

# Implementing Samsung Digital Technology in Pesantren Learning: A Qualitative Case Study of Adaptive Integration at Pondok Thursina

Jimly Assiddiqi\*<sup>1</sup>, Faris Khoirul Anam<sup>2</sup>, Muhammad Fadhil Hadziq<sup>3</sup>

<sup>1,2</sup> Department of Arabic language Education, Universitas Negeri Malang, Jawa Timur, Indonesia.

<sup>3</sup> International University Of Africa, Sudan.

\*corresponding author; [jimly.assiddiqi.2302316@students.um.ac.id](mailto:jimly.assiddiqi.2302316@students.um.ac.id)

Received: 2026-February-15

Rev. Req: 2026-May-09

Accepted: 2026-May-20

---

This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International license (<https://creativecommons.org/licenses/by/4.0/>)

---

**ABSTRACT:** *Digital transformation in education presents Indonesian pesantren, that is, Islamic boarding schools rooted in face to face transmission of religious knowledge through sorogan, bandongan, and halaqah, with both opportunity and tension. This qualitative case study examines how Pondok Thursina, a modern pesantren in East Java, integrates Samsung Digital Classroom technology while preserving its religious and communal identity. A single site embedded case study was conducted over five months (January to May 2026), drawing on twenty four nonparticipant classroom observations across general and religious subjects, semistructured interviews with eighteen informants (two kiai, eight ustadz, eight santri), and analysis of institutional documents and student digital artifacts. Data were analysed thematically using Miles, Huberman, and Saldaña's interactive model, with trustworthiness ensured through source and method triangulation, member checking, peer debriefing, and a complete audit trail. Findings reveal four interrelated themes: (1) layered remediation that augments rather than replaces classical pedagogy; (2) emergent Digital Pedagogical Content Knowledge for Pesantren (DPCKP) cultivated through peer micromentoring; (3) cultural and spiritual content filtering through musyawarah and adab norms; and (4) structural tensions involving infrastructure, screen time governance, and asymmetric digital literacy among santri. The study advances the Pesantren Digital Integration Model (PDIM), extending Mishra and Koehler's TPACK with two pesantren specific axes: spiritual and cultural alignment, and communal and spatial pedagogy. Findings inform Islamic education policy, EdTech vendors operating in faith based settings, and pesantren leaders pursuing digitisation without detraditionalisation.*

**Keywords:** *Digital pedagogy; Islamic education; Pesantren; Samsung digital classroom; TPACK.*

## I. INTRODUCTION

The dual currents of Industry 4.0 and Society 5.0 have reorganised the global education landscape, reframing schools as nodes within distributed digital ecosystems rather than discrete sites of knowledge transmission (Dito & Pujiastuti, 2021; Schleicher, 2023). For Indonesia, home to the world's largest Muslim majority population and to more than 39,000 active *pesantren* registered with the Ministry of Religious Affairs, this transformation is far from neutral. It compels Islamic boarding schools to negotiate between two equally weighty obligations: cultivating *santri* who are spiritually rooted in classical Islamic scholarship, and producing graduates equipped with

the digital fluencies demanded by economies of the twenty first century (Azra, 2019; Lukens Bull, 2020).

The *pesantren* is not simply an educational institution; it is a *tradition* of pedagogy, ethics, and communal life. Its canonical methods, *sorogan* (one to one recitation), *bandongan* (collective text reading led by the *kiai*), and *halaqah* (concentric study circles), do not merely transmit textual content; they enact a moral economy of presence, *adab* (proper comportment), and *barakah* (transmitted spiritual blessing) (Dhofier, 2011; Bruinessen, 2012). Reform efforts that overlook this moral economy tend to produce hybrid configurations that look modern on the surface but reproduce older pathologies underneath, or worse, hollow out the very features that make *pesantren* distinctive (Pohl, 2009).

Against this backdrop, EdTech vendors have positioned vertically integrated classroom solutions, including Samsung's Interactive Display, Flip 2 collaboration board, Knox Manage device policy platform, and accompanying teacher training ecosystem, as turnkey pathways into digital pedagogy. Marketed under the banner of the *Samsung Digital Classroom*, these technologies promise to convert physical learning spaces into multimodal environments where teachers can broadcast, annotate, capture, and assess in a single workflow (Samsung Electronics, 2024). Their uptake within Indonesian *pesantren*, however, is recent, uneven, and, critically, underexamined in the scholarly literature.

*Pondok Thursina*, located in Malang, East Java, offers a particularly informative site for this inquiry. The *pesantren* combines a classical *kitab kuning* curriculum with a national curriculum *madrasah* pathway, and since late 2023 has progressively rolled out Samsung Digital Classroom hardware and software across its general subject classrooms while keeping the *diniyyah* (religious sciences) instruction predominantly in person. The institution thus presents a naturally occurring contrast within a single setting, allowing the researcher to observe how digital tools are differentially integrated across subject domains with sharply different epistemic stakes.

Prior scholarship on digital transformation in Indonesian education has concentrated overwhelmingly on formal schools (*sekolah*) and *madrasah*, treating *pesantren* either as marginal cases or as objects of survey research that document attitudes rather than situated practices (Prasetya et al., 2022; Salsabila et al., 2020). Where *pesantren* do appear, the literature has tended toward either celebratory accounts of digital adoption or apocalyptic warnings about cultural erosion, with little detailed ethnographic work mapping how *kiai*, *ustadz*, and *santri* actually negotiate digital tools in everyday classroom life (Hefner, 2009; Rahman, 2021). The result is a sparse evidence base from which to derive theory or actionable guidance.

Theoretically, the dominant framework for analysing teacher technology integration, Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK), has proven generative across many contexts but presupposes a relatively secular, content-centred conception of teaching, leaving it with limited resources for theorising integration in settings where the pedagogical act is also a moral and devotional act, and where the spatial arrangement of teacher, student, and text carries doctrinal as well as instructional significance (Mishra, 2019; Voogt et al., 2016). This conceptual gap mirrors the empirical one. This study therefore addresses two research questions: (RQ1) How is Samsung Digital classroom technology being integrated into the everyday

teaching and learning practices at Pondok Thursina, and (RQ2) which contextual features of pesantren life shape, enable, or constrain this integration, and what theoretical framework best captures these dynamics?

The contribution of this study is threefold. Empirically, it offers what is, to the authors' knowledge, the first sustained qualitative account of Samsung Digital Classroom implementation in an Indonesian *pesantren*, grounded in five months of fieldwork. Theoretically, it advances the *Pesantren* Digital Integration Model (PDIM), which augments TPACK with two specific to *pesantren* axes, spiritual and cultural alignment and communal and spatial pedagogy, derived inductively from the data and refined against the literature. Practically, it surfaces actionable insights for *pesantren* leaders, teacher educators, and EdTech vendors seeking to design and deploy digital tools that respect, rather than erode, the moral architecture of Islamic boarding school education.

The remainder of the article is organised as follows. Section 2 reviews the relevant literature and sets out the analytical framework. Section 3 details the qualitative case study design and trustworthiness procedures. Section 4 presents the four major themes that emerged from the data. Section 5 discusses these findings against the literature, introduces the PDIM framework formally, and considers implications. Section 6 concludes with limitations and directions for further research.

## II. LITERATURE REVIEW

### Digital Transformation in Islamic Education

Studies of digital transformation in Islamic education broadly fall into three streams. The first, infrastructural and instrumental, treats digital tools as accelerators of conventional teaching, asking whether they raise test scores, engagement, or efficiency (Daryanes et al., 2023; Putri et al., 2021). The second, sociocultural, examines how digital media reconfigure religious authority, doctrinal interpretation, and the construction of Muslim identity online (Hirschkind, 2012; Husein, 2022). The third, institutional, focuses on how Islamic educational organisations, *madrasah*, Islamic universities, and *pesantren*, formally adopt and adapt digital systems within their governance structures (Hefner, 2009; Sutrisno & Fauzan, 2022). Each stream illuminates a different facet but is rarely brought into dialogue with the others, leaving the situated, everyday work of digital integration in religious schools comparatively underexplored.

The *pesantren*, in particular, occupies a distinctive position. Unlike *madrasah*, which are nationally regulated and curricularly aligned with state schools, *pesantren* retain considerable autonomy in curriculum, pedagogy, and the cultivation of the *kiai's* scholarly lineage (*sanad*). Digital reform in *pesantren* therefore unfolds not as top down policy implementation but as a negotiated practice among *kiai*, *ustadz*, *santri*, and, increasingly, parents and technology vendors (Azra, 2019; Sirry, 2020). This negotiated character makes the *pesantren* a strategic site for qualitative inquiry: outcomes are not predetermined by policy but emerge through localised meaning making.

The Indonesian *pesantren* digital landscape has shifted markedly since the COVID 19 pandemic, which forced even the most traditionalist (*salaf*) institutions to engage with synchronous video platforms and asynchronous learning management systems for the first time

(Khoirurrijal et al., 2023). Post pandemic, three broad trajectories have emerged: (a) salaf pesantren that have returned almost entirely to instruction conducted in person while retaining minimal digital tooling for administration; (b) khalaf and integrated pesantren that have selectively retained digital tools that proved pedagogically valuable; and (c) modern, often urban, pesantren that have actively expanded their digital footprint and increasingly partner with major EdTech vendors. Pondok Thursina belongs to the third category. Yet even within this category, vendor relationships have rarely been studied as objects of inquiry in their own right; the literature has treated them as background infrastructure rather than as actors whose design choices shape what counts as good teaching.

### TPACK and Its Limits in Religious Education

Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge framework conceives effective technology integration as residing at the intersection of three knowledge domains: technological knowledge, pedagogical knowledge, and content knowledge. The model has been widely applied, refined, and critiqued (Voogt et al., 2016), with growing attention to its contextual embeddedness (Phillips et al., 2017). Recent work has called for context specific elaborations, for instance, TPACK in early childhood education, in special education, and in remote indigenous schools (Mishra, 2019).

Three features make TPACK underspecified for *pesantren* settings. First, the model is silent on the *moral and spiritual* purpose of teaching: in *pesantren*, the pedagogical act is also a devotional act, and the legitimacy of any teaching tool depends on its compatibility with *adab*, *halal* permissibility considerations, and the cultivation of *barakah* (Dhofier, 2011; Pohl, 2009). Second, TPACK assumes a relatively standardised content domain; *pesantren* content includes classical Arabic language texts whose authority and interpretive tradition resist easy translation into multimedia formats. Third, TPACK is built on an implicit spatial imagination of a single teacher facing a class of similarly aged learners; the *pesantren* learning environment, by contrast, is structured around proximity that spans ages, layered authority, and communal living arrangements in which classroom and dormitory pedagogies blur (Bruinessen, 2012).

### The Communal and Spatial Pedagogy of the Pesantren

A distinctive feature of *pesantren* life is the deliberate organisation of physical and social space to *unite* rather than separate. The traditional *pesantren* layout positions the *kiai's* residence, the mosque, the classrooms, and the *santri* dormitories within a single walkable compound, such that elderly teachers, senior *santri*, and, in many *pesantren*, family members of the *kiai* and *santri* with special needs are encountered daily in shared corridors, courtyards, and communal meals. This copresence is not incidental; it is pedagogically intentional. Senior figures, including those who may not deliver formal lessons, function as *silent educators* whose conduct, vulnerability, and dignity become objects of ongoing observation and emulation by younger *santri*. Empathy, in this view, is cultivated through proximity, not segregation; those deserving of honour belong at the front, not displaced to the margins.

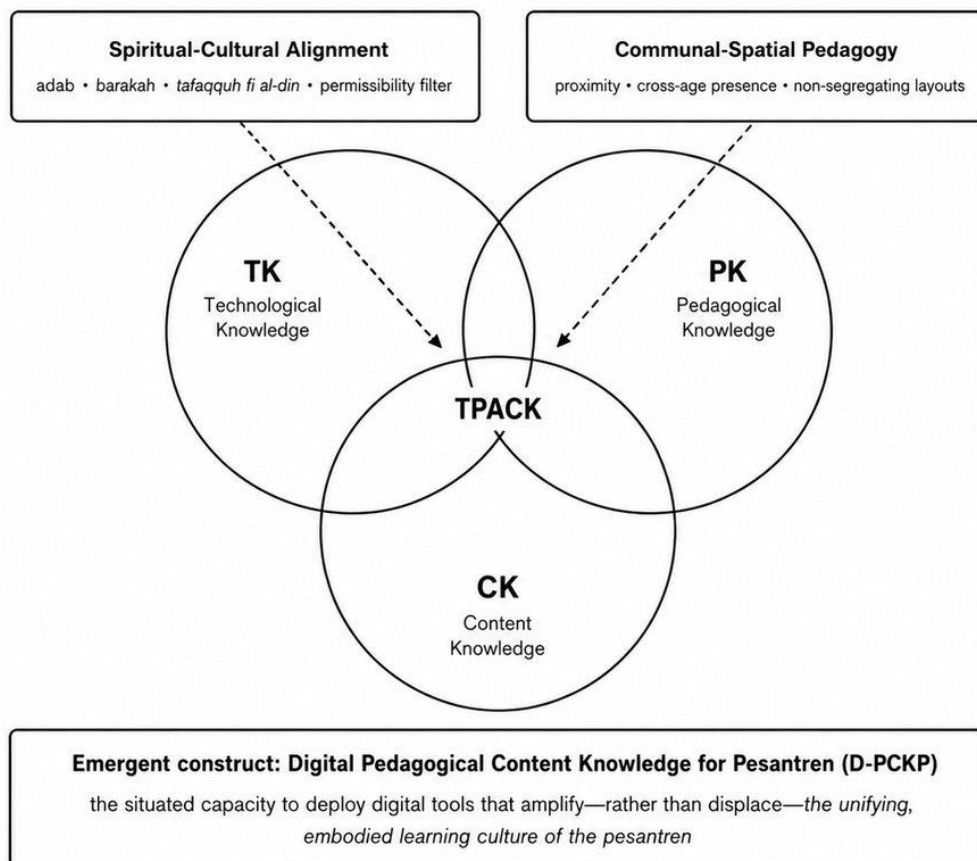
This *communal and spatial pedagogy* has direct implications for digital integration. Devices, screens, and digital workflows do not merely add a new layer to an existing pedagogy; they

reconfigure who is present to whom, when, and how attention flows. A *santri* immersed in a personalised digital task is, in that moment, less available to the human field, one that spans ages and statuses, that the *pesantren* has carefully arranged. The integration question is therefore not only ‘does the tool improve learning?’ but ‘does the tool sustain or erode the unifying copresence that defines *pesantren* formation?’ This question is largely absent from existing TPACK scholarship.

### An Analytical Framework: The Pesantren Digital Integration Model (PDIM)

Drawing on these considerations, the present study advances the *Pesantren* Digital Integration Model (PDIM), illustrated in Figure 1. PDIM retains the three core TPACK domains, technological, pedagogical, and content knowledge, and explicitly nests them within two additional axes specific to *pesantren*: (a) spiritual and cultural alignment, which captures the degree to which technological choices uphold *adab*, permissibility norms, and the cultivation of *tafaqquh fi al din* (deep religious understanding); and (b) communal and spatial pedagogy, which captures the degree to which technological choices sustain the unifying spatial pedagogy described above. Their intersection with TPACK generates a higher order construct that we term Digital Pedagogical Content Knowledge for *Pesantren* (DPCKP): the situated capacity to deploy digital tools that amplify, rather than displace, the embodied learning culture of the *pesantren*.

PDIM is offered here as a working framework that guided the analytical coding and was, in turn, refined inductively against the field data, in the spirit of methodologically transparent qualitative theory development (Charmaz, 2014). Figure 1 presents the framework graphically and is discussed further in Section 5.



*Figure 1. The Pesantren Digital Integration Model (PDIM).*

### III. METHOD

#### Research Design

This study adopts a single site embedded qualitative case study design (Yin, 2018) in which the bounded system is Pondok Thursina as a pesantren, and the embedded units of analysis are individual classrooms, teachers, and santri cohorts. The case study approach is appropriate because the phenomenon of interest, Samsung Digital Classroom integration, cannot be meaningfully separated from the institutional, cultural, and physical context in which it unfolds, and because the research questions are explanatory and process oriented (Stake, 1995; Yazan, 2015).

#### Setting and Participants

Pondok Thursina is a coeducational pesantren in Malang, East Java, with approximately 1,100 santri across junior and senior secondary levels. Since late 2023, the institution has installed Samsung Interactive Display panels in seventeen general subject classrooms, deployed Samsung Flip 2 collaboration boards in two science laboratories, and enrolled in Samsung's teacher training programme. Diniyyah (religious sciences) sessions remain predominantly in person with kitab kuning. Participants were selected through purposive maximum variation sampling (Patton, 2015), with eighteen informants distributed across two kiai (institutional leaders), eight ustadz (teachers from both general and religious subjects), and eight santri (four boys, four girls, drawn from grades 8, 10, and 11). Sampling continued until thematic saturation was reached, defined as the point at which two consecutive interviews yielded no new codes against the working codebook (Saunders et al., 2018).

#### Data Collection

Data were collected over five months (January to May 2026) through three complementary streams. First, nonparticipant classroom observation was conducted across twenty four sessions distributed across general subjects (mathematics, English, biology, social studies) and religious subjects (fiqh, hadith, tafsir), using a structured observation protocol focused on tool deployment, teacher santri interaction patterns, and spatial configurations. Detailed field notes and contextual photographs (avoiding santri faces, per ethical protocol) were produced after each session. Second, semistructured interviews of 45 to 75 minutes were conducted with each of the eighteen informants, using an interview guide that probed four domains: technology use, pedagogical decision making, perceived alignment with pesantren values, and challenges encountered. Interviews were audio recorded with consent and transcribed verbatim. Third, institutional documents were collected, including the pesantren's digital use policy, sample lesson plans, Samsung Knox Manage usage logs (where access was granted), Wi Fi traffic summaries, and a corpus of student artifacts produced digitally.

## Data Analysis

Analysis followed the interactive model of Miles, Huberman, and Saldaña (2014), comprising data condensation, data display, and conclusion drawing/verification, conducted iteratively rather than sequentially. The first author led an initial cycle of open coding on three observation transcripts and three interview transcripts to generate a provisional codebook of forty seven codes. The second author independently coded the same materials; inter coder agreement was reached on 84 percent of segments, with disagreements resolved through discussion and codebook refinement. Subsequent coding cycles applied the refined codebook to the full corpus, with analytical memos written throughout to track emergent patterns. Codes were then clustered into subthemes and, finally, into the four overarching themes presented in Section 4. Figure 2 summarises the design comprehensively.

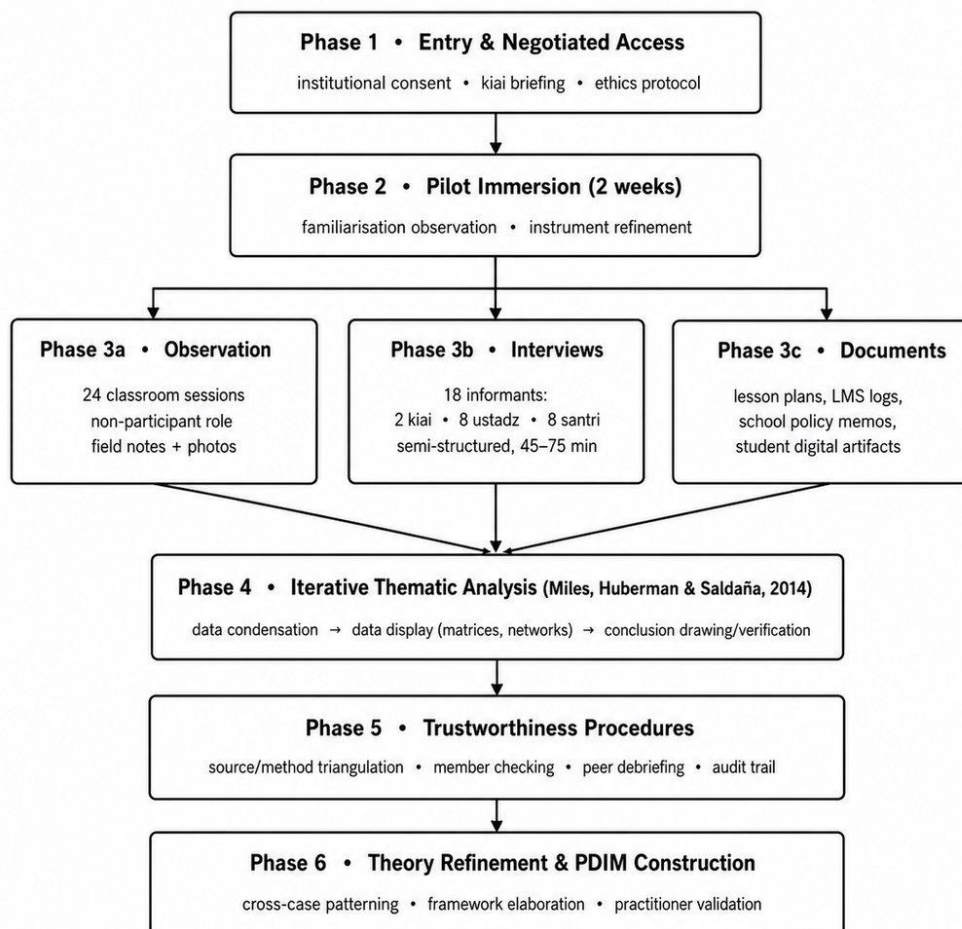


Figure 2. Qualitative case study research design.

## Trustworthiness

Following Lincoln and Guba’s (1985) criteria, trustworthiness was addressed through five procedures: (a) source triangulation across kiai, ustadz, and santri voices; (b) method triangulation across observation, interview, and document data; (c) member checking, in which preliminary themes were presented to six informants for confirmation or contestation; (d) peer debriefing

with two qualitative researchers external to the project; and (e) maintenance of a complete audit trail comprising raw data, coded transcripts, analytical memos, and decision logs.

### Ethical Considerations

The study received institutional ethical clearance prior to fieldwork. Informed consent was obtained from each adult informant; for santri under the age of eighteen, parental consent was secured in addition to the santri’s own assent. The pesantren leadership reviewed and approved the observation protocol, and the researcher honoured local norms regarding gender segregated classroom access, dress, and prayer times throughout the fieldwork.

## IV. RESULT AND DISCUSSION

### RESULT

Analysis yielded four interrelated themes that together characterise Samsung Digital Classroom implementation at *Pondok Thursina*. Figure 3 displays the underlying coding density across data sources (Panel A) and the observed maturity of implementation across PDIM dimensions (Panel B); the discussion below references both panels.

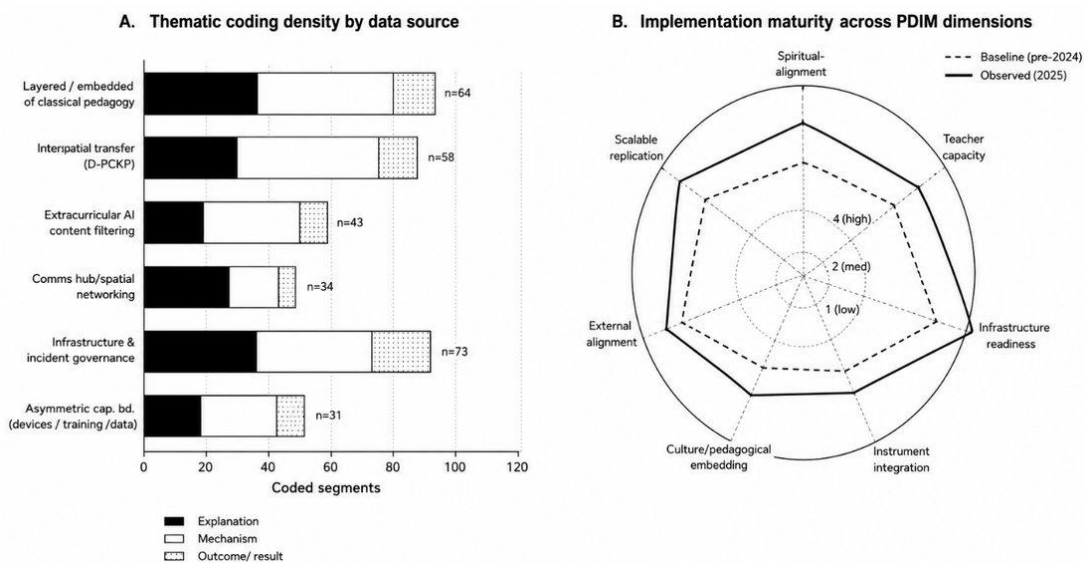


Figure 3. Qualitative data display.

### Layered Remediation of Classical Pedagogy

Across the twenty four observed sessions, the Samsung Interactive Display was rarely used as a one to one substitute for chalkboard teaching. Instead, it was deployed as one layer within a still recognisable *pesantren* lesson architecture. A typical mathematics session began with the customary opening recitation, followed by a brief teacher exposition at the front (now annotated on the Interactive Display rather than the whiteboard), then small group problem solving in which *santri* remained seated in their conventional rows but consulted shared digital workspaces, and concluded with a collective oral verification reminiscent of *bandongan*. The technology was, in effect, *folded into* an existing pedagogical grammar rather than rewriting it.

*"I did not throw away how my teacher taught me. I add the screen on top of it. The screen is a new pen; the lesson is still the lesson." (Ustadz F, mathematics, interview 06)*

This layered remediation was the single most heavily coded theme in the corpus (n = 94 coded segments; see Figure 3, Panel A). It was particularly visible in general subject classrooms but appeared in attenuated form even in religious sciences, where teachers occasionally used the display to project an enlarged scan of a *kitab kuning* passage for shared annotation while keeping the printed *kitab* open on every desk. *Diniyyah* teachers were emphatic that the printed text could not be replaced; the screen was permitted only as a magnifier or annotator, never as a substitute. This pattern aligns with what Hefner (2009) described as the *pesantren's* capacity to absorb new media without surrendering its textual core.

### Emergent Teacher Digital Pedagogical Content Knowledge for Pesantren

Teacher capacity emerged as the second most heavily coded theme (n = 90). Importantly, capacity development followed neither top down training models nor a purely individual self study trajectory. The training provided by vendors was described by most *ustadz* as a useful but insufficient starting point; the substantive learning occurred through what we term peer micromentoring, pairs and triads of teachers experimenting with the Interactive Display before and after formal teaching hours, sharing screen recordings of failures, and codeveloping routines specific to each subject.

*"The Samsung trainer showed us many features in one day. But I only learned to teach with it after I sat with Ustadz R for three afternoons and we tried, failed, tried again." (Ustadz A, biology, interview 11)*

Crucially, this peer micromentoring was inseparable from the moral and communal fabric of the *pesantren* itself. Teachers framed their collaboration as a form of *ta'awun* (mutual assistance) and as a continuation of the lineage logic by which scholarly competence is traditionally transmitted between *ustadz*. We theorise this configuration as the emergence of DPCKP, Digital Pedagogical Content Knowledge for *Pesantren*, a hybrid competency that combines the operational dimensions of TPACK with situated knowledge of how to integrate tools without violating the affective and moral norms of *pesantren* teaching. Panel B of Figure 3 shows the corresponding shift in teacher capacity, from a baseline of 1.8 (emerging to developing) to an observed level of 2.9 (developing to established) on the PDIM maturity scale.

### Cultural and Spiritual Content Filtering

Samsung's Knox Manage platform allows institutional administrators to whitelist applications, restrict browsing, and schedule device access. At *Pondok Thursina*, the configuration of this technical layer was the product of an explicit *musyawarah* (deliberative consultation) chaired by the *kiai* and involving teachers, the IT coordinator, and the parents' representative body. The *musyawarah* produced an institutional 'digital *adab* charter' specifying permissible content categories, prayer time automated locks, and prohibitions on personal social media during structured learning hours.

*"The device is amanah. If I cannot answer for what passes through it during teaching hours, I should not switch it on at all." (Kiai S, institutional leader, interview 02)*

Observation confirmed that this filtering was not merely declarative. Interactive Display sessions consistently drew from a previously vetted content library curated jointly by subject ustadz and the diniyyah faculty. When ad hoc content was needed mid lesson, teachers triangulated through a brief, almost ritualised consultation with a colleague before projecting. This practice consumed time and occasionally interrupted lesson flow, but informants framed it as a nonnegotiable feature rather than an inefficiency to be optimised away. Importantly, this filtering practice was the dimension with the highest observed maturity (3.6 of 4.0; Figure 3, Panel B), reflecting strong institutional ownership.

### Communal and Spatial Integration and Its Tensions

The fourth theme returns directly to the *pesantren's* communal and spatial pedagogy. Observation revealed considered design choices intended to preserve a unifying copresence that spans ages even within digitally mediated lessons. Interactive Displays were positioned at the front of the room, where, by *pesantren* convention, those deserving of honour belong, rather than recessed or relegated to the margins. Charging stations and device storage were placed in common circulation areas where senior *santri* and *ustadz* pass through, not hidden in dedicated computer rooms. During collaborative tasks, devices were used in shared mode at central tables rather than as individual workstations dedicated to one *santri* each, preserving the visibility and accessibility of each *santri* to their peers and to roving *ustadz*. Several informants articulated this design logic in explicitly spatial terms:

*"In our pondok, the kiai sits at the front. The grandfather of the founder, who is old and slow, also sits at the front. The boys with disabilities pray in the first row. We do not move them. So when the screen comes in, the screen also belongs at the front, not because it is honoured, but because the front is where everyone can see and be seen. If the device pulls a santri away from this seeing, we have lost something." (Ustadz H, religious studies coordinator, interview 04)*

This integration did not unfold without friction. Three additional tensions appeared. First, personalised digital tasks, however pedagogically attractive, were observed to reduce ambient awareness that spans ages in the room; teachers explicitly limited their duration. Second, dormitory device use policies were tighter than classroom policies, producing a perceived inconsistency that some senior *santri* questioned. Third, certain features marketed by the vendor as 'individual learning paths' were quietly deemphasised by teachers in favour of group mode features. These tensions, while real, did not destabilise the integration; rather, they were treated as design constraints to be continuously negotiated. This theme registered moderate coding density (n = 54) but disproportionately high analytical weight, as it was where the *pesantren's* distinctive logic was most visible.

### Cross cutting Structural Tensions

Beyond the four substantive themes, three structural tensions cut across the data. Infrastructure reliability, particularly intermittent Wi Fi during peak hours, was the most frequently named challenge (n = 73 coded segments). Asymmetric digital literacy among *santri* (n = 54), with girls from rural of Madura origin households consistently entering with less prior device

experience than peers from Java urban backgrounds, produced uneven participation that required deliberate teacher scaffolding. Finally, screen time governance during the dormitory evening hours generated recurrent contestation between the IT coordinator (favouring tighter automated lockouts) and senior *santri* (favouring graduated autonomy as a formation goal). None of these tensions undermined the overall integration; collectively, they describe its lived texture.

Taken together, the four themes and three crosscutting tensions describe Samsung Digital Classroom integration at Pondok Thursina not as a discrete project with a defined endpoint but as an ongoing institutional accomplishment. The technology has been made to fit the *pesantren* more than the *pesantren* has been remade to fit the technology, and this fitting is achieved through specific, identifiable practices: layered remediation rather than wholesale replacement; peer micromentoring rather than reliance on vendor training; deliberative content filtering through *musyawarah* rather than individual gatekeeping; and spatial design choices that preserve a copresence that spans ages rather than enable individualised isolation. The implementation maturity profile in Figure 3, Panel B, captures the cumulative result: substantial gains over baseline across every PDIM dimension, but with continuing room for development in teacher capacity and assessment integration, the two areas in which the dependence on tooling supplied by vendors is structurally hardest to localise. We turn next to the theoretical and practical implications of these findings.

## Discussion

### Theoretical Implications: Beyond TPACK

The findings substantiate the value of moving beyond a strict TPACK reading of *pesantren* technology integration. While the three core TPACK domains, technological, pedagogical, and content knowledge, remain analytically necessary, they are insufficient. The data make visible two further axes that are not optional additions but constitutive of what *good* technology integration means in this setting.

First, the spiritual and cultural alignment axis emerged unmistakably in Theme 3 and was reinforced in Themes 1 and 2. Decisions about which tools to use, which content to load, and which features to disable were not pedagogical technical decisions wrapped in religious rhetoric; they were religious pedagogical decisions for which the technical configuration was the implementation surface. This finding extends Mishra's (2019) call for contextually sensitive TPACK elaborations and aligns with Husein's (2022) argument that digital Muslim practice is structured by ongoing acts of permissibility discernment rather than by binary acceptance or rejection.

Second, the communal and spatial pedagogy axis emerged most clearly in Theme 4. It captures a feature of *pesantren* life that has, to our knowledge, not been formally theorised within EdTech scholarship: the deliberate engineering of physical and social proximity that spans ages without segregation as a pedagogical resource. Recognising this axis as constitutive of *pesantren* integration means that any digital tool whose default configuration tends toward individualisation, isolation, or attention capture must be evaluated not only against learning outcome metrics but against its effect on the unifying copresence that the *pesantren* has historically arranged. The

PDIM framework (Figure 1) makes both axes explicit and positions DPCKP as the higher order construct toward which teacher development should be oriented.

A deeper reading of the data suggests that the PDIM is best understood not as a simple additive extension of TPACK but as a reordering of its internal hierarchy. In conventional TPACK applications, technological knowledge typically enters as the underdetermined variable that pedagogy and content must accommodate (Mishra & Koehler, 2006; Tondeur et al., 2017). In our case, the directionality is inverted: spiritual and communal commitments operate as the anchoring constraints, and technological choices are evaluated against, and modified by, those constraints. This inversion explains an otherwise puzzling observation in the data, that *ustadz* at Pondok Thursina occasionally praised features they had never activated, framing the value of a tool less by its empirical pedagogical yield than by its compatibility with their formation logic. Such judgments resemble what Tondeur et al. (2017) describe as the “will, skill, tool, pedagogy” configuration but with an additional, value laden axis that determines whether will and tool can be ethically reconciled in the first place. The PDIM thus contributes to ongoing debates about how to theorise technology integration in non secular educational settings (Heidari et al., 2021; Akram et al., 2022), where instrumentalist frameworks have repeatedly proved insufficient.

A second analytical move concerns the relationship between space and pedagogy. The communal and spatial pedagogy axis converges with recent scholarship on the sociomaterial turn in education (Fenwick, 2015; Gourlay, 2021), which argues that learning is constituted not only by minds and content but by the material arrangement of bodies, objects, and environments. Yet the *pesantren* case adds a dimension typically absent from sociomaterial accounts: the spatial arrangement carries explicitly moral and devotional cargo. Placing the Interactive Display at the front of the room, where the *kiai* sits, is not a neutral ergonomic decision but an act of categorisation that situates the device within the *pesantren*’s symbolic order. When informants articulated that “those deserving of honour belong at the front,” they were enacting a coherent spatial theology that simultaneously governs the seating of senior figures, those with disabilities, and now, by extension, the digital apparatus. Reading the data through this lens clarifies why certain vendor defaults, particularly individualised learning paths and screen partitioning features, encountered quiet resistance: they reorganised attention in ways that contradicted the spatial logic by which the institution constitutes itself as a moral community (Apriyanti et al., 2023; Nasir & Rijal, 2021). The PDIM names this dynamic explicitly, where most existing frameworks elide it.

### Practical Implications

For *pesantren* leaders, the findings suggest that successful digital integration is less a procurement decision than a deliberative one. The led by *musyawarah adab* charter at Pondok Thursina functioned as more than a policy document; it served as a *socialising mechanism* that distributed ownership of the digital configuration across the institution. *Pesantren* considering similar implementations would be well advised to invest in this deliberative scaffolding before, not after, hardware deployment.

For teacher educators, the centrality of peer micromentoring in capacity development is instructive. Vendor led training events, however well designed, did not produce DPCKP on their own; the substantive learning happened in informal, sustained, peer paired experimentation

embedded in the daily rhythm of the *pesantren*. Training models that complement formal sessions with structured peer mentoring time, and that recognise such time as legitimate professional work, are more likely to produce the situated competence the setting requires.

For EdTech vendors, the findings indicate a strategic opportunity. *Pesantren* constitute a substantial, historically underserved market within Indonesia and the broader Muslim world. Vendors who design configuration defaults, training pathways, and content curation tools with specific to *pesantren* affordances, prayer time automated locks, aligned with *kitab* content libraries, group mode interaction by default, transparent administrative consultation tooling, will not only address an underserved segment but will also model what culturally responsive EdTech design can look like more broadly (Selwyn, 2021).

These practical implications, however, must be read against a sobering analytical observation about institutional sustainability. The deliberative scaffolding observed at Pondok Thursina, the musyawarah, the digital adab charter, the peer micromentoring routines, was costly in time and managerial attention; it functioned not because it was efficient but because it was institutionally protected. Where comparable *pesantren* have attempted lighter weight implementations, prior research suggests the integration tends to drift toward two failure modes: a thin compliance configuration in which the technology is installed but rarely used pedagogically, or an unmoderated configuration in which the technology is used but progressively erodes the institution's distinctive practices (Khoirurrijal et al., 2023; Mursidi et al., 2024). The Pondok Thursina case is not, therefore, a model that smaller or less resourced *pesantren* can copy line by line; it is a proof of concept that demonstrates what successful integration requires institutionally. This reframes the practical question from "how do we adopt this technology?" to "what institutional capacities must we cultivate, or borrow from network partners, before adoption becomes safe?" This more demanding question, we suggest, is the one EdTech vendors and Islamic education policymakers should be helping *pesantren* leaders to ask, and it situates digital integration within the broader literature on absorptive capacity in faith based organisations (Kasim & Yusof, 2023; Nguyen & Habók, 2024).

### Relation to Prior Research

Our findings both extend and complicate prior accounts. They extend infrastructural and instrumental scholarship (Daryanes et al., 2023; Putri et al., 2021) by showing that the question is not merely whether digital media improves learning, but *how* the media is configured within a moral and spatial pedagogy. They complicate celebratory accounts of *pesantren* digital adoption (Rahman, 2021) by surfacing the structural tensions that successful integration must navigate, not eliminate. They also constructively challenge apocalyptic readings (Pohl, 2009) by showing that *pesantren* can, in fact, host digital tools without surrendering core identity, provided that the integration is layered, deliberative, and spatially aware. In this respect, our case parallels Hefner's (2009) longstanding observation that *pesantren* have historically absorbed new media, print, audio, broadcast, through selective remediation rather than wholesale conversion.

Read alongside emerging international scholarship, our findings further refine ongoing debates about religious schooling and digitalisation. In studies of madrasah modernisation across South and Southeast Asia, Tan (2014) and more recently Halstead and Affouneh (2022) document

a recurring pattern wherein technology adoption initially appears compatible with religious tradition only to subtly recalibrate which competences count as religious expertise. Our data show how Pondok Thursina actively resists this recalibration: by routing curatorial decisions through *musyawarah* and by keeping *kitab kuning* instruction outside the digital workflow, the institution preserves the *kiai*'s authority as the locus of religious epistemology even while delegating technical authority elsewhere. This finding qualifies more pessimistic accounts of religious detraditionalisation through technology (Campbell & Tsuria, 2022) by showing that strategic spatial and procedural separation can preserve epistemic asymmetries that protect tradition. At the same time, it complicates strictly emancipatory readings of EdTech (Cuban, 2018; Williamson et al., 2022), which presume that digitalisation flattens authority and expands access. In the *pesantren*, certain asymmetries are pedagogically productive, and successful integration depends precisely on knowing which ones to preserve and which to dissolve.

### Transferability and Boundary Conditions

Although case study findings are not statistically generalisable, the analytical framework developed here can be assessed for transferability to other settings (Lincoln & Guba, 1985). Three boundary conditions are worth noting. First, PDIM presupposes an institutional culture in which deliberation, *musyawarah* or its functional equivalent, can take place. In settings where institutional decision making is highly centralised or, conversely, fragmented, the deliberative scaffolding that produced the digital *adab* charter at *Pondok Thursina* may be harder to mobilise. Second, the framework presupposes spatial arrangements that physically enable a copresence that spans ages. *Pesantren* housed in vertically stacked urban facilities, or those with strict age segregated layouts imposed by safety regulations, will need to identify other practical instantiations of the communal and spatial pedagogy axis. Third, the framework assumes that vendor configurability, particularly around content filtering, scheduling, and group mode defaults, is sufficiently flexible to accommodate institutional adaptation. Where vendor tools are rigid or where contractual terms restrict customisation, the integration calculus shifts substantially. Within these boundary conditions, PDIM offers a portable analytical resource for other Indonesian *pesantren* and, with appropriate translation, for cognate faith based educational institutions in Malaysia, Brunei, and parts of the Arabic speaking world where similar traditions of residential religious schooling endure.

### Limitations

Three limitations warrant explicit mention. First, single site design limits the generalisability of specific empirical findings beyond *Pondok Thursina*, but the PDIM framework, however, is offered as an analytical resource that can travel to and be tested in other *pesantren* contexts. Second, the five month fieldwork window captured an active integration phase but did not extend to longer horizon effects, including possible shifts in *santri* religious practice, alumni outcomes, or institutional identity over multiyear arcs. Third, the researcher's positionality, as a Muslim Indonesian education scholar with prior *pesantren* exposure, facilitated access and rapport but may have produced sympathetic framings; the trustworthiness procedures detailed in Section 3.5 were designed in part to mitigate this risk, but cannot eliminate it entirely.

## V. CONCLUSION

This study has examined the implementation of Samsung Digital Classroom technology at Pondok Thursina, a modern pesantren in East Java, through a five month qualitative case study. Findings reveal that effective digital integration in this context is not a matter of technology adoption per se but a sustained negotiation between the affordances of supplied by vendors tools and the moral and spatial pedagogy of pesantren life. Four interrelated themes, layered remediation of classical pedagogy, emergent teacher DPCKP, cultural and spiritual content filtering, and communal and spatial integration, together describe how this negotiation is actually conducted in everyday teaching and learning.

Conceptually, the study contributes the Pesantren Digital Integration Model (PDIM), which augments the TPACK framework with two specific to pesantren axes: spiritual and cultural alignment and communal and spatial pedagogy. The intersection of these axes with the TPACK core yields the higher order construct of DPCKP, the situated capacity to deploy digital tools that amplify rather than displace the unifying, embodied learning culture of the pesantren.

Practically, the findings indicate that pesantren leaders, teacher educators, and EdTech vendors each have distinctive roles in producing this kind of integration: leaders, by investing in deliberative scaffolding such as led by musyawarah adab charters before hardware deployment; teacher educators, by complementing vendor training with structured peer micromentoring time; and vendors, by designing aware of pesantren context defaults, content libraries, and administrative tooling.

Future research should test PDIM through comparative multisite studies across different pesantren typologies (salaf, khalaf, modern, integrated), examine longitudinal effects on santri formation, and explore how the framework might be adapted for cognate faith based educational settings beyond the Indonesian pesantren context. The broader question, how educational institutions whose pedagogy is grounded in deliberate copresence can integrate inherently individualising digital tools without surrendering their distinctive formation, remains open, urgent, and well worth sustained inquiry.

## VI. ACKNOWLEDGEMENTS

The authors thank the leadership, ustadz, and santri of Pondok Thursina for their generous participation and hospitality throughout this study. We also thank two anonymous reviewers for constructive feedback on an earlier draft.

## VII. REFERENCES (Calibri, 12 Bold)

- [1] Azra, A. (2019). *Pendidikan Islam: Tradisi dan modernisasi di tengah tantangan milenium III* (Rev. ed.). Kencana.
- [2] Akram, H., Abdelrady, A. H., Al-Adwan, A. S., & Ramzan, M. (2022). Teachers' perceptions of technology integration in teaching-learning practices: A systematic review. *Frontiers in Psychology, 13*, 920317. <https://doi.org/10.3389/fpsyg.2022.920317>
- [3] Apriyanti, N., Razak, R. A., Rahim, S. S. A., Shaharom, M. S. N., & Baharuldin, Z. (2023). Infographic instructional media as a solution for distance learning. *International Journal of*

- Evaluation and Research in Education*, 12(2), 982–990.  
<https://doi.org/10.11591/ijere.v12i2.24112>
- [4] Bruinessen, M. van. (2012). *Kitab kuning, pesantren dan tarekat: Tradisi tradisi Islam di Indonesia*. Gading Publishing.
- [5] Campbell, H. A., & Tsuria, R. (Eds.). (2022). *Digital religion: Understanding religious practice in digital media* (2nd ed.). Routledge. <https://doi.org/10.4324/9780367277550>
- [6] Charmaz, K. (2014). *Constructing grounded theory* (2nd ed.). Sage.
- [7] Cuban, L. (2018). *The flight of a butterfly or the path of a bullet? Using technology to transform teaching and learning*. Harvard Education Press.
- [8] Daryanes, F., Darmadi, D., Fikri, K., Sayuti, I., Rusandi, M. A., & Situmorang, D. D. B. (2023). The development of articulate storyline interactive learning media based on case methods to train student's problem solving ability. *Heliyon*, 9(4), e15082. <https://doi.org/10.1016/j.heliyon.2023.e15082>
- [9] Dhofier, Z. (2011). *Tradisi pesantren: Studi tentang pandangan hidup kyai* (Rev. ed.). LP3ES.
- [10] Dito, S. B., & Pujiastuti, H. (2021). Dampak revolusi industri 4.0 pada sektor pendidikan: Kajian literatur mengenai digital learning pada pendidikan dasar dan menengah. *Jurnal Sains dan Edukasi Sains*, 4(2), 59 to 65. <https://doi.org/10.24246/juses.v4i2p59-65>
- [11] Fenwick, T. (2015). Sociomateriality and learning: A critical approach. In D. Scott & E. Hargreaves (Eds.), *The SAGE handbook of learning* (pp. 83–93). SAGE. <https://doi.org/10.4135/9781473915213.n8>
- [12] Hefner, R. W. (Ed.). (2009). *Making modern Muslims: The politics of Islamic education in Southeast Asia*. University of Hawai'i Press.
- [13] Gourlay, L. (2021). There is no “virtual learning”: The materiality of digital education. *Journal of New Approaches in Educational Research*, 10(1), 57–66. <https://doi.org/10.7821/naer.2021.1.649>
- [14] Halstead, J. M., & Affouneh, S. (2022). Educating the human spirit in times of crisis: Digital transformation in Islamic religious education. *British Journal of Religious Education*, 44(3), 254–267. <https://doi.org/10.1080/01416200.2021.1947194>
- [15] Heidari, E., Mehrvarz, M., Marzooghi, R., & Stoyanov, S. (2021). The role of digital informal learning in the relationship between students' digital competence and academic engagement during the COVID-19 pandemic. *Journal of Computer Assisted Learning*, 37(4), 1154–1166. <https://doi.org/10.1111/jcal.12553>
- [16] Hirschkind, C. (2012). Experiments in devotion online: The YouTube khuṭba. *International Journal of Middle East Studies*, 44(1), 5 to 21. <https://doi.org/10.1017/S0020743811001218>
- [17] Husein, F. (2022). Digital Islam in Indonesia: The shift of ritual and religious authority. In I. R. Adi (Ed.), *Borders and beyond* (pp. 233 to 246). Routledge.
- [18] Khoirurrijal, K., Sirojuddin, A., Fatimah, S., Aprilianto, A., & Sa'dullah, A. (2023). Pesantren digital transformation during and after the pandemic: A multisite study. *Tarbawi: Jurnal Keilmuan Manajemen Pendidikan*, 9(1), 71 to 86. <https://doi.org/10.32678/tarbawi.v9i01.7891>

- [19] Kasim, T. S. A. T., & Yusof, Y. M. (2023). Absorptive capacity and digital transformation in Islamic educational institutions: A systematic review. *Journal of Islamic Thought and Civilization*, 13(1), 198–215. <https://doi.org/10.32350/jitc.131.12>
- [20] Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage.
- [21] Lukens Bull, R. (2020). *Islamic higher education in Indonesia: Continuity and conflict*. Palgrave Macmillan.
- [22] Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Sage.
- [23] Mishra, P. (2019). Considering contextual knowledge: The TPACK diagram gets an upgrade. *Journal of Digital Learning in Teacher Education*, 35(2), 76 to 78. <https://doi.org/10.1080/21532974.2019.1588611>
- [24] Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017 to 1054.
- [25] Mursidi, A., Setiawan, F., Soegiyanto, S., & Nuryana, Z. (2024). Digital transformation in Islamic boarding schools: Challenges and institutional readiness. *Cogent Education*, 11(1), 2314512. <https://doi.org/10.1080/2331186X.2024.2314512>
- [26] Nasir, M. K. M., & Rijal, S. (2021). Cultivating an environment of moral teaching in the digital era. *International Journal of Evaluation and Research in Education*, 10(4), 1290–1297. <https://doi.org/10.11591/ijere.v10i4.21743>
- [27] Nguyen, L. T., & Habók, A. (2024). Tools for assessing teacher digital literacy: A review. *Journal of Computers in Education*, 11(1), 305–346. <https://doi.org/10.1007/s40692-022-00257-5>
- [28] Patton, M. Q. (2015). *Qualitative research and evaluation methods* (4th ed.). Sage.
- [29] Phillips, M., Koehler, M., & Rosenberg, J. (2017). Looking outside the circles: Considering the contexts influencing TPACK development and enactment. In P. Resta & S. Smith (Eds.), *Proceedings of SITE 2017* (pp. 2476 to 2483). AACE.
- [30] Pohl, F. (2009). *Islamic education and the public sphere: Today's pesantren in Indonesia*. Waxmann.
- [31] Prasetya, R., Hadi, S. P., & Wahyu, F. R. (2022). Digital transformation in Indonesian Islamic education: Opportunities and barriers. *Jurnal Pendidikan Islam*, 8(2), 145 to 162.
- [32] Putri, S. R., Wahyuni, S., & Suharso, P. (2021). The effectiveness of digital learning media on students' learning outcomes. *Journal of Educational Research and Evaluation*, 5(3), 412 to 419.
- [33] Rahman, M. (2021). Digitalisasi pembelajaran di lingkungan pesantren modern. *Jurnal Pendidikan Islam*, 7(1), 88 to 97.
- [34] Salsabila, U. H., Sari, L. I., Lathif, K. H., Lestari, A. P., & Ayuning, A. (2020). Peran teknologi dalam pembelajaran di masa pandemi covid 19. *Al Mutharahah: Jurnal Penelitian dan Kajian Sosial Keagamaan*, 17(2), 188 to 198. <https://doi.org/10.46781/al-mutharahah.v17i2.138>
- [35] Samsung Electronics. (2024). *Samsung digital classroom: Teacher and administrator guide* (v3.2). Samsung Electronics Co., Ltd.

- [36] Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., & Jinks, C. (2018). Saturation in qualitative research: Exploring its conceptualization and operationalization. *Quality & Quantity*, 52(4), 1893 to 1907. <https://doi.org/10.1007/s11135-017-0574-8>
- [37] Schleicher, A. (2023). *PISA 2022 results: The state of learning and equity in education*. OECD Publishing.
- [38] Selwyn, N. (2021). *Education and technology: Key issues and debates* (3rd ed.). Bloomsbury Academic.
- [39] Sirry, M. (2020). *Controversies in contemporary Islam*. Routledge.
- [40] Stake, R. E. (1995). *The art of case study research*. Sage.
- [41] Sutrisno, E., & Fauzan, M. (2022). Tantangan implementasi teknologi pendidikan di lembaga pendidikan Islam. *Jurnal Inovasi Pendidikan Islam*, 4(1), 33 to 41.
- [42] Tan, C. (2014). Educative tradition and Islamic schools in Indonesia. *Journal of Arabic and Islamic Studies*, 14, 47–62. <https://doi.org/10.5617/jais.4638>
- [43] Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. *Educational Technology Research and Development*, 65(3), 555–575. <https://doi.org/10.1007/s11423-016-9481-2>
- [44] Voogt, J., Fisser, P., Tondeur, J., & van Braak, J. (2016). Using theoretical perspectives in developing an understanding of TPACK. In M. C. Herring, M. J. Koehler, & P. Mishra (Eds.), *Handbook of technological pedagogical content knowledge (TPACK) for educators* (2nd ed., pp. 33 to 52). Routledge.
- [45] Williamson, B., Eynon, R., & Potter, J. (2022). Pandemic politics, pedagogies and practices: Digital technologies and distance education during the coronavirus emergency. *Learning, Media and Technology*, 47(2), 107–114. <https://doi.org/10.1080/17439884.2022.2057499>
- [46] Yazan, B. (2015). Three approaches to case study methods in education: Yin, Merriam, and Stake. *The Qualitative Report*, 20(2), 134 to 152.
- [47] Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage.