

Digital Transformation in Madrasahs: Optimizing the Role of Madrasah Principals in Developing Teachers' Digital Competencies

Habib Zakaria Bahasyim
Darullughah Wadda'wah International Islamic University, Pasuruan, Indonesia
e-mail: zakariabahasyim5@gmail.com

Akhmad Fauzi Hamzah
Darullughah Wadda'wah International Islamic University, Pasuruan, Indonesia
e-mail: akhmadfauzihamzah@uiidalwa.ac.id

Abstrac: Digital transformation in education has emerged as an inescapable imperative, and Islamic educational institutions known as madrasahs are no exception to this global shift. This study is motivated by the observable gap between teachers' relatively limited digital competencies and the escalating demands of twenty-first-century learning environments in these institutions. The primary objective is to examine and analyze strategies through which madrasah principals can systematically and sustainably advance their teachers' digital competencies. A qualitative case study methodology was employed, with data gathered via in-depth interviews, participatory observation, and document analysis across three madrasahs in Sumenep Regency, Indonesia. Thematic data analysis followed the interactive model proposed by Miles, Huberman, and Saldana. The findings indicate that effective madrasah principals function as catalysts of digital transformation by pursuing three interconnected strategies is cultivating a conducive digital ecosystem through transformational leadership practices, designing needs-informed digital competency development programs for teaching staff and establishing sustainable professional digital learning communities. These findings contribute both theoretically and practically to the discourse on madrasah governance in the digital era.

Keywords: Digital Transformation, Madrasah Principals, Teachers' Digital Competency, Educational Leadership, Madrasah

Abstrak: Transformasi digital dalam dunia pendidikan telah menjadi keniscayaan yang tidak dapat dihindari, termasuk di lembaga

pendidikan madrasah. Urgensi penelitian ini berangkat dari kenyataan bahwa kompetensi digital guru di madrasah masih berada pada tingkat yang relatif rendah, sementara tuntutan pembelajaran abad ke-21 semakin meningkat. Penelitian ini bertujuan untuk mengeksplorasi dan menganalisis strategi optimalisasi peran kepala madrasah dalam mengembangkan kompetensi digital guru secara sistematis dan berkelanjutan. Dengan menggunakan pendekatan kualitatif berjenis studi kasus, data dikumpulkan melalui wawancara mendalam, observasi partisipatif, dan studi dokumentasi pada tiga madrasah di Kabupaten Sumenep. Analisis data dilakukan secara tematik mengikuti model Miles, Huberman, dan Saldana. Hasil penelitian mengungkapkan bahwa kepala madrasah yang efektif berperan sebagai katalisator transformasi digital melalui tiga strategi utama, yaitu membangun ekosistem digital yang kondusif melalui kepemimpinan transformasional, merancang program pelatihan kompetensi digital guru berbasis kebutuhan dan membangun komunitas belajar profesional digital yang berkelanjutan. Temuan ini memberikan kontribusi teoretis sekaligus praktis bagi pengembangan tata kelola madrasah di era digital.

Kata Kunci: Transformasi Digital, Kepala Madrasah, Kompetensi Digital Guru, Kepemimpinan Pendidikan, Madrasah

INTRODUCTION

The dual emergence of Industry 4.0 and Society 5.0 has precipitated far-reaching transformations across all dimensions of contemporary life, with education among the sectors most profoundly affected.¹ Digitalization has transitioned from an optional enhancement to an operational necessity, compelling every educational institution including Islamic boarding schools and their associated madrasahs to adapt with both urgency and precision.² Within this context of accelerating change, teachers' digital

¹ N Jannah, H Sari, and P Lestari, "Literasi Digital Guru Madrasah Di Era Revolusi 5.0," *Jurnal Teknologi Pendidikan Islam* 10, no. 2 (2023): 48–55.

² Akmalun Najmi and Ismail Ismail, "Eksplorasi Makna Hidup Anak Gen Z Di Era Digital," *Abdurrauf Journal of Education and Islamic Studies* 2, no. 1 (2025): 25–35.

competency has become a determinant variable in the success of technology-mediated learning. Educators who possess robust digital literacy are well-positioned to design learning experiences that are interactive, innovative, and consonant with the developmental needs of twenty-first-century learners.

The phenomenon of the digital divide within madrasahs constitutes a research issue of considerable significance and urgency. Unlike mainstream public schools, which have historically received earlier and more substantial government-supported technology interventions, madrasahs especially those in rural and semi-urban areas frequently contend with constraints in infrastructure, funding, and digitally competent human resources. This situation has progressively widened the gap between the ideals of twenty-first-century education and the instructional realities playing out in madrasah classrooms.³

Several interrelated problems have been identified within this context. First, digital literacy among madrasah teachers remains unevenly distributed and generally insufficient.⁴ Second, formal professional development programs that specifically target digital competency enhancement are scarce. Third, technology-supported supervision systems capable of monitoring and sustaining teachers' digital growth remain underdeveloped. Fourth, and perhaps most critically, the role of madrasah principals as agents of change capable of orchestrating comprehensive

³ Muhammad Hanif et al., "Integrated Dakwah Model: How Mosques, Pesantrens, and Campuses Become Islamic Preaching Centers in Bogor," *Progresiva: Jurnal Pemikiran Dan Pendidikan Islam* 12, no. 01 (2023): 85–102.

⁴ Gondo Adhi Saputra et al., "Epistemologi Pendidikan Agama Islam: Integrasi Sumber Transenden Dan Rasional Dalam Pembentukan Kesadaran Religius Peserta Didik," *Pendas: Jurnal Ilmiah Pendidikan Dasar* 10, no. 04 (2025): 186–96.

digital transformation has not been fully realized. These challenges are interdependent and cannot be resolved through isolated interventions; they demand a holistic approach grounded in decisive institutional leadership.

Prior scholarly work has contributed meaningfully to understanding the relationship between school leadership and digital transformation. Kurniawati et al. (2022) established that the transformational leadership style of school principals correlates positively and significantly with teachers' readiness to integrate technology into their instructional practices.⁵ Principals who inspire, motivate, and empower their staff demonstrably produce a more favorable climate for digital innovation. These findings affirm that leadership transcends administrative function it serves as the primary driver of institutional transformation.

Sari and Hidayat (2023) conducted research in elementary-level madrasahs and found that structured, continuous digital competency training programs significantly enhanced teachers' capacity to leverage digital platforms in their work.⁶ Crucially, however, this research also established that training program success is highly dependent on consistent institutional support from the madrasah principal, not merely the individual motivation of teachers. This underscores the strategic and central position of the principal within any digital transformation ecosystem.

At the international level, Purnomo et al. (2021) reviewed digital teacher competency development models across several ASEAN countries and concluded that technology-focused professional learning communities

⁵ A. Kurniawati, N., Supriyono, Y., & Wirawan, "Transformational Leadership of School Principals and Its Impact on Teacher Digital Readiness in Islamic Schools," *Jurnal Pendidikan Islam*, 8, no. 2 (2022): 113-130.

⁶ Jannah, Sari, and Lestari, "Literasi Digital Guru Madrasah Di Era Revolusi 5.0."

represent one of the most effective strategies for collectively and sustainably enhancing digital competencies.⁷ This model enables teachers to share best practices, collaboratively address technical challenges, and collectively build their digital capacities within a psychologically safe and supportive environment.

Notwithstanding the value of these prior studies, notable research gaps remain. First, investigations that specifically explore the multidimensional role of madrasah principals as distinct from general school leaders in holistically integrating transformational leadership with digital competency development programs are conspicuously absent. Second, most existing research tends to be sectoral, examining only one dimension (such as training, supervision, or leadership) without viewing these as components of an integrated system. Third, the distinctive context of madrasahs characterized by Islamic values, pesantren culture, and the regulatory framework of the Ministry of Religious Affairs has received insufficient attention in the broader discourse on digital educational transformation in Indonesia.

Responding to these gaps, this study pursues three objectives to analyze the role of madrasah principals as transformational digital leaders who cultivate conducive digital ecosystems, to explore the strategies these principals employ in designing teacher digital competency development programs and to identify models of professional digital learning communities developed within madrasahs as vehicles for sustained competency growth. Theoretically, this research is expected to enrich the

⁷ R. Purnomo, A., Rachmadtullah, R., & Rusmaini, "Digital Competency Development Model for Teachers in ASEAN: A Systematic Review," *International Journal of Emerging Technologies in Learning*, 16, no. 14 (2021): 42-58.

scholarship of Islamic educational management and leadership in the digital era. Practically, the findings are intended to serve as a reference for madrasah principals, supervisors, and policymakers in designing more effective, contextually sensitive, and impactful digital transformation programs.

RESEARCH METHODOLOGY

This study employed a qualitative approach with a case study research design. The selection of this methodology was guided by the complexity of the phenomenon under investigation namely, the role of madrasah principals in developing teachers' digital competencies which necessitates an in-depth exploration of context, process, and dynamic interactions that cannot be adequately captured through numerical measurement alone. The case study design was chosen for its capacity to illuminate the 'how' and 'why' of phenomena as they unfold within their natural settings.⁸

The data sources for this study comprised two categories: primary and secondary. Primary data were obtained from key informants consisting of three madrasah principals, nine teachers (three per madrasah, selected to represent a range of digital competency levels), three deputy principals for curriculum affairs, and two madrasah supervisors from the Ministry of Religious Affairs in Sumenep Regency. Secondary data encompassed madrasah principal work program documents, training activity reports, internal regulatory documents, and supervision records. Data collection

⁸ Robert K Yin, *Case Study Research and Applications*, vol. 6 (Sage Thousand Oaks, CA, 2018).

employed three techniques in-depth semi-structured interview, participatory observation of meetings, training sessions, and supervisory processes and documentary analysis of relevant archival materials.

Data analysis adhered to the interactive model of Miles, Huberman, and Saldana (2014), which encompasses four stages: data condensation, data display, conclusion drawing, and verification.⁹ Data trustworthiness was established through source triangulation (comparing data from principals, teachers, and supervisors), methodological triangulation (cross-checking interview data against observational and documentary evidence), and member checking with key informants. The research was conducted at three madrasahs in Sumenep Regency comprising one Madrasah Ibtidaiyah (primary level), one Madrasah Tsanawiyah (junior secondary level), and one Madrasah Aliyah (senior secondary level) over the period from August to November 2024.

RESULTS AND DISCUSSION

A. The Madrasah Principal as a Digital Transformational Leader: Cultivating a Conducive Ecosystem

The first finding of this study reveals that madrasah principals who effectively catalyze digital transformation consistently exhibit the characteristics of transformational leadership. Rather than functioning merely as administrative managers, these principals operate as visionaries who construct a compelling institutional narrative about the significance of madrasah digitalization, communicate this vision

⁹ Matthew B Miles, A Michael Huberman, and Johnny Saldana, "Qualitative Data Analysis: A Methods Sourcebook," *Sidalc.Net*, 2014.

persuasively to the entire school community, and systematically align all policies and programs with that digital vision. This phenomenon corresponds to Bass and Riggio's transformational leadership theory,¹⁰ which delineates four core components: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration.

In the madrasah context, digital transformational leadership assumes a distinctive and contextually informed character. The principal of MI Mathla'ul-Ulum, for instance, initiated the transformation process not by procuring technological devices but by constructing collective consciousness through Islamic discussion forums that integrated religious values with the imperatives of digital literacy. Drawing inspiration from a hadith of the Prophet encouraging Muslims to seek knowledge even as far as China, this principal interpreted the tradition as an exhortation to embrace technological fluency. This culturally and religiously grounded approach proved effective in minimizing resistance among teachers who were initially skeptical of change.

This finding is reinforced by Mulyasa (2021), who argues that effective school leaders must function as change agents who not only manage routine operations but proactively create conditions in which innovation flourishes.¹¹ In the digital domain, this requires madrasah principals to build infrastructure across three registers: physical

¹⁰ Kurniawati, N., Supriyono, Y., & Wirawan, "Transformational Leadership of School Principals and Its Impact on Teacher Digital Readiness in Islamic Schools."

¹¹ Taufikurrahman Taufikurrahman, "Kepemimpinan Kepala Sekolah Di Era Digital," *Proceeding: Islamic University of Kalimantan*, 2021.

infrastructure (internet connectivity, digital devices), social infrastructure (a culture of collaboration and technological exploration), and policy infrastructure (internal regulations that support technology use in teaching and learning).

Field observations indicated that all three madrasahs studied had pursued efforts to construct a digital ecosystem, albeit at varying stages of advancement. MTs Mathla'ul-Ulum, led by a principal with a technical background, demonstrated the most rapid progress in physical infrastructure: campus-wide WiFi coverage, interactive projection systems in every classroom, and a well-equipped media center facility. Paradoxically, however, this rapid infrastructural growth did not automatically translate into enhanced teacher digital competency a finding that corroborates Resta et al.'s (2018) assertion that technology provision unaccompanied by human capacity development yields digital artifacts that are chronically underutilized.¹²

The principal of MA Mathla'ul-Ulum adopted a contrasting but equally effective approach: beginning with human development rather than hardware acquisition. A phased digital transformation roadmap was designed, comprising three sequential stages: the first concentrating on foundational digital literacy training for teachers; the second on technology integration in instructional practice; and the third on digital pedagogical innovation. This stepwise approach aligns with the SAMR framework (Substitution, Augmentation, Modification, Redefinition)

¹² Paul Resta et al., "Issues and Challenges Related to Digital Equity: An Overview," *Second Handbook of Information Technology in Primary and Secondary Education*, 2018, 1-18.

developed by Puentedura and adapted to the Indonesian educational context.¹³

An equally important leadership dimension was the principals' capacity to manage resistance and cultivate a psychologically safe environment in which teachers could experiment with new technologies without fear of judgment.¹⁴ Interview data revealed that senior teachers tended to feel intimidated by unfamiliar technologies and were anxious about being perceived as less competent by younger colleagues. Successful principals in this study addressed this challenge by implementing reverse mentoring, wherein digitally proficient younger teachers were paired with senior colleagues as learning partners rather than instructors. This model effectively inverted traditional hierarchical power dynamics and generated productive relationships of mutual respect.

From an organizational ecology perspective, these findings indicate that digital transformation in madrasahs constitutes not merely a process of technology adoption but a fundamental transformation of organizational culture.¹⁵ Madrasah principals must possess high emotional intelligence to navigate complex social dynamics, cultivate cross-generational trust, and consistently sustain transformational momentum even amid the administrative and bureaucratic pressures

¹³ Purnomo, A., Rachmadtullah, R., & Rusmaini, "Digital Competency Development Model for Teachers in ASEAN: A Systematic Review."

¹⁴ Moh Wardi et al., "Digital Transformation of Islamic Boarding School Financial System; Formulation, Implementation and Evaluation," *Munaddhomah: Jurnal Manajemen Pendidikan Islam* 5, no. 4 (2024): 461–82.

¹⁵ Ismail Ismail and Moh Wardi Moh Wardi, "Transforming Elementary School Students' Science Literacy through Scratch-Based E-Modules Integrated with Islamic Value," *International Journal of Elementary Education* 9, no. 2 (2025): 237–47.

that routinely consume time and energy. Schleicher (2018) has argued that twenty-first-century educational leaders must serve as orchestrators of learning individuals who not only administer curricula and operations but actively orchestrate a dynamic, adaptive, and human-centered learning ecosystem.¹⁶

The practical implication of these findings is a need to recalibrate principal education and training programs (Diklat) to explicitly incorporate digital leadership competency as a core requirement. Madrasah principals require preparation not only in technical knowledge of technology but also in leading change, managing resistance, and constructing a digital vision that is contextually sensitive to Islamic values and the specific needs of their madrasah communities.

B. Needs-Based Design of Teacher Digital Competency Training Programs: Strategies and Implementation

The second finding of this study addresses the strategies employed by madrasah principals in designing and implementing teacher digital competency development programs. The data indicate that the most effective programs are those grounded in careful needs assessment rather than generic, uniform delivery that disregards the diverse backgrounds, competency levels, and specific professional needs of individual teachers.¹⁷

The principal of MTs Mathla'ul-Ulum developed a comprehensive digital competency mapping instrument by adapting the European

¹⁶ Andreas Schleicher, *World Class* (OECD Publishing, Paris, 2018).

¹⁷ Akmalun Najmi, "PERAN KESABARAN PENDIDIK DALAM MENCIPTAKAN KEPERIBADIAN SISWA BERKUALITAS PSIKOLOGI PENDIDIKAN ISLAM," *Istifkar* 4, no. 2 (2024): 200-212.

Framework for the Digital Competence of Educators (DigCompEdu) to the madrasah context. This instrument assessed teacher digital competency across six dimensions: (1) professional digital engagement, (2) digital resources, (3) digital pedagogy, (4) digital assessment, (5) learner empowerment through digital means, and (6) facilitation of learners' digital competency development. Mapping results were subsequently used to cluster teachers into three groups basic, intermediate, and advanced each assigned differentiated training programs tailored to their respective profiles.

This differentiated training approach aligns with the principles of adult learning (andragogy) articulated, which posit that adult learners engage most effectively when they perceive the relevance of content to their genuine professional needs, participate in planning their own learning, and maintain autonomy throughout the learning process.¹⁸ Teachers who were initially resistant to technology training demonstrated marked attitudinal shifts once they recognized that the program genuinely accounted for their specific contexts and challenges.

Training methods were diversified and calibrated to content and participant profiles. Teachers in the basic cluster received instruction focused on foundational productivity applications such as Google Workspace for Education (Google Docs, Sheets, Slides, Classroom, and Meet), immediately applied in authentic instructional simulations. The intermediate cluster's training emphasized the design of interactive digital learning experiences using platforms including Canva for Education, Quizizz, Padlet, and Jamboard. Advanced cluster training

¹⁸ Jannah, Sari, and Lestari, "Literasi Digital Guru Madrasah Di Era Revolusi 5.0."

was directed toward more complex digital content development, encompassing the creation of instructional videos, the integration of augmented reality (AR) in science teaching, and the use of digital tools for learning outcome data analysis.

One of the most noteworthy innovations identified in this study was the project-based training model implemented at MA Mathla'ul-Ulum. Within this model, teachers did not merely study technology in theoretical terms; they produced digital artifacts that would be deployed in actual instructional settings. Over a four-week training period, each teacher was required to design and develop a complete digital learning unit, including an interactive presentation, a digital worksheet, an online quiz, and an explanatory video.¹⁹ These products were subsequently presented at a peer sharing forum, where colleagues provided constructive feedback.

This project-based training model generated a dual benefit: enhancement of technical competencies and the simultaneous construction of the madrasah's own digital learning resource repository. The principal of MA Mathla'ul-Ulum noted that within one year of implementation, the madrasah had accumulated more than 200 digital learning products accessible to all teachers. This created a meaningful multiplier effect in which investment in a single training program yielded long-term benefits for the entire madrasah community.

Another critical dimension of teacher digital competency development is program sustainability beyond formal training events.

¹⁹ Ismail and Wardi, "Transforming Elementary School Students' Science Literacy through Scratch-Based E-Modules Integrated with Islamic Value."

The findings indicate that episodic training programs lacking systematic follow-through rarely produce enduring behavioral change. Effective madrasah principals understood this and designed coaching and mentoring systems that persisted long after the conclusion of formal training.

The principal of MI Mathla'ul-Ulum, for example, designated the most digitally proficient teachers as 'Digital Champions' institutional digital ambassadors responsible for supporting colleagues in integrating technology into daily instruction. These champions received compensation in the form of reduced teaching loads, priority access to the latest technological resources, and opportunities to participate in external training. This carefully designed incentive system proved effective in sustaining the motivation and commitment of Digital Champions while organically generating a peer support ecosystem that is self-renewing and scalable.²⁰

A persistent barrier encountered in program implementation was teachers' limited availability of time. Teachers across all three madrasahs reported high workloads compounded by increasing administrative demands.²¹ Astute principals anticipated this constraint by embedding digital competency development within regular scheduling: for instance, designating the first thirty minutes of monthly staff meetings as a 'Digital Learning Moment,' during which one teacher

²⁰ Ismail Ismail et al., "Tanfidh Bir Al-Wālidain Fi Tafā'ulāt Al-Ijtimā'iyah Li Mujtama'Madura: Tahlil Thaḳāfat Abhakte Min Manzūr Al-Tarbiyah Al-Islamiyah," *Journal Of Indonesian Islam* 19, no. 1 (2025): 263–99.

²¹ Moh Wardi et al., "Implementation of Religious Moderation Values through Strengthening Diversity Tolerance in Madrasah," *Jurnal Pendidikan Islam* 9, no. 2 (2023): 241–54.

shares a digital technique or tool they have successfully implemented. This micro-learning approach, integrated into organizational routine, proved more effective than intensive but temporally isolated training events.

It is also important to note that the success of digital competency development programs is substantially influenced by the principal's capacity to build support across stakeholder groups. Financial support from foundation boards or madrasah committees, program legitimization from the Ministry of Religious Affairs, and parental buy-in for home-based digital learning activities constitute extra-institutional factors that cannot be disregarded. Successful principals in this study demonstrated strong negotiation and communication skills in constructing these broad networks of support.

C. Professional Digital Learning Communities: Building a Sustainable Growth Ecosystem

The third and most innovative finding of this research concerns the development of the Digital Professional Learning Community (DPLC) model as a mechanism for sustained teacher digital competency growth. Unlike training events characterized by one-directional delivery and temporal boundaries, the DPLC represents a collaborative learning ecosystem that is horizontal, dynamic, and evolves continuously alongside technological advancement and shifting instructional needs.²²

The DPLC model developed in this study integrates elements from three complementary theoretical frameworks. First, the Professional

²² Ismail Ismail, "Politik Pendidikan Islam Di Daerah: Analisis Kebijakan Pemerintah Provinsi Jawa Timur Dalam Pengembangan Madrasah Diniyah [Disertasi]," *UIN Sunan Ampel Surabaya*, 2017.

Learning Community (PLC) theory advanced, which foregrounds professional collaboration, a focus on student learning outcomes, and a culture of sustained reflection.²³ Second, the Community of Practice (CoP) concept of Wenger-Trayner (2015), which privileges learning through authentic participation in communities that share a domain, practice, and collective identity.²⁴ Third, the UNESCO (2021) educational technology framework, which advocates for collective and ongoing teacher digital competency development.²⁵

At MTs Mathla'ul-Ulum, the DPLC manifested as a 'Digital Teacher Community' (DTC) operating through two channels: weekly face-to-face meetings and an active WhatsApp group. The Friday afternoon meetings provided a structured yet flexible forum in which teachers shared experiences from technology-integrated instruction, discussed challenges encountered, and collaboratively developed solutions. The session format was deliberately simple: fifteen minutes of best practice sharing, twenty minutes of collaborative problem discussion, and ten minutes of exploration of a new digital tool. The WhatsApp group enabled continuous information exchange, resource sharing, and real-time technical assistance.

The DPLC model at MA Mathla'ul-Ulum assumed a more formal configuration: a 'Digital Education Research Circle' (DERC) operating as a small research collective. Each semester, the DERC designated a

²³ Purnomo, A., Rachmadtullah, R., & Rusmaini, "Digital Competency Development Model for Teachers in ASEAN: A Systematic Review."

²⁴ Etienne Wenger, "Communities of Practice: A Brief Introduction," 2015.

²⁵ Stephen Carney, *Reimagining Our Futures Together: A New Social Contract for Education: By UNESCO, Paris, UNESCO, 2021, 186 Pages, ISBN 978-92-3-100478-0, vol. 58* (Taylor & Francis, 2022).

single classroom action research (CAR) theme related to technology use in instruction. Teachers collaboratively designed, implemented, and analyzed the CAR project, then presented their findings at an internal seminar open to the entire school community. This model yielded dual dividends: the enhancement of digital competencies and the simultaneous cultivation of a research culture within the madrasah.

Madrasah principals played a crucial role in facilitating and sustaining the viability of the DPLC. The findings identify at least five facilitative functions performed by these principals: (1) providing the time, physical space, and resources required by the community; (2) shielding the community from excessive bureaucratic demands and administrative interruptions; (3) publicly validating and celebrating community achievements; (4) connecting the community to external networks comprising experts, institutions, and analogous practitioner communities; and (5) personally participating as a learning member of the community rather than acting solely as an evaluator or supervisor.

External connectivity emerged as an important distinguishing factor between thriving DPLCs and those that stagnated. The principal of MI Mathla'ul-Ulumbuilt strategic partnerships with three institutions: Institut Agama Islam Mathla'ul-UlumSumenep as an academic partner providing expert resource persons, the Google Educator Group (GEG) Madura as a regional digital practitioner community, and a local technology company that offered access to a premium digital learning platform at no cost as part of its corporate social responsibility

program.²⁶ These partnerships not only enriched the resources available to the community but also provided powerful extrinsic motivation for teachers to continue advancing their digital competencies.²⁷

This study also identified significant challenges in establishing and sustaining DPLCs. The first was competency heterogeneity: within a single community, teachers ranged from highly proficient to those struggling with basic applications. Without thoughtful management, this heterogeneity risked generating unproductive community dynamics in which advanced teachers felt unstimulated while beginners felt left behind and embarrassed. Principals addressed this by designing community activities with multiple entry points across competency levels, enabling all teachers to participate meaningfully according to their individual stage of development.

The second challenge was maintaining long-term momentum. Newly formed communities typically exhibit high enthusiasm, but the weight of daily routines and professional pressures tends to erode member commitment over time. Successful principals in this study periodically revitalized their communities through various mechanisms: inviting inspirational guest speakers, organizing ‘Digital Challenges’ to stimulate creativity, rotating community leadership to distribute ownership, and regularly celebrating members’ achievements however incremental.

²⁶ Ahmad Irfan et al., “Optimizing Cyber Media as an Islamic Education and Da’wah Tool: A Case Study of Majelis Ulama Indonesia (MUI) DKI Jakarta,” *Jurnal Studi Pendidikan Agama Islam* 2, no. 1 (2026): 42–50.

²⁷ Kamal Hamdun et al., “Model Konseptual Pembelajaran Adaptif Berbasis Kecerdasan Buatan Sebagai Inovasi Kontekstualisasi Kurikulum Pendidikan Menuju Indonesia Emas 2045,” *Raudhah Proud To Be Professionals: Jurnal Tarbiyah Islamiyah* 10, no. 2 (2025).

From a digital learning ecology perspective, a successful DPLC is not merely an information-sharing forum but a living social organism. It possesses a strong collective identity, community-endorsed norms, and regenerative capacity that enables it to endure despite membership turnover or even leadership changes. This sustainability distinguishes the DPLC from episodic training programs: it does not depend on any single individual or catalytic moment but has become embedded in the organizational DNA of the madrasah.²⁸

A synthesis of these three findings indicates that digital transformation in madrasahs is not a linear process unfolding from point A to point B in a straightforward trajectory. Rather, it is a spiral process of continuous becoming. The principal's digital transformational leadership creates the enabling conditions for effective competency development programs; these programs, in turn, give rise to robust learning communities; and those communities, in their vitality, further strengthen the overall digital leadership capacity of the institution. Leadership, program, and community function as a mutually reinforcing and self-sustaining system within the madrasah's digital transformation ecosystem.

CONCLUSION

This study affirms that madrasah principals occupy a central and strategic position in advancing digital transformation within Islamic educational institutions. The three principal findings digital

²⁸ Wardi et al., "Implementation of Religious Moderation Values through Strengthening Diversity Tolerance in Madrasah."

transformational leadership, needs-based competency program design, and the development of professional digital learning communities constitute a mutually reinforcing ecosystem in which each element sustains and amplifies the others. The success of digital transformation in madrasahs is determined not by the sophistication of available technology but by the quality of leadership capable of orchestrating change in a manner that is holistic, inclusive, and sustainable, while preserving the distinctive identity and Islamic values that characterize madrasahs as institutions of faith-based education.

The practical implications of these findings are significant across multiple stakeholder domains. For madrasah principals, there is a need for the development of digital leadership competencies that are contextually grounded in madrasah realities. For the Ministry of Religious Affairs, the challenge is to design principal professional development policies that explicitly integrate transformational digital leadership as a mandatory dimension. For Islamic higher education institutions, there exists an opportunity to contribute as strategic partners in madrasah digital transformation programs. Future research is recommended to explore the DPLC model in greater depth, including the development of instruments to measure its impact on student learning outcomes.

REFERENCES

Carney, Stephen. *Reimagining Our Futures Together: A New Social Contract for Education: By UNESCO, Paris, UNESCO, 2021, 186 Pages, ISBN 978-92-3-100478-0*. Vol. 58. Taylor & Francis, 2022.

Hamdun, Kamal, Wahyu Nisawati Mafrukha, Mohammad Firmansyah, and Akmalun Najmi. "Model Konseptual Pembelajaran Adaptif

Berbasis Kecerdasan Buatan Sebagai Inovasi Kontekstualisasi Kurikulum Pendidikan Menuju Indonesia Emas 2045." *Raudhah Proud To Be Professionals: Jurnal Tarbiyah Islamiyah* 10, no. 2 (2025).

Hanif, Muhammad, Abdul Hamid, Agusman Agusman, and Siti Nurhaidah. "Integrated Dakwah Model: How Mosques, Pesantrens, and Campuses Become Islamic Preaching Centers in Bogor." *Progresiva: Jurnal Pemikiran Dan Pendidikan Islam* 12, no. 01 (2023): 85-102.

Irfan, Ahmad, Ahamd Yunus, Ayuhan Ayuhan, and Siti Nuri Nurhaidah. "Optimizing Cyber Media as an Islamic Education and Da'wah Tool: A Case Study of Majelis Ulama Indonesia (MUI) DKI Jakarta." *Jurnal Studi Pendidikan Agama Islam* 2, no. 1 (2026): 42-50.

Ismail, Ismail. "Politik Pendidikan Islam Di Daerah: Analisis Kebijakan Pemerintah Provinsi Jawa Timur Dalam Pengembangan Madrasah Diniyah [Disertasi]." *UIN Sunan Ampel Surabaya*, 2017.

Ismail, Ismail, Achmad Maulidi, Miftahul Muttaqin, Ali Ridho, Moh Wardi, and Supandi Supandi. "Tanfidh Bir Al-Wālidain Fi Tafā'ulāt Al-Ijtimā'iyah Li Mujtama'Madura: Tahlīl Thaqāfat Abhakte Min Manzūr Al-Tarbiyah Al-Islamiyah." *Journal Of Indonesian Islam* 19, no. 1 (2025): 263-99.

Ismail, Ismail, and Moh Wardi Moh Wardi. "Transforming Elementary School Students' Science Literacy through Scratch-Based E-Modules Integrated with Islamic Value." *International Journal of Elementary Education* 9, no. 2 (2025): 237-47.

Jannah, N, H Sari, and P Lestari. "Literasi Digital Guru Madrasah Di Era Revolusi 5.0." *Jurnal Teknologi Pendidikan Islam* 10, no. 2 (2023): 48-55.

Kurniawati, N., Supriyono, Y., & Wirawan, A. "Transformational Leadership of School Principals and Its Impact on Teacher Digital Readiness in Islamic Schools." *Jurnal Pendidikan Islam*, 8, no. 2 (2022): 113-130.

Miles, Matthew B, A Michael Huberman, and Johnny Saldana. "Qualitative Data Analysis: A Methods Sourcebook." *Sidalc.Net*, 2014.

- Najmi, Akmalun. "PERAN KESABARAN PENDIDIK DALAM MENCIPTAKAN KEPERIBADIAN SISWA BERKUALITAS PSIKOLOGI PENDIDIKAN ISLAM." *Istifkar* 4, no. 2 (2024): 200–212.
- Najmi, Akmalun, and Ismail Ismail. "Eksplorasi Makna Hidup Anak Gen Z Di Era Digital." *Abdurrauf Journal of Education and Islamic Studies* 2, no. 1 (2025): 25–35.
- Purnomo, A., Rachmadtullah, R., & Rusmaini, R. "Digital Competency Development Model for Teachers in ASEAN: A Systematic Review." *International Journal of Emerging Technologies in Learning*, 16, no. 14 (2021): 42–58.
- Resta, Paul, Thérèse Laferrière, Robert McLaughlin, and Assetou Kouraogo. "Issues and Challenges Related to Digital Equity: An Overview." *Second Handbook of Information Technology in Primary and Secondary Education*, 2018, 1–18.
- Saputra, Gondo Adhi, Bambang Triawan Pamungkas, Nur Naria Dina Romadhon, Akmalun Najmi, and Muhammad Wahyudi Azzukhruf. "Epistemologi Pendidikan Agama Islam: Integrasi Sumber Transenden Dan Rasional Dalam Pembentukan Kesadaran Religius Peserta Didik." *Pendas: Jurnal Ilmiah Pendidikan Dasar* 10, no. 04 (2025): 186–96.
- Schleicher, Andreas. *World Class*. OECD Publishing, Paris, 2018.
- Taufikurrahman, Taufikurrahman. "Kepemimpinan Kepala Sekolah Di Era Digital." *Proceeding: Islamic University of Kalimantan*, 2021.
- Wardi, Moh, Mustiqowati Ummul Fithriyyah, Z Fathorrahman, Tawvicky Hidayat, Ismail Ismail, and Supandi Supandi. "Implementation of Religious Moderation Values through Strengthening Diversity Tolerance in Madrasah." *Jurnal Pendidikan Islam* 9, no. 2 (2023): 241–54.
- Wardi, Moh, Lidia Candra Sari, Moh Zainol Kamal, and Sri Irawati. "Digital Transformation of Islamic Boarding School Financial System; Formulation, Implementation and Evaluation." *Munaddhomah: Jurnal Manajemen Pendidikan Islam* 5, no. 4 (2024): 461–82.

Wenger, Etienne. "Communities of Practice: A Brief Introduction," 2015.

Yin, Robert K. *Case Study Research and Applications*. Vol. 6. Sage Thousand Oaks, CA, 2018.