas for

improvement and measuring the impact of new initiatives (Secăreanu, 2025). Furthermore, AI-powered communication tools, such as Chatbots and virtual assistants, can improve efficiency and responsiveness, freeing up leaders to focus on strategic planning and relationship-building (Kafa and Eteokleous, 2024; Karakose and Tülübaş, 2024; Tømte, 2024).

Despite its considerable promise, the integration of AI in educational leadership is accompanied by significant challenges (Karakose and Tülübaş, 2024; Qudrat-Ullah, 2024). One of the most pressing concerns is the risk of algorithmic bias, which can exacerbate existing inequities and disadvantage marginalized student populations (Secăreanu, 2025; U.S. Department of Education, 2023). AI systems that rely on incomplete or biased historical data may perpetuate unfair practices, such as differential access to learning resources or disciplinary actions (U.S. Department of Education, 2023). Ensuring fairness, transparency, and accountability in AI applications is therefore a critical responsibility for educational leaders (Akgun and Greenhow, 2022; Dangol *et al.*, 2025; Secăreanu, 2025).

AI adoption in education raises important questions about the evolving roles of school leaders and teachers. While AI can automate routine tasks and provide valuable insights, essential human elements like mentorship, empathy, and relationship-building remain irreplaceable (Dangol *et al.*, 2025; U.S. Department of Education, 2023; U.S. House Committee on Education and the Workforce, 2025). Educational leaders must balance leveraging AI's capabilities with preserving the human dimensions of teaching and learning (Akgun and Greenhow, 2022; Richardson *et al.*, 2025). To effectively harness AI's potential, leaders need nuanced understanding of both technical and ethical aspects of these technologies (Qudrat-Ullah, 2024). AI literacy has become a core competency for administrators, requiring not just technical skills but the ability to critically assess AI's implications for equity, privacy, and pedagogy (Qudrat-Ullah, 2024). AI offers significant opportunities to enhance educational leadership through improved efficiency, data-driven decisions, and personalized student support. However, realizing these benefits requires careful attention to ethics, data privacy, and potential unintended consequences. Leaders must prioritize AI literacy, equity, and preserving human elements central to effective education (Karakose and Tülübaş, 2024; U.S. Department of Education, 2023; Qudrat-Ullah, 2024). As demonstrated by our review, recent discussions on generative AI, algorithmic governance, and data ethics in education complicate leadership, posing questions about transparency and accountability. Our study examines how leaders' pandemic experiences with technology, data, and equity initiatives might inform the adoption or resistance to AI.

Theoretical framework

Distributed Leadership Theory (DLT) offers a concise yet powerful lens for understanding educational leadership as a collective practice rather than the work of a single individual (Spillane, 2005). From this perspective, leadership is an emergent property of organizational activity, a practice "stretched over people, situations, and tools" that depends on interdependent action, shared expertise, and collaborative sensemaking among multiple actors in the school community (Spillane, 2005; Harris and Jones, 2020; Tian *et al.*, 2016). At its core, DLT emphasizes expertise over formal authority and highlights how leadership capacity is mobilized across organizational levels as teachers, support staff, students, and community members work alongside administrators to interpret problems and enact responses (Spillane, 2005, 2006). Drawing on activity theory and sociocultural perspectives, DLT focuses attention on dynamic interactions among leaders (formal and informal), followers, and situational context (Spillane *et al.*, 1999), in contrast to traditional "great man" models that center on a single, hierarchical decision-maker. The following Table 1 summarizes core distinctions between traditional and distributed leadership models:

Table 1. Key distinctions between traditional and distributed leadership

Aspect	Traditional leadership	Distributed leadership
Main Actor	Single leader (principal, CEO)	Multiple agents (leaders, teachers, staff)
Authority	Hierarchical, position-based	Shared, expertise-based
Decision-Making	Top-down, centralized	Collaborative, networked
Flexibility	May be limited	High, adaptive to context
Knowledge Flow	Linear	Multidirectional
Examples in Schools	Principal mandates change	Leadership teams, teacher mentoring

Crisis leadership and adaptive capacity

This distributed perspective is especially salient in contexts of rapid change and crisis, such as the COVID-19 pandemic, where the scale and velocity of challenges routinely exceeded the capacity of any one leader (Harris and Jones, 2020). Crisis leadership addresses immediate responses to mitigate harm, while adaptive leadership emphasizes continuous learning and capacity-building in new realities (Brown *et al.*, 2023; Fernandes, 2024). In such contexts, the central question shifts from “Who is the leader?” to “How is leadership best distributed and coordinated?” (Smith and Riley, 2012). DLT conceptualizes this shift as an “adaptive infrastructure” that enables networked responsiveness, in which organizations sense, interpret, and respond at multiple points rather than relying on centralized decision-making (Harris and Jones, 2020). DLT in crisis settings is not merely about reallocating tasks; it involves cultivating shared mental models, collective sensemaking, and “relational trust” through transparent communication, collaborative professional learning, and prior shared decision-making experiences that become essential social capital under pressure. While transformational leadership foregrounds vision and inspiration and systems leadership emphasize cross-boundary alignment, DLT allows us to examine who actually holds influence, whose expertise is activated, and how everyday practices around data and technology are negotiated, questions at the heart of governing AI in schools (Kafa, 2025).

DLT is therefore a particularly useful framework for understanding technology integration, especially under urgent or large-scale conditions such as pandemic-driven shifts to remote learning (König *et al.*, 2020; Torrance *et al.*, 2023). Successful implementation of educational technologies requires far more than hardware procurement; it involves developing user proficiency, fostering pedagogical innovation, ensuring technical support, allocating resources with an equity lens, and sustaining ongoing professional learning systems (Lamb and Weiner, 2021; Richardson *et al.*, 2015). During COVID-19, leadership became increasingly distributed, digital, and networked, with schools relying heavily on technological infrastructures to support teaching and learning (Torrance *et al.*, 2023). Schools that had already cultivated collaborative professional cultures, invested in teacher leadership, and built structures for peer learning were better positioned to mobilize internal expertise, provide just-in-time professional development, troubleshoot emergent problems, and maintain instructional quality (Kraft and Simon, 2020).

The principal's evolving role in distributed technology leadership

Within this landscape, the principal's role in technology integration is less about being the sole decision-maker and more about facilitating distributed leadership processes in ways that support innovation and resilience (AlAjmi, 2022; Baker *et al.*, 2020; Gustafson and Haque, 2020). During the pandemic, principals took proactive steps to secure equitable access to devices, partnered with tech-savvy teachers to lead in-house professional development, and modeled digital communication and instructional practices (Beauchamp *et al.*, 2021; Chiu, 2022; Torrance *et al.*, 2023). They also acted as catalysts for grassroots innovation, sponsoring collaborative projects that reimaged assessment, scheduling, and school routines rather than

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reverting to pre-crisis norms (Virella, 2023, 2025). Through these distributed approaches to technology integration and crisis response, schools leveraged collective expertise, responded flexibly to evolving demands, and built organizational resilience and professional collaboration that extend beyond the immediate crisis.)

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Methods

Data collection

For this study, qualitative data were collected through semi-structured interviews with a diverse sample of public-school leaders from across the United States ($N = 50$). Participants were identified using purposeful sampling, a strategy that selects “information-rich cases” to provide deep insight into the research questions (Patton, 2015). Interviews were conducted between 2020 and 2022, a period marked by significant disruption and adaptation in K-12 education. The interviews explored leaders’ experiences with urgent decision-making, distributed leadership practices, professional development, technology access, and the emotional and psychological needs of staff and students. The semi-structured interview protocol included questions about leaders’ experiences with urgent decision-making, technology integration, equity, and the wellbeing of staff and students during the pandemic. To ensure consistency while allowing for individual expression, we used common prompts and follow-up questions. Each interview lasted approximately 50–65 min, generating a rich dataset of leaders’ reflections, strategies, and lessons learned.

Sample

The sample included principals and other administrators who served during the COVID19 pandemic and had direct experience navigating urgent, complex challenges related to technology integration, equity, crisis management, and rapid organizational change. There were 31 participants who identified as female and 19 as male. Participant ages ranged from 32 to 56 years with an average of 44 years, and their time in the principalship ranged from 1–27 years with an average of 7 years. There were 32 White (64%), 11 Black (22%), and six Latinx participants (10%). One participant identified as both White and Latinx. In this way, the sample ($N = 50$) offered a range of demographic backgrounds, allowing for a broad understanding of leadership responses during this unprecedented era (Creswell and Poth, 2018).

Data analysis

Data analysis followed an iterative, inductive approach consistent with grounded theory principles (Charmaz, 2014; Corbin and Strauss, 2015) and guided by Distributed Leadership Theory (Spillane, 2006) to capture how leaders interpreted and enacted their roles during COVID-19. All interviews were professionally transcribed and uploaded into Atlas.ti for systematic coding. Analysis proceeded through open coding to capture recurring language and in vivo descriptions, followed by axial coding to explore relationships and cluster codes into themes including “crisis response”, “distributed professional learning”, “technology access”, “equity”, and “emotional support” (Miles et al., 2020). Conceptual framework analysis (Jabareen, 2009) enabled iterative movement between inductive themes and deductive interpretation informed by DLT.

Rigor was supported through multiple strategies. Analytic memos captured first impressions, contradictions, and emergent questions after each interview (Boeije, 2002), creating an audit trail of analytic decisions. We conducted constant comparison across transcripts, memos, and codes to check for consistency and saturation. We discussed preliminary frameworks across the research team through peer debriefing, and selected participants reviewed thematic summaries for accuracy.

Data analysis

Data analysis followed an iterative, inductive approach consistent with grounded theory principles (Charmaz, 2014; Corbin and Strauss, 2015) and was guided by Distributed Leadership Theory (Spillane, 2006) to understand how leaders interpreted and enacted their roles during COVID-19. Interviews were professionally transcribed and uploaded into Atlas.ti, where we conducted open coding to capture participants' own language about crisis response, technology, equity, professional learning, and emotional support, followed by axial coding to examine relationships among codes and to develop themes such as "crisis response," "distributed professional learning," "technology access," "equity," and "emotional support" (Miles *et al.*, 2020). Conceptual framework analysis (Jabareen, 2009) supported iterative movement between inductively derived themes and deductive interpretation informed by DLT, with the theory functioning as a sensitizing rather than a fixed coding template.

Rigor was enhanced through analytic memos documenting first impressions, contradictions, and emergent questions after each interview (Boeije, 2002), constant comparison across transcripts, memos, and codes, and peer debriefing to refine the developing thematic framework. Selected participants reviewed thematic summaries to check resonance and accuracy. Reflexivity was supported through researcher positionality statements and ongoing memoing, and credibility was further strengthened by triangulating insights across interviews, memos, and theoretical constructs. Thick description in the findings section was used to support transferability. Together, these strategies generated a nuanced account of how educational leaders navigated technological, social, and organizational challenges during COVID-19 and how these experiences inform emerging questions about the evolving role of AI in school leadership.

Findings

The COVID-19 pandemic thrust schools into unprecedented disruption, requiring educational leaders to simultaneously function as crisis responders, technologists, and community organizers. Analysis of 50 interviews reveals leadership characterized by urgency, improvisation, and collective effort, with pandemic challenges catalyzing distributed responsibility and adaptive problem-solving. In the sections that follow, we present an in-depth analysis of emergent themes from these interviews, supported by data patterns across cases while illustrating context-specific variations.

Technology as solution and challenge

When crises abruptly disrupted traditional school operations, technology quickly emerged as both a lifeline and a source of new complexity. Leaders described an unprecedented compression of timelines, as tasks that once took months were now accomplished in days.

Everett, an elementary school principal, recalled, "We basically had three days from the Thursday of [lockdown] that we opened something that looked like virtual learning the following Tuesday because we didn't want to wait." This urgency forced reliance on whatever tools were immediately available, and many principals initially defaulted to the most accessible devices and platforms. As Everett continued, "So a lot of my communication was done through cellphones, because that was before we even knew what Zoom was, let alone used it as our predominant means of communication. So we did have a couple of staff meetings to talk about, "All right, what are we doing here? What is our goal? Where are we in the school year?" Some leaders rapidly developed centralized digital hubs to consolidate communication and resources. Rosalie, a K–21 principal, explained, "We knew everyone had a cellphone, so let's get a website. All the information will go there, all the contact information, all the news, everything, and we kind of made it like one-stop-shopping for families . . . Then, as we realized how long this closure was going to go on, the website morphed; we got technology and hotspots deployed to families." Her account illustrates how technology became a flexible platform for evolving solutions as new challenges emerged.

However, even when devices and hotspots were distributed, equitable access for all was not guaranteed. Diane, another elementary principal, noted, “The hard part was . . . if families could not afford the Internet, they could not log on, so our district tried to provide hotspots and devices, but that didn’t always work out.” In some communities, leaders turned to non-digital interventions to meet basic learning needs. Derrick, an elementary principal, shared . . . people are telling me to give them Chromebooks and hotspots . . . but a hotspot connotes that you have something. I had to use my money to print out stuff and send a bus over there and give them stuff.” As these principals describe, when the technological “solution” could not be implemented equitably, technology itself became part of the challenge.

Professional development had to keep pace with the influx of new tools and rapidly shifting expectations. Henry, an elementary principal, reflected, “On top of that, I had some staff members that really stepped up and helped me run some PD . . . how to use Google Classroom . . . how to run Zoom meetings, what are the pitfalls to recording.” For others, training was largely ad hoc and urgent. Kenny, a K–8 principal, described, “. . . next thing we knew we were designing an entire virtual program over spring break, trying to figure out how do we get this done, how do we get equipment to kids”. These accounts show how the same tools that enabled continuity of learning also amplified barriers related to infrastructure, affordability, and digital literacy; in schools with experienced staff and routines for distributing leadership, “tech champions” could quickly support peers, while schools without such capacity struggled to adopt new practices at the necessary pace.

As dependence on technology deepened, principals reported that basic communication failures, unreliable systems, and severe device shortages quickly became major obstacles to educational continuity and safety. In some districts, shortages were so acute that leaders resorted to extraordinary measures; Jennifer, an elementary principal, recalled “literally taking desktops out of the classroom and delivering them to parents’ households that didn’t have anything.” Leaders stressed that equity was inseparable from infrastructure: getting devices into students’ hands was only the first hurdle. Meaningful participation also required reliable connectivity, adequate support, and skills at home. Henry described taking a rapid inventory of limited Chromebooks and contacting families to assess need: “We took inventory of every Chromebook that we had in district, and it wasn’t many . . . We put a survey out to parents saying, ‘Let us know if you need a computer in your household . . . We’re going to get you at least one Chromebook . . .’” Despite such efforts, barriers such as a lack of Internet in rural communities or crowded homes meant technology provision remained an incomplete solution.

For many leaders, the pandemic underscored how digital divides layered onto existing social inequalities. Jordan, an elementary principal, reflected, “We had to figure out how to disseminate technology, we had to figure out how to engage kids, got to figure out how to enhance connectivity for families who had . . . either no Internet or poor Internet service, and we were literally risking our lives by going up to the school and having to do these things . . .” Gaps in access, support, and digital literacy were sharply pronounced, with families’ home environments and resources often tipping the balance between educational continuity and exclusion. There were, however, notable exceptions: a handful of schools that had invested in robust one-to-one device programs prior to the crisis were better positioned to respond rapidly and more equitably. “We did a Chromebook initiative, and my old school was the first to go one-to-one,” Jordan remarked, highlighting the value of proactive infrastructure for unpredictable events. Underneath these logistical and infrastructural concerns, many leaders expressed a values-driven commitment to ensuring that all students could progress. Steven, an elementary principal, summarized this stance by noting that the real work was in “building the children’s confidence and personality, that they can achieve in any fashion or form, was my goal.

Taken together, these experiences illustrate how technology functioned simultaneously as a solution and amplifier, providing essential tools for continuity while exposing and intensifying inequities in access, infrastructure, and support. Notably, this pattern of experiences was reported exclusively by elementary school principals in our sample, suggesting that the

challenges and solutions related to technology during the crisis may have manifested differently in elementary settings than in middle or high schools. Although participants did not specifically describe AI tools, their accounts of how digital platforms magnified both organizational strengths and inequities point to likely dynamics in AI adoption. Leaders' experiences with infrastructure gaps, opaque vendor systems, and uneven staff readiness suggest that similar issues, such as algorithmic opacity, data quality, and differential AI literacy, will shape whether AI serves to mitigate or deepen existing disparities in the future.

Culture of learning. Stories across contexts show that pre-crisis investment in professional culture and staff buy-in was critical to the relative success of COVID-era technology implementation. Schools and districts where leaders had already built technological competence, shared ownership, and open professional learning cultures navigated the shift to remote learning with greater agility and cohesion. Everett explained that "the goal was to really do some of that groundwork so that there was some staff buy-in to really hit the ground running next year with PD. Now, those were my big three priorities pre-COVID." This groundwork paid dividends as teachers and leaders who had developed confidence with digital tools through consistent exposure and collaborative professional development were able to transition to new platforms and virtual teaching models with less resistance and more creativity. For Michael, an elementary principal, the impact of prior investments in professional learning communities and staff technology readiness was clear: "Our district is very fortunate. We have a one-to-one initiative for all electronics devices . . . so when the time came, the adjustment was more about pedagogy than panic."

By contrast, the transition was much more challenging in schools where staff lacked prior training or where resistance to technology persisted. Leslie, an elementary principal, noted, "I have a veteran staff that did not take kindly to technology, even before I got here." In these contexts, leaders had to address not only technical gaps but also relational dimensions such as building trust, acknowledging anxieties, and partnering with teacher-leaders to provide hands-on, job-embedded support. As Anthony reflected, "There is no professional training that really prepares you for this. The coaching and mentoring support were what made it possible." The importance of immediate, practical training, "trial by fire PD," was echoed in Henry's account, where staff learned tools like Google Classroom and Zoom in real time while tech-savvy colleagues led informal peer-to-peer workshops and troubleshooting sessions.

Many leaders emphasized relational practices and distributed approaches to leadership development, often described as "learning together." Mark, a K-8 principal, explained, "I get a lot of support also from East coast leaders to leaders . . . just networking with other people, whether they're veteran or not, just other people doing this work." These distributed professional networks provided not only technical knowledge but also emotional support and shared sensemaking in a period of profound uncertainty. Professional development extended beyond technology content to include social-emotional learning, equity practices, and continual reflection. Trina described staff pursuing micro-credentials in gifted education to broaden their instructional repertoire, while Emilia highlighted a continued desire for deeper virtual teaching training: "I think some training and support around how to teach virtually . . . There was some to be fair, but I would have liked more." Emotional support, burnout prevention, and culturally responsive practice, as described by leaders such as Henry and Laura, were treated as integral components of ongoing adult learning rather than as add-ons.

Staff buy-in during COVID emerged less from top-down mandates than from collective, distributed, and relational processes that engaged educators at every level. Principals, teacher-leaders, and support staff modeled openness, coached peers, and surfaced real-time needs that shaped professional development priorities, as described by leaders such as Henry, Diane, and Dalton. Principals who trusted "tech champions" to lead tutorials fostered both skill development and team ownership, while schools where staff co-constructed solutions by designing just-in-time PD or curriculum pivots, reframed professional learning as a shared enterprise rather than a compliance exercise. As Everett and Mark emphasized, this distributed, collaborative approach built trust and collective efficacy, enabling educators to

adapt rapidly, advocate for resources, and provide mutual support. Professional development proved most effective when it was collaborative, flexible, and responsive to immediate needs, while grounded in pre-existing learning cultures that valued experimentation and mutual support.

The distributed professional learning networks that leaders built during the pandemic, where tech-savvy teachers mentored colleagues and cross-functional teams experimented with new tools, mirror the kinds of collaborative structures that will be necessary for ethical and effective AI integration. These findings suggest that, even without direct AI experience, leaders have already developed routines and relationships that could either facilitate or constrain future.

AI-related innovation, depending on how they are mobilized and resourced.

Limitations

It is important to note that the interviews were conducted during the height of the.

COVID-19 pandemic, before the widespread diffusion of generative AI tools in K–12 settings. As a result, participants spoke primarily about digital platforms, learning management systems, and other non-AI technologies rather than AI-specific tools or decision systems. Our analysis therefore does not provide direct empirical evidence of AI implementation; instead, we interpret leaders' pandemic-era technology work as a precursor and lens for thinking about future AI adoption.

Discussion

This study of 50 principals' COVID-19 experiences reveals critical insights for AI integration in educational leadership and responds to previous research, deepening our understanding of how educational leaders might approach AI use moving forward. In this study, the lens of distributed leadership helps us see how pandemic-era technological adaptations can inform current AI implementation challenges in schools.

Pandemic-era leadership teaches that successful AI implementation in schools must be rooted in adaptability, distributed expertise, and an unwavering commitment to equity. As leaders confronted crisis conditions, the shift away from top-down decision-making toward collaborative, networked leadership facilitated rapid problem-solving and resilient adaptation. These experiences provide a framework for integrating AI into educational practice: rapid integration of new tools is most effective when leaders actively empower teacher-leaders, nurture professional trust, and ensure equitable access to technology and training. The lessons of the pandemic, including the importance of urgency, improvisation, and relational trust, highlight that harnessing AI's potential demands ethical vigilance, systemic agility, and support for all stakeholders to navigate continuous change together. The AI integration literature highlights three themes about which our data offers further insight, foregrounding equity, balance of solution and challenge, and keeping humans at the center of work. We put the literature in conversation with our findings below.

Foregrounding equity

The AI literature warns of the importance of centering equitable resourcing and deployment of AI tools when thinking about educational policy and implementation as well as the built-in biases in generative AI tools. AI systems can perpetuate and amplify existing inequities, creating new forms of digital discrimination (Akgun and Greenhow, 2022; Dangol *et al.*, 2025; Secăreanu, 2025; U.S. Department of Education, 2023). The use of AI is unevenly distributed across schools and between classrooms and without careful resource management and implementation of new tools, the rapid adoption of AI could widen already concerning technology gaps between resourced and under-resourced schools (Dangol *et al.*, 2025). The literature also reminds us that AI incorporates concerning racial and gender algorithmic biases that may also deepen systemic

discrimination and exclusion, and without clarity from leaders that AI is not a neutral tool, schools become part of this system as well (Akgun and Greenhow, 2022).

Our findings speak to this imperative to foreground equity when planning for and implementing new technological tools, especially in a rapidly changing environments. In fact, this study's most significant finding is how the pandemic transformed digital equity from a peripheral concern to a central leadership imperative. The crisis exposed the digital divide as an immediate barrier to educational access, with principals adopting transformative practices that addressed systemic barriers and prioritized marginalized communities. Others have called attention to the digital divide for years (see Graves and Bowers, 2018 for an example), and the pandemic brought this equity crisis into even starker view. This finding extends the crisis equity leadership framework (Virella, 2023, 2025) by illustrating how digital access becomes a fundamental social justice issue.

Contemporary political attacks on equity initiatives across multiple national contexts, including DEI program rollbacks and restrictions on equity-focused curricula, and similar policies in countries such as Italy (Riboldi, 2019) and other European nations (European Commission, 2020), compound these concerns. The pandemic revealed that digital divides affect entire educational systems, making equity not merely a moral imperative but a practical necessity for comprehensive student outcomes (Fullan et al., 2023; Liu et al., 2024). When equity frameworks are dismantled, resulting gaps in digital access and AI literacy disadvantage entire generations in an increasingly AI-driven economy, educational leaders must recognize that current anti-equity policies represent fundamental threats to national competitiveness and educational advancement.

Balance of solution and challenge

The AI literature discusses the possibilities and potential pitfalls introducing AI in schools might bring (Karakose and Tülübaş, 2024; Richardson et al., 2015; Secăreanu, 2025), Dangol et al. (2025) find that teachers are not understanding AI integration as only threatening or supportive, but rather are “negotiating its [AI] role within their professional identities, pedagogical goals, and classroom relationships” (p. 2). AI can be useful in data-driven decision making and automating logistical tasks (Karakose and Tülübaş, 2024; Secăreanu, 2025) but can also create friction for schools as they think about the issues of equity (as discussed above) or skill-building.

In our findings as well, technology's dual nature as both solution and challenge emerged consistently across narratives. While digital tools enabled critical communication and instruction during crisis, they simultaneously exposed and amplified existing inequities and vulnerabilities. This finding challenges simplistic technology adoption narratives and build on the findings of Dangol et al. (2025) suggesting that impact is fundamentally shaped by context, preparation, and implementation intentionality. Technology functioned as an amplifier of existing organizational strengths and weaknesses, highlighting the importance of foundational infrastructure, staff capacity, and equity-oriented leadership when thinking about incorporating AI into school practices.

Keeping humans as the center of work

Building on the above, the AI literature reminds us that keeping humans at the center of AI work, allows it to be equitably and thoughtfully implemented in schools, especially when the tools, contexts, challenges, and possibilities are rapidly changing. (Dangol et al., 2025; Karakose and Tülübaş, 2024; Richardson et al., 2015; Tømte, 2024; U.S. Department of Education, 2023; Qudrat-Hullah, 2024). Our findings highlight that when using new technology rapidly and under pressure, distributed leadership that leverages human capital is most effective for successful and thoughtful implementation. The pandemic offered leaders an opportunity to shift from conventional top-down crisis leadership to adaptive, distributed models emphasizing collective sensemaking and continuous learning. As leaders were faced

with rapid pivots that relied on skills and experiences with which they might not be familiar, leaders needed to rely on others in the building to lead and inspire. Leaders discussed leveraging the experts already in the building to best use the resources and allowing more staff to get the help they needed quickly. Schools that were already practicing this type of distributed leadership were more successful when schools needed to change their ways of being and doing. When thinking about AI integration, leveraging the experiences and skills already present provides leaders the opportunity to practice distributed leadership and use resources more fully and equitably. AI will require learning new tools and skills in a pressure filled environment, similar to how technology was implemented during the pandemic. Schools that already have a supportive culture of learning will have more success in implementing AI tools, than those that do not. Thus, emphasizing the human elements of school culture and climate are vital to using new technological tools.

This evolution aligns with adaptive leadership theory (Heifetz *et al.*, 2009) while extending crisis leadership literature by showing how prolonged disruption creates durable organizational change (Virella, 2023, 2025). The progression from crisis to adaptive to agile leadership has profound implications for AI integration, suggesting that successful technology adoption requires fundamental shifts in how leadership is conceptualized and enacted, not merely technical implementation (Lamb and Weiner, 2021; König *et al.*, 2020; Warschauer and Matuchniak, 2020).

Our findings provide compelling evidence for the practical necessity of distributed leadership during a crisis. Participants consistently described how pandemic demands made centralized leadership unsustainable, requiring deliberate distribution of authority across organizational levels. This reinforces Spillane's (2005) distributed leadership framework while revealing how crisis conditions accelerate its adoption. For AI implementation, these insights are crucial: the complexity of AI systems, their varied educational applications, constantly shifting landscape, and the need for ongoing ethical oversight demand distributed expertise that cannot be concentrated in a single individual.

This study makes distinct contributions to school leadership for AI planning and integration by bridging crisis leadership literature with AI implementation frameworks and building on existing AI implementation literature. It demonstrates how distributed leadership theory provides a robust foundation for managing complex technological transitions while extending existing leadership theories into new technological territories. The findings offer empirically supported guidance for leaders preparing for AI adoption, filling a significant gap in the literature by theorizing how pandemic-era technological adaptation can inform contemporary.

AI implementation challenges.

Implications for policy, practice and future directions

The pandemic created an environment of shared crisis that significantly transformed how schools approached leadership decisions, gained staff commitment, and deployed technology and equity initiatives. Several clear implications have emerged for educational policy, practice and future research.

Policy

The crisis highlighted the need for systemic flexibility and responsive resource allocation (Virella, 2023, 2025). Districts and states should institutionalize funding models that can rapidly address technology gaps and provide ongoing infrastructure support, particularly for vulnerable students facing connectivity and device barriers, thus taking the burden off of schools and placing it onto more centralized systems. Strategic, ongoing investment in professional development and staff support, rather than one-time emergency measures, must become the norm, alongside regular feedback and iterative adaptation as part of formal policy frameworks.

Practice

Our data shows some schools thrived amid crisis by empowering teacher-leaders, leveraging multidisciplinary teams, and normalizing rapid cycles of feedback and adjustment. Going forward, professional development should focus equally on technology implementation and equity challenges, maintaining an explicit focus on staff wellbeing to prevent burnout. Structures built for crisis response, such as collaborative planning and distributed leadership, should be institutionalized as the foundation for ongoing practice.

Research

Future research should explore the sustainability of distributed leadership and perpetual technology evolution, with emphasis on iterative adaptation and stakeholder engagement in postcrisis contexts. Directly studying AI implementation with distributed leadership lenses will allow further development of the lessons learned in this study, specifically with a focus on equity.

Finally, continual dialog among policymakers, practitioners, and communities is essential to ensure that the hard-won lessons from the pandemic inform lasting, meaningful change, rather than fleeting solutions.

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