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Accelerating Digital Transformation in Islamic Education: Insights, Gaps, and Conceptual Frameworks

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ABSTRACT

This article reports a systematic literature review of recent work on the digital transformation of Islamic education. Following PRISMA, we searched Scopus and Web of Science for studies published in 2023 and 2024. After screening, and after appraising quality with the Mixed Methods Appraisal Tool (MMAT), we retained 18 studies for analysis. The challenges reported in these studies are not separate problems; they are tied to one another. Unequal digital access sits at the base, shaping both the readiness of infrastructure and the capacity of teachers, and weak pedagogical training in turn limits what teachers can do with the technology they have. Whether digital learning is accepted, and whether it lasts, also depends on how well it fits cultural and religious expectations. We read these findings through digital divide theory, the TPACK framework, and diffusion of innovations theory, and from them we build a three-dimensional perspective that links structural, pedagogical, and cultural factors. The scope of the review is modest, but its results speak to policymakers, teachers, and researchers, especially in settings where digital education is still taking shape.

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INTRODUCTION

Digital technology has changed how schools and universities work, and the COVID-19 pandemic pushed many of them into online and hybrid teaching almost overnight.[1] The change was not only a disruption. It also made learning easier to reach, more flexible, and more open to new teaching ideas.[2] Islamic education, though, meets this change on its own terms. Its teaching has long relied on face-to-face contact between teacher and student and on passing down religious knowledge from recognised sources. A digital classroom, which values flexibility and works through screens and platforms, does not always sit comfortably with that.

Access is a second problem. In many developing regions, poor infrastructure and weak internet connections still keep students and teachers out. Culture and religion matter too, because people judge a new technology partly by whether it respects what they believe. For learning materials to be accepted as legitimate, and to work, they have to agree with Islamic values and with the way Islam understands knowledge. Research on digital transformation in education has grown quickly, yet the part of it that deals with Islamic education is scattered, tied to particular settings, and poorly connected. Most studies look at technology adoption or at teaching practice on its own, and few ask how structural, pedagogical, and cultural conditions affect each other. Even less has been written on how digital change can be made to fit the epistemological foundations of Islamic education.

Madrasah and pesantren in Southeast Asia show these pressures clearly, since many had to move their teaching and administration onto digital platforms in a short time. At a state madrasah aliyah in Ponorogo, for instance, teachers chose between synchronous and asynchronous media in stages: they set criteria, listed possible media, and then tried them out in class. In practice they often used both modes together to keep distance learning going.[3] At the level of the institution, management information systems built on the Rapor Digital Madrasah were significantly related to the quality of madrasah education, but explained only about a quarter of its variance.[4] In state Islamic senior high schools in Karawang, artificial intelligence is now used to prepare materials, run interactive assessment, record attendance, process grades, and keep digital archives; unstable internet and thin technical training, however, still hold back what it can deliver.[5] Read together, these cases suggest that Islamic schools are no longer just coping with an emergency. They are making planned institutional changes, although how far those changes go still depends on infrastructure, on the people involved, and on the values that guide them.

We use the term digital transformation to mean more than moving face-to-face lessons

[1] Shweta Dhawan, "Online Learning: A Panacea in the Time of COVID-19 Crisis," *Journal of Educational Technology Systems* 49, no. 1 (2020): 5–22, https://doi.org/10.1177/0047239520934018.

[2] Ghada Refaat El Said, "How Did the COVID-19 Pandemic Affect Higher Education Learning Experience? An Empirical Investigation of Learners' Academic Performance at a University in a Developing Country," *Advances in Human-Computer Interaction* 2021 (February 2021): 1–10, https://doi.org/10.1155/2021/6649524.

[3] Dhawan, "Online Learning: A Panacea in the Time of COVID-19 Crisis."

[4] El Said, "How Did the COVID-19 Pandemic Affect Higher Education Learning Experience?"

[5] Iwan Hermawan, Oyoh Bariah, and Nur Aini Farida, "Artificial and Spiritual Intelligence Synergy in Madrasah Digital Transformation," *Cendekia: Jurnal Kependidikan Dan Kemasyarakatan* 24, no. 1 (2026): 147–64, https://doi.org/10.21154/cendekia.v24i1.13463.

online. It refers to the way digital tools reshape institutional structures, teaching practice, and the culture of learning. During the pandemic the two ideas were easily confused, because many institutions practised what Shamir and Blau call emergency remote teaching, not online learning that had been designed as such.[6] In Islamic education the sudden switch revealed concrete barriers: too few devices, unreliable connections, and teachers who had little experience of teaching online.[7] In Malaysia, studies from the Movement Control Order period found that lower-income households carried a heavier share of the economic burden, which probably made it harder for them to pay for the devices and data that home learning required.[8]

Structure is only part of the picture. Islamic education also has its own epistemology, and this affects how technology is received. Learning traditionally passes through the relationship between teacher and student, is held together by *adab*, and aims at *tarbiyah*, the formation of the whole person, not simply the transfer of information. Some reviews of educational technology in Islamic education already exist.[9] There are not many of them, though, most were published as conference papers and not in peer-reviewed journals, and none sets out a theory of how structural, pedagogical, and cultural factors shape one another. A systematic literature review with a clear theoretical basis is needed to fill that gap.

Studies in regional journals show both what the field promises and how scattered it is. One team developed augmented reality as an anti-corruption learning medium in Islamic Religious Education and found gains in learners' cognitive outcomes across three junior secondary schools set in different environments.[10] In a pesantren-based madrasah tsanawiyah, structural gamification (points, levels, and leaderboards) raised students' intrinsic motivation and their participation in class.[11] Blended learning helped adult learners improve their tahsin al-Qur'an while keeping the mentoring that face-to-face sessions provide.[12] Others have tried to combine pesantren cultural values with twenty-first-century skills, including the use of information and communication technology.[13] These are useful studies, but each usually deals with one intervention, one institution, or one aspect of change. They

[6] T. Shamir-Inbal and I. Blau, "Facilitating Emergency Remote K-12 Teaching in Computing-Enhanced Virtual Learning Environments During COVID-19 Pandemic - Blessing or Curse?," *Journal of Educational Computing Research* 59, no. 7 (2021): 1243–71, Scopus, https://doi.org/10.1177/0735633121992781.

[7] Akhmad Habibi et al., "Mapping Instructional Barriers During COVID-19 Outbreak: Islamic Education Context," *Religions* 12, no. 1 (2021): 50, https://doi.org/10.3390/rel12010050.

[8] Mohd Khairi Ismail, Vikniswari Vija Kumaran, and Siti Nurul Munawwarah, "COVID-19 Outbreak: An Analysis of Malaysian Household Income Class During Movement Control Orders (MCO)," *Asia Proceedings of Social Sciences* 7, no. 1 (January 2021): 26–29, https://doi.org/10.31580/apss.v7i1.1738.

[9] Zulfatun Ni'mah and Huzdaeni Rahmawati, "Educational Technology in Islamic Education: A Systematic Literature Review," *Proceedings of the 2023 6th International Conference on Educational Technology Management*, November 3, 2023, 148–55, https://doi.org/10.1145/3637907.3637967.

[10] M. Nasir et al., "Revolutionizing Teungku Dayah Learning Model: Exploring the Transformative Impact of Technological Advancements on Islamic Education in Aceh," *Cogent Education* 11, no. 1 (2024): 2335720.

[11] Ni'mah and Rahmawati, "Educational Technology in Islamic Education."

[12] Putri Vidi Tiarawati et al., "Blended Learning Approach Implementation to Improve Adults' Tahsin Ability in the Digital Era," *Cendekia: Jurnal Kependidikan Dan Kemasyarakatan* 21, no. 2 (2023): 180–96, https://doi.org/10.21154/cendekia.v21i2.7111.

[13] Ahmad Fahrudin and Muhammad Khoirul Malik, "A Pesantren Cultural Value-Based Learning Model: Integrating Islamic Values and 21st-Century Skills," *Cendekia: Jurnal Kependidikan Dan Kemasyarakatan* 23, no. 1 (June 2025): 89–105, https://doi.org/10.21154/cendekia.v23i1.10646.

show what digital tools can do when conditions are good. They do not tell us why the same ideas fail in other places, or how infrastructure, teaching, and culture together decide whether an innovation survives. For that, the findings need to be read side by side within one theoretical frame.

That fragmentation is the problem this study takes up. A great deal has been written about digital transformation in education generally, but no synthesis yet shows how structural, pedagogical, and cultural factors interact inside the particular epistemological setting of Islamic education. Without one, policymakers and teachers have no clear, evidence-based guide for planning digital change that is both sound as pedagogy and acceptable on religious grounds. Our aim, therefore, is to review recent research on the digital transformation of Islamic education systematically and, on that basis, to propose a perspective that connects its structural, pedagogical, and cultural sides. We identify the main challenges reported in the literature and suggest a way of thinking about them that supports approaches suited to context and able to last. Two questions guide the review. What are the main challenges in the digital transformation of Islamic education? And what solutions have been proposed to deal with them? The study adds to the literature in three ways. It brings scattered empirical findings together into a structured map of challenges; it explains those challenges through named theories instead of simply describing them; and it offers a framework that institutions can use in planning and that later studies can test.

Three theories inform the review, and each one matches a dimension of the perspective we develop. For the structural dimension we draw on van Dijk's resources and appropriation theory. Van Dijk treats the digital divide as a series of stages (motivational, material, skills, and usage access), with gaps at an early stage carrying over into later ones.[14] Van Deursen and van Dijk add that the first-level divide is now less about whether people have physical access at all and more about material access: how good their devices are, what subscriptions they can afford, and what equipment they have around them.[15] Seen this way, digital disparity is better understood as a condition that comes first and shapes the other problems, not as one challenge among equals.

For the pedagogical dimension we use the Technological Pedagogical Content Knowledge (TPACK) framework. Its central claim is that teachers integrate technology well only when they bring technological, pedagogical, and content knowledge together, instead of keeping them in separate compartments.[16] In Islamic education the content itself has normative and spiritual weight. A teacher who is skilled with technology but lacks the matching pedagogical content knowledge may end up turning religious learning into the delivery of information. How willing teachers are to build this combined knowledge also depends on psychosocial factors. Among Islamic Religious Education teachers in madrasah

[14] Alexander Jam Van Deursen and Jan Agm Van Dijk, "The First-Level Digital Divide Shifts from Inequalities in Physical Access to Inequalities in Material Access," *New Media & Society* 21, no. 2 (February 2019): 354–75, https://doi.org/10.1177/1461444818797082.

[15] Van Deursen and Van Dijk, "The First-Level Digital Divide Shifts from Inequalities in Physical Access to Inequalities in Material Access."

[16] Punya Mishra and Matthew J. Koehler, "Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge," *Teachers College Record: The Voice of Scholarship in Education* 108, no. 6 (June 2006): 1017–54, https://doi.org/10.1111/j.1467-9620.2006.00684.x.

aliyah, self-efficacy, outcome expectations, and environmental support were all significantly linked to interest in adopting deep learning approaches.[17] Being pedagogically ready, then, takes confidence and support from the institution as well as skill.

For the cultural and epistemological dimension we turn to Rogers' diffusion of innovations theory, and in particular to compatibility, which Rogers defines as how far an innovation is seen to fit the values, past experience, and needs of those who might adopt it.[18] In Islamic education, compatibility is measured against a tradition that understands education as *ta'dib*, the instilling of *adab*, and that passes knowledge on through recognised chains of authority.[19] Leadership also affects how compatibility is perceived. In pesantren-based madrasah, transformational leaders have been reported to win stakeholder commitment to digital infrastructure and to innovative teacher training, which suggests that a sense of fit can be built over time and need not simply be assumed.[20] We use these three lenses to organise the challenges found in the review and to develop the three-dimensional perspective. The next section explains how the literature was identified, appraised, and analysed.

RESEARCH METHOD

We conducted a systematic literature review following the PRISMA framework, which moves through four phases: identification, screening, eligibility, and inclusion.[21] PRISMA is widely used because it makes a review transparent, rigorous, and possible to repeat. Our purpose was to find, assess, and synthesise studies on the digital transformation of Islamic education, using Scopus and Web of Science (WoS) as the main databases and keeping to the two research questions and the theoretical framework set out above.

We chose a systematic literature review over a narrative one because we wanted to do more than describe existing work; we wanted the steps of finding, selecting, and appraising it to be visible and repeatable. Reporting follows the PRISMA 2020 statement, which sets out a standard order for documenting how records move from identification to inclusion.[22] Scopus and Web of Science were used because both are multidisciplinary citation databases with established indexing and quality checks, and between them they cover a wide range of international journals in education and religious studies. We limited the search to 2023 and 2024 on purpose. These years fall in the post-pandemic period, when institutions started to leave emergency remote teaching behind and to plan for longer-term digital integration.

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[17] Abdul Hakim et al., "Psychosocial Predictors of Islamic Education Teachers' Interest in Implementing Deep Learning: An Application of Social Cognitive Career Theory," *Cendekia: Jurnal Kependidikan Dan Kemasyarakatan* 24, no. 1 (July 2026): 115–30, https://doi.org/10.21154/cendekia.v24i1.13008.

[18] Everett M. Rogers, *Diffusion of Innovations*, 5th ed (New York: Free Press, 2003), 551; Rogers, *Diffusion of Innovations*.

[19] Syed Muhammad Naquib Al-Attas, *The Concept of Education in Islam: A Framework for an Islamic Philosophy of Education* (Kuala Lumpur: Muslim Youth Movement of Malaysia (ABIM), 1980), 60.

[20] M. Syafiq Humaisi, et al., "Pesantren-Based Transformational Leadership in the Development of International Madrasah Innovation," *Cendekia: Jurnal Kependidikan Dan Kemasyarakatan* 22, no. 1 (2024), https://doi.org/10.21154/cendekia.v22i1.8781.

[21] Hermawan, Bariah, and Farida, "Artificial and Spiritual Intelligence Synergy in Madrasah Digital Transformation."

[22] Matthew J. Page et al., "The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews," *BMJ*, March 29, 2021, n71, https://doi.org/10.1136/bmj.n71.

Identification and Screening

In the identification phase we selected the databases and built search strings matched to the aims of the study. The strings were run in Scopus and Web of Science (Table 1), with limits for publication years (2023 to 2024), language (English), and publication stage (final). The searches returned 1,328 records. Initial screening against the criteria removed 1,141 records, and another 30 were removed as duplicates, which left 157 records for eligibility screening.

The eligibility criteria came from these search limits and from the research questions. We included journal articles in English, published between 2023 and 2024, open access, and in final form, provided that they dealt with the use, adoption, or effects of digital technology in an Islamic educational setting, whether formal, non-formal, or informal. We excluded errata, short surveys, books, and book chapters, as well as papers that discussed digital technology without linking it to teaching, learning, or the management of Islamic educational institutions. The same criteria were used for both databases so that the final set of studies would be comparable in type and scope.

Table 1. Search Strategy

Database	Search String
Scopus	TITLE-ABS-KEY (islamic* AND (education* OR pedagogy*) AND (digital* OR multimedia OR technology* OR online)) AND (LIMIT-TO (PUBYEAR , 2023) OR LIMIT-TO (PUBYEAR , 2024)) AND (EXCLUDE (DOCTYPE , "sh") OR EXCLUDE (DOCTYPE , "er") OR EXCLUDE (DOCTYPE , "bk")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (OA , "all")) Access Date: July 2024
Web of Science (WoS)	islamic* AND (education* OR pedagogy*) AND (digital* OR multimedia OR technology* OR online) (Topic) and 2024 or 2023 (Publication Years) and English (Languages) Access Date: July 2024

Eligibility and Quality Assessment

At the eligibility stage we screened the titles and abstracts of 157 articles and excluded 138. The other 19 were appraised with the Mixed Methods Appraisal Tool (MMAT).[23] One of these was a conference proceeding and was therefore removed,[24] leaving 18 studies for thematic analysis. We abstracted the data and used integrative thematic analysis to identify patterns that recurred across the studies. Figure 1 shows the full selection process in a

[23] M. Rikza Chamami, Nasikhin, and Ahmad Saefudin, "Development of Augmented Reality in Islamic Religious Education as an Anti-Corruption Learning Medium," *Cendekia: Jurnal Kependidikan Dan Kemasyarakatan* 20, no. 2 (2022): 147–63, https://doi.org/10.21154/cendekia.v20i2.3817.

[24] Zainab Ni'mah and H. Rahmawati, "Educational Technology in Islamic Education: A Systematic Literature Review," *Proceedings of the 6th International Conference on Educational Technology Management (ICETM 2023)*, 2023.

PRISMA flow diagram.

We used the MMAT because the retained studies included qualitative, quantitative, and mixed-methods designs, and the tool makes it possible to appraise all of them within one framework.[25] Each study was first checked against the tool's two screening questions, which ask whether the research questions are clear and whether the data are adequate to answer them. It was then appraised against the five methodological criteria for its design category. Following the developers' advice, we did not reduce the appraisal to a single overall score; instead, we used it to inform how the findings were interpreted. The thematic analysis had three stages. We first read the full texts several times and recorded every finding about challenges and proposed solutions in a data abstraction matrix. We then coded these findings inductively and grouped codes with similar meanings into provisional themes. Finally, we checked the provisional themes against the original studies, refined them into the challenge themes reported below, and interpreted them through the three theoretical lenses introduced earlier.

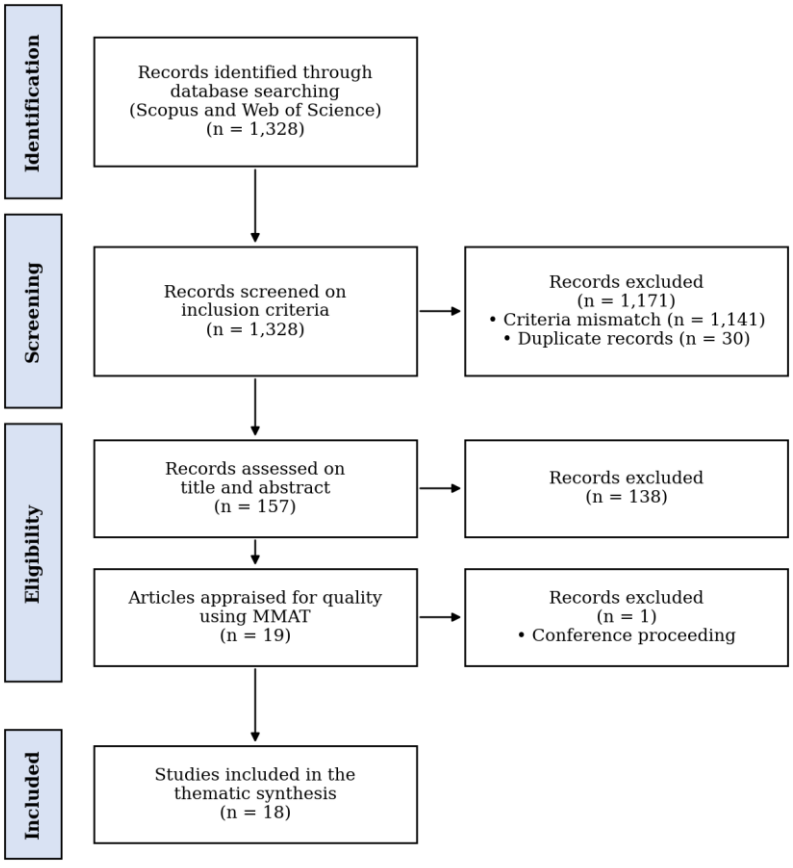


Figure 1. PRISMA Flow Diagram of the Study Selection Process

[25] M. Rikza Chamami, Nasikhin, and Ahmad Saefudin, "Development of Augmented Reality in Islamic Religious Education as an Anti-Corruption Learning Medium.

RESULT AND DISCUSSION

Characteristics of the Reviewed Studies

The final synthesis includes 18 studies. Their main characteristics and thematic focus are listed in Table 2. Most of the studies were published in 2023 (n = 11). Six appeared in 2024, and one was published in a 2025 journal issue after first appearing online within the search period. Indonesia is the most common setting, followed by Malaysia; the remaining studies come from the Middle East and Europe, including one on Muslim youth in Austria. The studies cover a range of levels and settings: higher education and teacher education programmes, madrasah and secondary schools, traditional institutions such as the dayah in Aceh and Qur'anic memorisation programmes, and informal settings such as religious education in the family. In terms of method, the set includes qualitative case studies, quantitative surveys, studies that developed instruments or applications, and one meta-analysis. This variety makes the synthesis more transferable, but it should also be noted that Indonesian studies weigh heavily in the overall patterns.

Table 2. Summary of Reviewed Studies in Islamic Education Digital Transformation

No.	Author	Title	Journal	Theme
1	Ali[26]	Institutional Adoption and Implementation of Blended Learning:	Turkish Online Journal of Distance Education	Digital disparity, educator training
2	Alkandari[27]	Engagement, Interaction, and Socialization of Pre-service Teachers	Sage Open	Educator training, infrastructure deficiencies
3	Dalimunthe et al[28]	Challenges of Islamic education in the new era of ICT	HTS Teologiese Studies	Digital disparity, educator training, infrastructure
4	Haddade et al.[29]	Madrasah Management Strategies through Madrasah Reform	Int. Journal of Educational Management	Digital Disparity, Educator

[26] Ramiz Ali, "Institutional Adaption and Implementation of Blended Learning: Differences in Student Perceptions," *Turkish Online Journal of Distance Education* 24, no. 1 (January 2023): 37–53, https://doi.org/10.17718/tojde.973869.

[27] Kalthoum Alkandari, "Engagement, Interaction, and Socialization of Islamic Education Pre-Service Teachers through Virtual Discussions," *Sage Open* 14, no. 2 (April 2024): 21582440241255844, https://doi.org/10.1177/21582440241255844.

[28] Maulana Andinata Dalimunthe et al., "Challenges of Islamic Education in the New Era of Information and Communication Technologies," *HTS Teologiese Studies / Theological Studies* 79, no. 1 (June 2023), https://doi.org/10.4102/hts.v79i1.8608.

[29] Hasyim Haddade et al., "Madrasah Management Strategies through Madrasah Reform Program: An Evidence from Indonesia," *International Journal of Educational Management* 38, no. 5 (July 2024): 1289–304, https://doi.org/10.1108/IJEM-05-2023-0236.

No.	Author	Title	Journal	Theme
				Training, Infrastructure
5	Haddad et al.[30]	Quality Assurance Strategies of Higher Education in Digital Era	Quality Assurance in Education	Digital disparity, educator training
6	Jusubaidi[31]	Students' Critical Awareness of Internet and Social Media Use	*British Journal of Religious Education*	Digital Disparity, Educator Training, Infrastructure
7	Khamis[32]	The Paradoxes of Modern Islamic Discourses in the Digital Age	Religions	Digital disparity
8	Moradi[33]	The Relationship Between Student Attitudes Towards Virtual Education and Satisfaction	Educatio Siglo XXI	Digital Disparity, Educator Training, Infrastructure
9	Musthofa et al.[34]	Influence of Online Learning on Student Professionalism	Cogent Education	Digital Disparity, Educator Training, Infrastructure
10	Nasir[35]	Revolutionizing Teungku Dayah Learning Model	Cogent Education	Digital Disparity, Educator Training,

[30] H. Haddade et al., "Quality Assurance Strategies of Higher Education in Digital Era: An Anthropology of Education Study in Islamic Higher Education Institution," *Quality Assurance in Education* 32, no. 1 (2024): 46–63.

[31] Jusubaidi et al., "Students' Critical Awareness of the Internet and Social Media Use as Resources for Islamic Learning in Indonesian Public Senior High Schools," *British Journal of Religious Education* 47, no. 2 (2025), https://doi.org/10.1080/01416200.2024.2368888.

[32] Sahar Khamis, "The Paradoxes of Modern Islamic Discourses and Socio-Religious Transformation in the Digital Age," *Religions* 15, no. 2 (2024): 207.

[33] F. Moradi, S. S. A. Sabe, and S. Soufi, "The Relationship Between Student Attitudes Towards Using Virtual Education and Their Satisfaction During the COVID-19 Pandemic," *Educatio Siglo XXI* 41, no. 2 (2023): 103–24.

[34] M. Musthofa et al., "The Influence of Online Learning on Student Professionalism in Teacher Professional Education Programs: Studies in Islamic Higher Education in Indonesia," *Cogent Education* 10, no. 2 (2023): 2276025.

[35] Nasir et al., "Revolutionizing Teungku Dayah Learning Model: Exploring the Transformative Impact of Technological Advancements on Islamic Education in Aceh."

No.	Author	Title	Journal	Theme
				Infrastructure
11	Noor & Mokhtar[36]	COVID-19 in Islamic Perspective: Impacts on Students	Akademika	Digital Disparity, Educator Training, Infrastructure
12	Nordin et al.[37]	The Art of Qur'anic Memorization: A Meta-Analysis	Pertanika J. Soc. Sci. Hum.	Digital Disparity, Educator Training
13	Nuruddin[38]	Hybrid Learning in Higher Education: The design and challenges	International Journal of Instruction	Digital Disparity, Educator Training, Infrastructure
14	Otaya et al.[39]	Fit Data Model Feasibility of Teachers' Pedagogic Competency	International Journal of Instruction	Digital Disparity, Educator Training, Infrastructure Deficiencies
15	Sholehuddin et al.[40]	Developing children's Islamic spiritual intelligence	International Journal of Instruction	Digital Disparity, Educator Training, Infrastructure Deficiencies
16	Sopandi et	The role of digital literacy and its relation with	Eurasian Journal of Educational	Digital Disparity,

[36] Ahmad Yunus Mohd Noor and Asmilyia Mohd Mokhtar, "Covid-19 In Islamic Perspective: Overview of Its Impacts on Students in The Faculty of Islamic Studies (FPI), National University of Malaysia (UKM)," *Akademika* 93, no. 02 (July 2023), https://doi.org/10.17576/akad-2023-9302-16.

[37] Ossman Nordin et al., "The Art of Quranic Memorization: A Meta-Analysis," *Pertanika Journal of Social Sciences and Humanities* 31, no. 2 (June 2023): 787–801, https://doi.org/10.47836/pjssh.31.2.16.

[38] Nuruddin, "Hybrid Learning (HL) in Higher Education: The Design and Challenges," *International Journal of Instruction* 17, no. 1 (2024): 97–114.

[39] Lian Gafar Otaya et al., "The Assessment of Fit Data Model Feasibility of the Teachers' Pedagogic Competency Variables," *International Journal of Instruction* 16, no. 2 (2023): 909–26.

[40] M. S. Sholehuddin et al., "Developing Children's Islamic Spiritual Intelligence in the Digital Age: Indonesian Family Education Methods," *International Journal of Instruction* 16, no. 1 (2023): 357–76.

No.	Author	Title	Journal	Theme
	al[41]	performance of madrasah aliyah students	Research	Educator Training, Infrastructure
17	Tuna[42]	Religious Learning Environments of Austrian Muslim Youth	Religions	Educator Training,
18	Zulfiani et al.[43]	Developing MathSci 21st App for HOTS Assessment context	International Journal of Advanced and Applied Sciences	Digital Disparity, Educator Training, Infrastructure

Challenge Themes and Proposed Responses

Table 3 shows the six challenge themes that came out of the synthesis. Digital disparity was reported most often (15 studies). Educator training and infrastructure deficiencies came next, with 13 studies each, then resistance to change (10), cultural and religious sensitivities (9), and the quality and authenticity of online resources (7). Since most studies reported more than one challenge, the themes overlap and should not be treated as exclusive categories. To make them easier to follow, we group them below into three clusters that match the structural, pedagogical, and cultural dimensions of our framework.

The first cluster is about the structural conditions of digital learning. Studies that reported digital disparity described unequal access to devices, bandwidth, and learning platforms, both between urban and rural institutions and between students from richer and poorer families. Infrastructure deficiencies were closely linked to this, and went beyond connectivity to include electricity, hardware, and technical support within institutions. In blended and hybrid programmes, these gaps made real-time interaction hard to sustain and left students to solve access problems on their own.[44] Studies on madrasah reform and on quality assurance in Islamic higher education likewise place digital readiness within the wider capacity of the institution, so the structural constraints turn out to be organisational as well as technical.[45]

The second cluster is about the human and pedagogical capacity needed to use technology well. Studies that pointed to gaps in educator training found that teachers and

[41] E. Sopandi et al., "The Role of Digital Literacy and Its Relation with Performance of Madrasah Aliyah Students," *Eurasian Journal of Educational Research* 104 (2023): 16–32.

[42] M. H. Tuna, J. Kolb, and Z. Sejdini, "Religious Learning Environments of Austrian Muslim Youth: An Empirical Analysis of Religious Educational Processes," *Religions* 14, no. 8 (2023): 1002.

[43] Z. Zulfiani et al., "Developing the MathSci 21st App: Enhancing Higher-Order Thinking Skills Assessment in Mathematics and Science Education Within an Islamic Context," *International Journal of Advanced and Applied Sciences* 10, no. 8 (2023): 19–31.

[44] Hakim et al., "Psychosocial Predictors of Islamic Education Teachers' Interest in Implementing Deep Learning: An Application of Social Cognitive Career Theory."

[45] Humaisi, et al., "Pesantren-Based Transformational Leadership in the Development of International Madrasah Innovation."

lecturers usually had general digital literacy but were not confident designing interactive online activities, leading discussions in virtual spaces, or assessing higher-order thinking in digital form.[46] Resistance to change often showed up next to these gaps. It took the form of a preference for familiar methods, doubt about whether online platforms had real educational value, and uncertainty over how digital tools could fit with traditional teaching such as *halaqah* and *talaqqi*.[47]

The third cluster is about the cultural and epistemological ground on which digital change happens. Studies here worried about the authenticity of religious content online, about the loosening of recognised chains of scholarly authority, and about how hard it is for learners to tell reliable sources from unreliable ones.[48] Other studies stressed that religious learning is bound up with family, community, and spiritual formation, so digital tools should support those relationships and not replace them.[49] The three clusters, in short, line up closely with the structural, pedagogical, and cultural dimensions of the framework, a point we return to in the discussion.

The studies also proposed several responses to these challenges, which answer our second research question. Blended or hybrid learning was recommended most often. It keeps face-to-face contact for mentoring and moral formation and uses digital platforms for content, discussion, and assessment.[50] A second set of responses dealt with human capacity: improving teachers' pedagogical competence, and building students' digital literacy and critical awareness when they use online sources to learn about Islam.[51] A third set focused on adapting to institutions and contexts. Examples include building technology into madrasah reform and quality assurance, adapting the traditional dayah learning model, developing local applications for assessing higher-order thinking, and giving families a stronger role in nurturing children's spiritual intelligence in the digital age.[52] These responses are rarely linked to one another, which is one reason we propose an integrative framework in the discussion.

[46] Fahrudin and Malik, "A Pesantren Cultural Value-Based Learning Model: Integrating Islamic Values and 21st-Century Skills."

[47] Nasir et al., "Revolutionizing Teungku Dayah Learning Model: Exploring the Transformative Impact of Technological Advancements on Islamic Education in Aceh."

[48] Khamis, "The Paradoxes of Modern Islamic Discourses and Socio-Religious Transformation in the Digital Age."

[49] Sholehuddin et al., "Developing Children's Islamic Spiritual Intelligence in the Digital Age: Indonesian Family Education Methods."

[50] Tiarawati et al., "Blended Learning Approach Implementation to Improve Adults' Tahsin Ability in the Digital Era."

[51] Otaya et al., "The Assessment of Fit Data Model Feasibility of the Teachers' Pedagogic Competency Variables."

[52] Humaisi, "Pesantren-Based Transformational Leadership in the Development of International Madrasah Innovation," *Cendekia: Jurnal Kependidikan Dan Kemasyarakatan* 22, no. 1 (July 2024): 1–15, https://doi.org/10.21154/cendekia.v22i1.8781.

Table 3. Summary of Challenge Themes across Reviewed Studies

Theme	Issues	No. of articles
Digital Disparity	Significant inequalities in access to hardware, internet bandwidth, and platforms	15
Educator Training	Inadequate pedagogical and technical skills among educators to integrate technology	13
Infrastructure Deficiencies	Lack of basic technological infrastructure, electricity, and hardware in institutions	13
Resistance to Change	Institutional adherence to traditional learning methods and scepticism of digital platforms	s10
Quality and Authenticity of Online Resources	Concerns over unfiltered, unverified, or misleading religious content online	7
Cultural/Religious Sensitivities	Tension between digital practices and traditional Islamic educational ethics/epistemology	9

Interpreting the Structural, Pedagogical, and Cultural Challenges

This systematic literature review set out to bring together recent empirical work on the digital transformation of Islamic education, to map its main challenges, and to identify solutions that can last. The evidence shows that digital technology does open new possibilities for access and for teaching. In Islamic education, however, its uptake is held back by a set of barriers that are structurally linked to one another.

One of the main contributions of this review is to show that digital disparity is a basic constraint from which many practical problems follow. It appears in 15 of the 18 studies. It is not only a technical shortcoming; it is a question of equity, and it widens inequalities that already exist between Islamic institutions. Dalimunthe et al.[53] and Musthofa et al.[54] show that institutions in rural or underfunded areas face deficits that build on each other. Weak connectivity makes real-time blended learning difficult to run; this lowers student engagement and also gives lecturers less contact with digital tools.[55] The finding carries van Dijk's sequential model of the digital divide, in which gaps in material access lead to later gaps in skills and use, into the field of Islamic pedagogy. It also shows that unequal access directly limits students' ability to reach authentic and authoritative religious learning materials.[56]

[53] Dalimunthe et al., "Challenges of Islamic Education in the New Era of Information and Communication Technologies."

[54] Musthofa et al., "The Influence of Online Learning on Student Professionalism in Teacher Professional Education Programs: Studies in Islamic Higher Education in Indonesia."

[55] Hakim et al., "Psychosocial Predictors of Islamic Education Teachers' Interest in Implementing Deep Learning: An Application of Social Cognitive Career Theory," 115–30.

[56] Van Deursen and Van Dijk, "The First-Level Digital Divide Shifts from Inequalities in Physical

Recent studies of madrasah support this sequential reading. In Karawang, unstable internet limited what artificial intelligence could add to learning effectiveness and administrative efficiency, even though institutional policy supported innovation and staff were motivated.[57] In the same way, the mixed use of synchronous and asynchronous media in madrasah aliyah can be seen as a way of coping with uneven connectivity, with asynchronous exercises and assignments making up for what live sessions could not provide.[58] These are sensible and useful adaptations. They also show, however, that teaching decisions are often driven by material limits and not by deliberate learning design.

The review also shows that providing infrastructure is not enough unless teachers' competence grows alongside it. Thirteen studies noted that Islamic educators often feel unsure of their teaching when they move from the traditional *halaqah* or other face-to-face models into digital settings. Otaya et al.[59] and Sopandi et al.[60] report that many teachers have basic personal digital literacy but lack the specialised digital pedagogical content knowledge (*TPACK*) needed to design interactive, morally grounded online assessment that targets higher-order thinking. Policy, in our view, needs to move away from buying hardware and towards sustained, well-designed professional development. In Mishra and Koehler's terms, the gap is not in technological knowledge as such. It is in bringing technological, pedagogical, and content knowledge together, and in Islamic education that content has a normative and spiritual character. [61]

Research on teachers' attitudes towards new teaching approaches points the same way. Among Islamic Religious Education teachers in Ponorogo, self-efficacy, outcome expectations, and environmental support were each significantly related to interest in using deep learning.[62] Professional development, then, should go beyond technical workshops. It should build teachers' confidence, show them what new approaches can do for learners, and take place within an institution that supports them. Leadership matters a great deal here: in pesantren-based madrasah, transformational leadership has been linked to innovative training and to making digital infrastructure part of institutional development.[63]

Digital transformation in Islamic education is also shaped, in a particular way, by cultural, religious, and epistemological concerns. Secular education does not carry the same commitments. Islamic education is grounded in keeping religious knowledge authentic, in spiritual development (*tarbiyah*), and in the bond between teacher and student (*sanad* and *adab*). Khamis and Jusubaidi et al. point out that digital platforms spread information widely

Access to Inequalities in Material Access."

[57] Hermawan, Bariah, and Farida, "Artificial and Spiritual Intelligence Synergy in Madrasah Digital Transformation."

[58] Dhawan, "Online Learning: A Panacea in the Time of COVID-19 Crisis."

[59] Otaya et al., "The Assessment of Fit Data Model Feasibility of the Teachers' Pedagogic Competency Variables."

[60] Evi Sopandi, Sumarsih Anwar, and Neneng Habibah, "The Role of Digital Literacy and Its Relation with Performance of Madrasah Aliyah Students," *Eurasian Journal of Educational Research (EJER)*, no. 104 (2023): 16.

[61] Mishra and Koehler, "Technological Pedagogical Content Knowledge."

[62] Hakim et al., "Psychosocial Predictors of Islamic Education Teachers' Interest in Implementing Deep Learning: An Application of Social Cognitive Career Theory."

[63] Humaisi, et al., "Pesantren-Based Transformational Leadership in the Development of International Madrasah Innovation."

but often strip away the context that gives it authority, and this has raised concern about the amount of unverified religious content online.[64] The resistance to digital adoption found in 10 studies should therefore not be written off as institutional inertia. It is better understood as a conscious effort to protect epistemological integrity and spiritual intelligence. From the standpoint of diffusion of innovations theory, this resistance indicates that certain digital practices are seen as incompatible with the *ta'dib*-based values of Islamic education; it is not a rejection of technology as a whole.[65]

Recent findings support this reading, since they treat technology as something that serves the educational relationship and does not stand in for it. In state Islamic senior high schools, artificial and spiritual intelligence worked together when artificial intelligence acted as a cognitive and administrative helper and teachers kept their role as muaddib, guided by amanah, ikhlas, responsibility, *adab*, and *tawakal*.[66] Among learners, students with strong self-management and decision-making skills were able to filter religious information well, although weak digital literacy and too little guidance still got in the way.[67] The answer to concerns about authenticity, then, is not to restrict access to digital content. It is to develop learners' critical, ethical, and socio-emotional ability to judge it.

Integrative Framework, Theoretical Contributions, and Implications

In response to these challenges, and drawing on the theories outlined in the introduction, we propose an integrative three-dimensional framework. It links a Structural dimension (infrastructure and equity), a Pedagogical dimension (educator training and blended models), and a Cultural/Epistemological dimension (authenticity and value alignment). For digital transformation to last, the technology has to fit with traditional Islamic values. Blended learning stands out as a key strategy here, because it keeps the face-to-face bond between mentor and student, which the tradition holds sacred, while making use of digital tools for research, collaboration, and flexible assessment.

Each dimension calls for its own strategies, and these support one another. On the structural side, the first priority is fair access: targeted help for rural and poorly resourced institutions, learning designs that work on low bandwidth, and management information systems that make institutions more efficient and their decisions better informed by data.[68] On the pedagogical side, professional development should be continuous and should aim at integrating technological, pedagogical, and Islamic content knowledge, along with teaching designs that pair digital flexibility with mentoring. Better tahsin among adult learners in a structured blended programme, higher student participation through structural gamification, and cognitive gains linked to augmented reality are examples of what becomes possible once infrastructure and teacher readiness are in place.[69] On the cultural and epistemological side,

[64] Khamis, "The Paradoxes of Modern Islamic Discourses and Socio-Religious Transformation in the Digital Age"; Jusubaidi et al., "Students' Critical Awareness of the Internet and Social Media Use as Resources for Islamic Learning in Indonesian Public Senior High Schools."

[65] Rogers, *Diffusion of Innovations*.

[66] Hermawan, Bariah, and Farida, "Artificial and Spiritual Intelligence Synergy in Madrasah Digital Transformation."

[67] Haddade et al., "Quality Assurance Strategies of Higher Education in Digital Era: An Anthropology of Education Study in Islamic Higher Education Institution."

[68] El Said, "How Did the COVID-19 Pandemic Affect Higher Education Learning Experience?"

[69] Tiarawati et al., "Blended Learning Approach Implementation to Improve Adults' Tahsin Ability in

institutions should curate trustworthy digital resources, build adab-based guidance into online interaction, and treat pesantren and madrasah traditions as a source of legitimacy for innovation, not as a barrier to it.[70]

The framework also makes clear that the three dimensions depend on each other; they cannot simply be added up. Infrastructure without teacher readiness ends up underused. Pedagogical innovation that does not fit the culture meets resistance or is adopted only on the surface. And cultural legitimacy without adequate access keeps the benefits of digital learning within institutions that are already well off. In theoretical terms, this extends van Dijk's sequential model: in Islamic education, appropriation depends on motivation, material access, skills, and usage, but also on whether the technology is seen as compatible with *ta'dib*. It extends TPACK by bringing the normative nature of the content domain to the fore. It also gives Rogers' idea of compatibility a concrete meaning, expressed through *adab*, *sanad*, and the teacher's role as *murabbi* and *muaddib*.

The framework moves beyond earlier reviews of educational technology in Islamic education. Those reviews mostly listed the kinds of technology in use and the benefits reported, and most of them were published in conference proceedings, not peer-reviewed journals.[71] Our review, by contrast, appraises the methodological quality of the studies, organises the evidence around stated theories, and explains how problems in one dimension affect outcomes in the others. The question thus shifts from which technologies are available to the conditions under which digital transformation in Islamic education can last and remain religiously legitimate.

The findings have practical implications for several groups. Policymakers should direct digital transformation budgets towards closing access gaps and paying for ongoing professional development, and not spend mainly on hardware. Leaders of madrasah, pesantren, and Islamic higher education institutions can use the framework to diagnose which dimension is holding back progress in their own setting before they choose an intervention. Teacher education programmes need to prepare future Islamic education teachers to design technology-supported learning that stays true to the formative aims of tarbiyah. For researchers, the framework offers testable propositions about the sequential and interactive links among structural, pedagogical, and cultural factors.

CONCLUSION

This systematic literature review shows that the digital transformation of Islamic education involves much more than adopting technology. Digital disparity is a basic constraint, and it is bound up with weak infrastructure, gaps in teacher training, and epistemological concerns about whether content is authentic. Lasting change requires an integrated approach that brings structural infrastructure, pedagogical readiness, and cultural and religious authenticity into line. Policymakers and educational leaders should give priority to strategies that fit their context, especially blended learning and continuous teacher training,

the Digital Era."

[70] Fahrudin and Malik, "A Pesantren Cultural Value-Based Learning Model: Integrating Islamic Values and 21st-Century Skills."

[71] Ni'mah and Rahmawati, "Educational Technology in Islamic Education: A Systematic Literature Review."

so that digital learning environments are effective in technical terms, sound in pedagogical terms, and legitimate in religious terms.

On the first research question, the review identifies six related challenges: digital disparity, gaps in educator training, infrastructure deficiencies, resistance to change, cultural and religious sensitivities, and doubts about the authenticity of online resources. Of these, digital disparity is the prior condition that makes the others worse. On the second research question, the review finds that the solutions most likely to work are those that tackle all three dimensions together, combining fair provision of infrastructure, sustained professional development that also builds confidence, blended teaching designs, and curation of digital content in line with Islamic values.

The review has limitations. It covers only English-language, open-access, final-stage articles indexed in Scopus and Web of Science from 2023 to 2024, so relevant work in Arabic, Malay, or Indonesian, or in regional databases, may have been missed. Future studies should search these sources and later years, and should test the proposed three-dimensional framework empirically in a range of Islamic educational settings.

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All authors took part in conceiving and developing the study, interpreting the findings, and critically revising the manuscript, and all of them read and approved the final version.

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The authors used generative artificial intelligence (AI) tools only for language editing and for improving the structure of the text. These tools played no part in the scientific content, the design of the study, the analysis or interpretation of the data, or the results and conclusions. The authors take full responsibility for the content of this article.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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