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## AI-GAMIFICATION IN QUR'ANIC LEARNING: ASSESSING INDONESIAN ISLAMIC RELIGIOUS EDUCATION TEACHERS' READINESS FOR GENERATION ALPHA

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### Abstract

This study investigates the readiness of Indonesian Islamic Religious Education (PAI) teachers at the lower secondary level to integrate AI-based gamification into Qur'anic learning for Generation Alpha students. As part of the Transformative Tilawah research program, the study also provides initial validity evidence for the TRAIGE instrument, which measures five dimensions of readiness: technical, pedagogical, content, perceived usefulness, and institutional readiness. Using a convergent mixed-methods design, data were collected through a survey of 30 teachers and semi-structured interviews with 5 participants selected through purposive network sampling. Quantitative data were analyzed descriptively, while qualitative data were examined using reflexive thematic analysis. The findings show that overall teacher readiness is high ( $M = 81.50$ ; 81.5%). Technical readiness is the strongest dimension (87.2%), whereas pedagogical readiness is the weakest (78.9%). Perceived usefulness is very high (82.0%), indicating positive views of AI-gamification for motivation and learning outcomes. However, a support-capacity gap persists: leadership is supportive, but training and technical assistance remain limited. Implementation therefore requires ethical design, pedagogical strengthening, and stronger institutional support.

**Keywords:** teacher readiness; AI-gamification; Qur'anic learning

### Abstrak

Penelitian ini mengkaji kesiapan guru Pendidikan Agama Islam (PAI) tingkat Sekolah Menengah Pertama (SMP) di Indonesia dalam mengintegrasikan gamifikasi berbasis AI ke dalam pembelajaran Al-Qur'an bagi Generasi Alpha. Sebagai bagian dari program riset Transformative Tilawah, studi ini juga memberikan bukti validitas awal terhadap instrumen TRAIGE yang mengukur lima dimensi kesiapan, yaitu kesiapan teknis, pedagogis, konten, persepsi kegunaan, dan dukungan institusional. Penelitian menggunakan desain mixed methods konvergen dengan pengumpulan data melalui survei terhadap 30 guru serta wawancara semi-terstruktur dengan 5 partisipan yang dipilih melalui purposive network sampling. Data kuantitatif dianalisis secara deskriptif, sedangkan data kualitatif dianalisis menggunakan reflexive thematic analysis. Hasil penelitian menunjukkan bahwa kesiapan guru secara umum berada pada kategori tinggi ( $M = 81,50$ ; 81,5%). Kesiapan teknis menjadi dimensi terkuat (87,2%), sedangkan kesiapan pedagogis menjadi yang terendah (78,9%). Persepsi kegunaan berada pada kategori sangat tinggi (82,0%). Namun, masih terdapat kesenjangan antara dukungan pimpinan dan kapasitas nyata sekolah, terutama dalam pelatihan dan bantuan teknis. Karena itu, implementasi memerlukan desain etis, penguatan pedagogis, dan dukungan institusional yang lebih kuat.

**Kata kunci:** kesiapan guru; gamifikasi berbasis AI; pembelajaran Al-Qur'an

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## Introduction

Islamic Religious Education (PAI) teachers in Indonesia face a concrete pedagogical dilemma: their classrooms are now entirely populated by Generation Alpha, the cohort born between 2010 and 2025, fully socialized within a mature digital ecosystem (McCrinkle & Fell, 2020), yet the subject they teach, Qur'anic learning, is epistemologically grounded in centuries-old transmission practices that cannot simply be digitized. AI-gamification, which integrates adaptive artificial intelligence with game-design elements such as points, progressive challenges, and instant feedback, has emerged as a technically substantive response to this dilemma ((Baah et al., 2023; Hastuti & Agustina, 2023). However, the effectiveness of any technology in a classroom depends less on the technology itself than on whether teachers are ready, technically, pedagogically, content-wise, and institutionally, to implement it meaningfully. This study examines that readiness in the specific and demanding context of Qur'anic learning.

Qur'anic learning in Indonesia is epistemologically distinct from secular subjects in ways that are directly consequential for technology integration. Its dimensions, including recitation (*tilawah*), pronunciation rules (*tajwid*), measured recitation (*tartil*), memorization (*tahfidz*), and internalization of meaning, each require phonetic precision at the level of *makharij al-huruf*, preservation of authentic teacher–student transmission chains (*sanad*), and the cultivation of spiritual values that cannot be reduced to cognitive metrics (Artha et al., 2025). The *talaqqi* method, tested over centuries, remains epistemologically valid yet faces efficiency pressures in large classes with constrained teacher–student ratios. Generation Alpha students' learning profile, characterized by reliance on interactive stimulation, expectations of instant feedback, and limited tolerance for passive content delivery (Fadlurrohim et al., 2019), amplifies rather than creates these pressures, making pedagogical renewal an urgent rather than optional response.

The empirical case for AI-gamification in Islamic educational contexts has strengthened in recent years. On the AI side, speech-recognition systems can detect *tajwid* errors in real time with high accuracy, and deep-learning systems demonstrate capability for recognizing individual recitation patterns to deliver personalized feedback (An et al., 2025). On the gamification side, (Sakdiah et al., 2025) demonstrate that gamified media improve student motivation and PAI learning outcomes; and (Mahmubi & Homaidi, 2025) show that gamification supports internalization of Islamic values through immediate feedback and constructive competition. Collectively, these findings position AI-gamification as a pedagogically substantive response to the specific pressures facing Qur'anic learning, not merely a global technology trend imported into Islamic education.

Whether this potential translates into classroom reality, however, depends on teacher readiness as the essential mediating condition. Research on AI integration in K–12 contexts consistently shows that the critical gap is not technology access but pedagogical integration competence (Cheah et al., 2025). In the Indonesian context specifically, (Harsanti et al., 2025) show that teachers' digital readiness gaps are primarily psychological, relating to self-confidence and perceived relevance to their specific subject, rather than purely infrastructural; These findings confirm that PAI teacher readiness for AI-gamification is a multidimensional and context-sensitive construct requiring purposeful, domain-specific investigation.

This study operationalizes teacher readiness through three complementary theoretical frameworks, each of which is mapped directly and analytically onto specific TRAIGE dimensions, not as general background, but as the operational foundation explaining the selection, scope, and boundaries of each dimension. The TPACK framework (Mishra & Koehler, 2006) provides the primary architecture: *Technological Knowledge* (TK) maps onto Technical Readiness (TR), capturing teachers' foundational comfort with and autonomy over digital tools; *Content Knowledge* (CK) maps onto Content Readiness (CR), capturing mastery of Qur'anic content and capacity to adapt it into digital formats; and the PK/TPK/TPCK intersections map onto Pedagogical Readiness (PR), capturing the ability to design AI-gamification-integrated sequences that are both pedagogically sound and content-authentic. The Technology Acceptance Model (Davis, 1989) contributes the psychological dimension, operationalized as the Perceived Usefulness (PU) dimension, which captures teachers' beliefs about AI-gamification's benefits for student motivation, outcomes, and spiritual relevance. Organizational Readiness Theory (Holt et al., 2007) addresses the structural level, including leadership support, training provision, and infrastructure availability, operationalized as the Institutional Readiness (IR) dimension. Crucially, TRAIGE extends beyond these three Western-origin frameworks by incorporating a fifth dimension: *spiritual compatibility* (SC). Drawing on (Amri, 2025) argument that perceived value-alignment functions as a significant moderator of technology adoption in Islamic educational settings, SC captures teachers' judgments of whether AI-gamification aligns with the epistemological and ethical principles of Qur'anic learning. This five-dimension architecture is analytically integrative, not merely additive: each dimension reflects a distinct yet interrelated aspect of readiness, and the boundaries between dimensions are determined by the theoretical frameworks themselves.

A systematic review of existing instruments reveals the precise gap this architecture addresses. Validated TPACK surveys (Schmid et al., 2020) measure technological-pedagogical-content knowledge intersections but are explicitly content-neutral; they cannot differentiate between *tajwid* mastery and general subject-matter knowledge, nor do they assess the spiritual dimension of learning. TAM-based instruments assess technology acceptance attitudes but lack pedagogical design competence measures and institutional capacity indicators. Generic AI readiness scales assess technical confidence and perceived usefulness but incorporate neither the content specificity required for PAI nor any mechanism for capturing spiritual or value-based dimensions of adoption. No existing instrument simultaneously addresses all five dimensions, namely technical, pedagogical, content, motivational-psychological, and institutional, within a contextualized framework for Islamic Religious Education. This gap is especially consequential because PAI teachers' technology integration is consistently shaped by domain-specific factors: the authority structure of *talaqqi*, the sanctity of the Qur'anic text, and normative expectations around *adab* in religious learning (Artha et al., 2025; Saputro et al., 2025; Amri, 2025).

Three specific and interrelated research gaps follow from this review. First, no prior study has empirically examined PAI teachers' readiness to integrate AI-gamification into Qur'anic learning, a context with spiritual, ethical, and knowledge-transmission dimensions absent from secular subjects. Second, no contextualized instrument exists for measuring this multidimensional readiness in the PAI domain; available tools are either generically applicable edtech instruments or broad AI readiness scales insensitive to Qur'anic content specifics. Third, PAI teachers' perceptions of the compatibility of AI-gamification with Qur'anic spiritual values remain empirically

unmapped, despite evidence that such perceptions constitute a significant adoption moderator in value-based educational settings (Amri, 2025).

This study addresses these three gaps as a preliminary, contextually bounded investigation. As the second study in the staged *Transformative Tilawah* research programme (Artha et al., 2025), it functions as an empirical diagnostic bridge between the programme's conceptual framework (Study 1) and its planned intervention designs (Study 3). Three proportionate contributions are claimed. First, it introduces the TRAIGE instrument and provides initial reliability ( $\alpha = 0.925$ ) and expert-reviewed content validity evidence, which is preliminary rather than definitive, but sufficient to constitute a purpose-built diagnostic baseline for this domain. Second, it provides an exploratory mixed-methods readiness profile of SMP/MTs PAI teachers in the Bandung network, establishing a contextually rich diagnostic baseline for professional development planning in comparable settings. Third, it identifies the *support-capacity gap* and *conditional spiritual compatibility* as empirical constructs warranting further investigation in larger and more representative studies. The study addresses four research questions: (1) What is the overall and dimension-wise readiness profile of PAI teachers in the study sample as measured by TRAIGE? (2) Which dimensions are relatively strongest, and which represent the most critical implementation bottlenecks? (3) What factors do teachers perceive as structural barriers and potential facilitators? (4) How do PAI teachers perceive the compatibility of AI-gamification with Qur'anic spiritual values, and what conditions do they articulate for its implementation?

## Method

This study employed a convergent mixed-methods design (Creswell & Clark, 2017), in which quantitative and qualitative data were collected concurrently, analysed independently, and integrated at the interpretation stage. This design was considered appropriate because teacher readiness is a multidimensional construct that cannot be adequately understood through numerical indicators alone. While quantitative data enable the identification of measurable patterns and relative levels of readiness, qualitative data provide explanatory depth regarding the contextual, motivational, and value-based considerations underlying teachers' responses.

The study focused on in-service Islamic Religious Education (PAI) teachers at the lower secondary (SMP/MTs) level. This level was selected for three substantive reasons. First, SMP/MTs students born between 2010 and 2013 represent a full Generation Alpha cohort. Second, *tajwid* and *tartil* content at this level is directly relevant to the pedagogical and technical affordances of AI-gamification. Third, lower secondary education constitutes an important stage in the consolidation of sustainable Qur'anic literacy (Artha et al., 2025). Participants were recruited through purposive network sampling via two channels: the alumni network of the Islamic Religious Education Study Program at Universitas Pendidikan Indonesia (UPI) and the MGMP PAI SMP/MTs network in Bandung. To be included in the study, participants had to be active in-service PAI teachers, teach at the SMP or MTs level, and currently serve as the primary PAI instructor for at least one class. The study was conducted in two stages. The first stage involved a pilot study with 10 teachers to examine item clarity, readability, and internal consistency of the instrument. The second stage involved the main study with 30 PAI teachers. Of the main-study respondents, 28 teachers (93.3%) were from schools within the Greater Bandung metropolitan

area, while two teachers from outside this area were retained because they fulfilled all inclusion criteria. Because this sample was geographically concentrated and professionally networked through UPI and MGMP channels, the findings should be interpreted as contextually bounded and exploratory rather than as representative of PAI teachers at the national or provincial level. For the qualitative strand, five teachers were selected from the main-study respondents through purposive sampling based on variation in teaching experience, school type, geographic sub-area, and leadership roles within MGMP in order to obtain a diverse and information-rich qualitative dataset.

The primary instrument used in this study was TRAIGE (Teacher Readiness Assessment for Integration of AI-Gamification in Education-Quranic Learning), developed by the first author specifically for this research context. TRAIGE is a five-point Likert-scale questionnaire (1 = Strongly Disagree, 5 = Strongly Agree) consisting of 20 items distributed across five theory-grounded dimensions: Technical Readiness (TR, 5 items), Pedagogical Readiness (PR, 5 items), Content Readiness (CR, 4 items), Perceived Usefulness (PU, 3 items), and Institutional Readiness (IR, 3 items), with a total possible score range of 20–100. Item development proceeded in three stages. First, the items were generated through a systematic literature review informed by the TPACK framework (Mishra & Koehler, 2006), which underpinned the TR, PR, and CR dimensions; the Technology Acceptance Model (Davis, 1989), which informed the PU dimension; and Organizational Readiness Theory (Holt et al., 2007), which informed the IR dimension. Second, content validity was assessed by three experts, comprising two specialists in Islamic Religious Education and one specialist in educational technology. Their review focused on item relevance, domain representativeness, and clarity of wording, and revisions were made iteratively based on their feedback. Third, the revised instrument was piloted to assess internal consistency. The pilot yielded a Cronbach's alpha of 0.925 for the total scale, which is classified as excellent according to George and Mallery (2003) and exceeds the common acceptability threshold of  $\alpha > 0.70$ . However, this evidence remains preliminary. The pilot sample was too small for factor analysis, and the present study reports only internal consistency evidence. Structural validity, test-retest reliability, and discriminant validity have not yet been established. Accordingly, TRAIGE should be regarded as a purpose-built instrument with preliminary reliability and content validity evidence rather than as a fully validated scale.

Quantitative data were collected through an online Google Forms questionnaire administered to the 30 main-study respondents. In addition to the 20 TRAIGE items, the questionnaire included three open-ended questions concerning perceived barriers to AI-gamification implementation, facilitating factors and support needs, and perceptions of the compatibility of AI-gamification with the spiritual values of Qur'anic learning. These open-ended responses functioned as a bridge between the quantitative and qualitative strands. For the qualitative component, semi-structured interviews were conducted with the five selected participants, either face-to-face or via online platforms, with each session lasting approximately 45 to 60 minutes. All interviews were audio-recorded with participants' informed consent and subsequently transcribed verbatim. An interview guide was used to maintain consistency across interviews while allowing flexibility for follow-up probing.

Quantitative data were analysed descriptively using Jamovi (version 2.6), including means, medians, standard deviations, and minimum and maximum scores at the item, dimension, and

total-score levels. Readiness levels were classified using a five-tier percentage-achievement rubric: Very High (>85%), High (75–85%), Moderate (65–75%), Low (55–65%), and Very Low (<55%). Qualitative data, including both open-ended questionnaire responses and interview transcripts, were analysed using Reflexive Thematic Analysis (Braun & Clarke, 2006) through iterative processes of familiarization, coding, theme construction, review, definition, and analytic writing. Consistent with the reflexive epistemological stance underpinning this approach, themes were treated as researcher-generated interpretive constructions rather than as entities passively emerging from the data (Byrne, 2022). The first author served as the primary analyst, while the co-authors reviewed analytic decisions during theme construction and refinement to strengthen interpretive credibility. The first author's positionality as a researcher with a background in Islamic Education and educational technology is acknowledged as shaping, though not determining, the analytic lens. Integration of the quantitative and qualitative strands was undertaken at the interpretation stage using a merging strategy (Creswell & Clark, 2017), whereby quantitative patterns were compared with qualitative themes to generate meta-inferences based on convergence, complementarity, and tension between the two datasets.

## Results and Discussion

### Overall Profile of Teacher Readiness

Descriptive analysis of the total TRAI GE scores from 30 respondents yielded a mean of  $M = 81.50$  ( $SD = 7.80$ ), with scores ranging from 67 to 97 out of a maximum of 100. An achievement percentage of 81.5% places PAI teacher readiness in the **High** category based on the predetermined rubric. The distribution of respondents across readiness categories is presented in Figure 1.

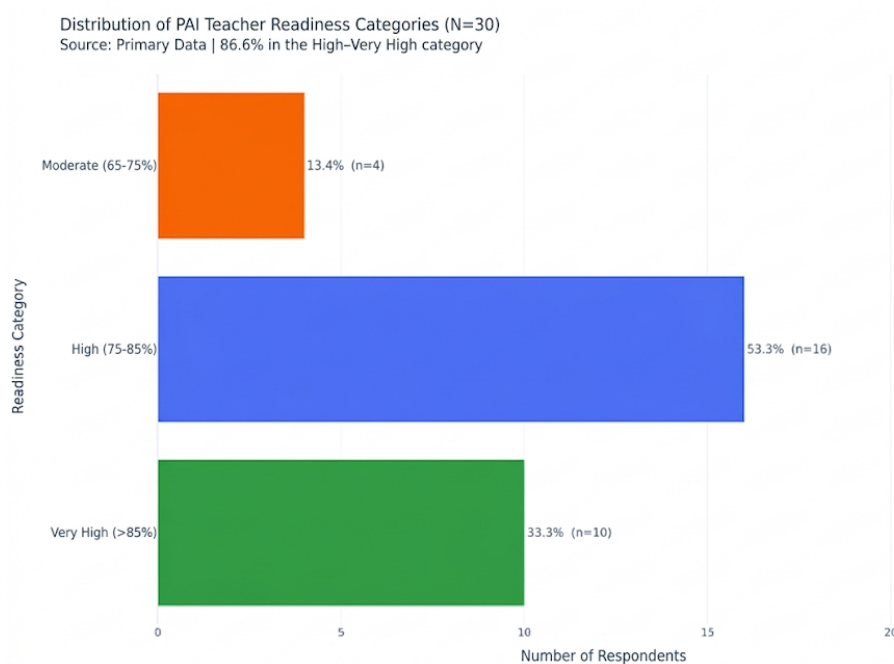


Figure 1. Distribution of Teacher Readiness Categories Based on Total TRAI GE Scores (N = 30)

As shown in Figure 1, 10 respondents (33.3%) fall into the Very High category, 16 respondents (53.3%) into the High category, and 4 respondents (13.4%) into the Moderate category. None of the respondents are in the Low or Very Low categories. In aggregate, 86.6% of respondents are in the top two categories, a substantively positive finding that nonetheless needs to be interpreted with caution, given a coefficient of variation of 9.6%, which indicates non-trivial heterogeneity. In this context, uniform training approaches are unlikely to meet the genuinely diverse needs of teachers (Mane, 2025).

Demographic context enriches the interpretation of this distribution. The bimodal pattern of teaching experience, with 43.3% very junior teachers (<5 years) and 26.7% very senior teachers (>20 years), creates two clusters with distinct readiness profiles. Junior teachers tend to be more familiar with digital technology but less experienced in designing authentic Qur’anic pedagogy, whereas senior teachers bring deep pedagogical expertise and *talaqqi* authority but may face greater psychological barriers to AI adoption. These differences are reflected in consistent score variation across dimensions, particularly on items related to technical autonomy and pedagogical innovation.

### Dimension-wise Analysis of TRAIGE

The profiles of the five TRAIGE dimensions are visualized in Figure 2, which simultaneously highlights the strongest performance on Technical Readiness (TR) and the relative gap on Pedagogical Readiness (PR).

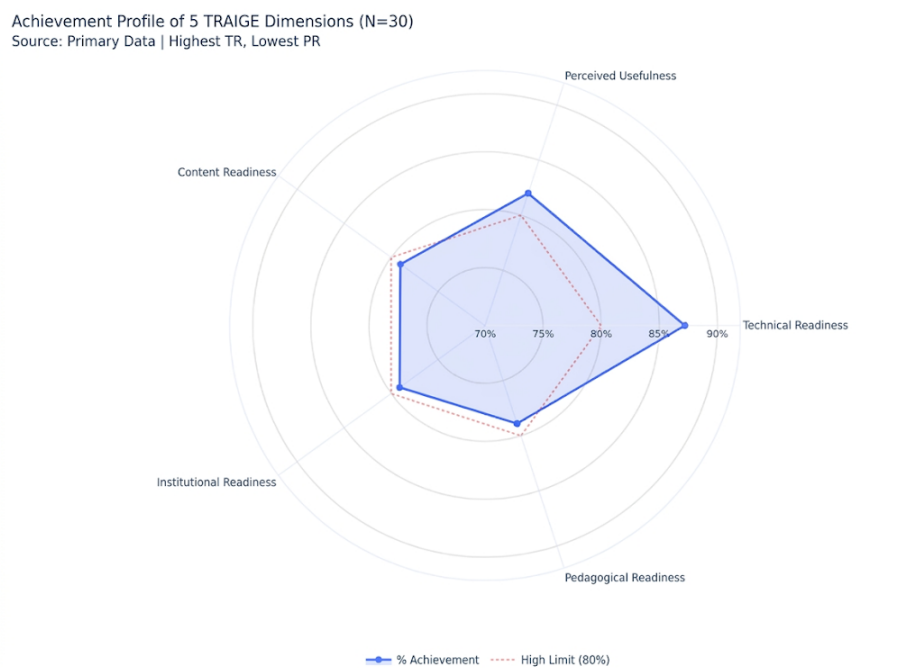


Figure 2. Percentage Achievement of the Five TRAIGE Dimensions (N = 30)

As shown in Figure 2, the four dimensions other than TR cluster within a relatively narrow range (78.9–82.0%), whereas TR stands out at 87.2%. The dashed line at 80% indicates that PU is slightly above this threshold, while CR, IR, and PR remain just below it. This profile portrays PAI teachers as strong in technical readiness but in need of strengthening on integrative dimensions.

Table 1. Descriptive Statistics of the Five TRAIGE Dimensions (N = 30)

Dimension	Mean	SD	Max Score	% Achievement	Category
Technical Readiness (TR)	21.80	2.73	25	87.2%	Very High
Perceived Usefulness (PU)	12.30	1.62	15	82.0%	Very High
Content Readiness (CR)	15.80	1.88	20	79.0%	High
Institutional Readiness (IR)	11.87	2.49	15	79.1%	High
Pedagogical Readiness (PR)	19.73	2.70	25	78.9%	High

A more granular picture of item-level variation is presented in Figure 3, which displays all 20 TRAIGE items along with their standard deviations.

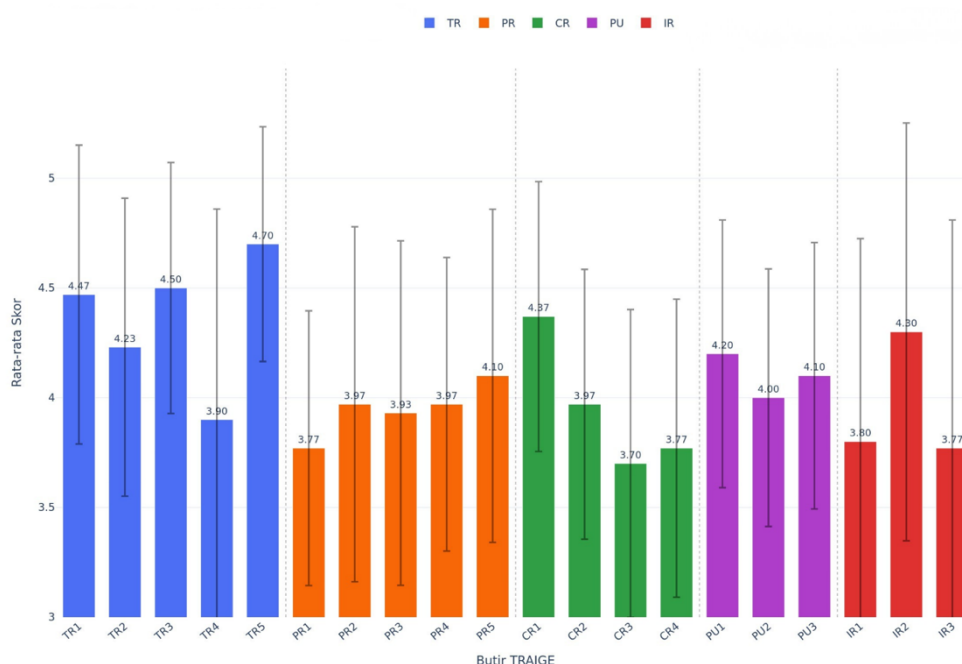


Figure 3. Item Means and Standard Deviations for the 20 TRAIGE Items (N = 30)

Figure 3 highlights two items at the extremes of the scale: TR5 as the item with the highest mean ( $M = 4.70$ ) and CR3 as the item with the lowest mean ( $M = 3.70$ ), while the longest error bar appears on IR3 ( $SD = 1.040$ ), visually confirming the sharp polarization of institutional experiences among respondents.

### Technical Readiness (TR): A Strong Foundational Capacity

The TR dimension comprises five statements concerning comfort with technology, speed in learning new applications, use of digital platforms, confidence in technical troubleshooting, and interest in learning about new technologies. This dimension records the highest achievement (87.2%) among all TRAIGE dimensions and can thus be regarded as the strongest foundation of PAI teacher readiness in the context of AI-gamification.

Table 2. Descriptive Statistics for Technical Readiness (TR) Items (N = 30)

Item	Statement	Mean	SD	Min	Max
TR1	Comfortable with technological devices	4.47	0.681	2	5
TR2	Able to learn new applications quickly	4.23	0.679	3	5
TR3	Already use digital platforms regularly	4.50	0.572	3	5
TR4	Confident in technical troubleshooting	3.90	0.960	1	5
TR5	Interested in learning about new technology	4.70	0.535	3	5

Note. 5-point Likert scale; TR4 has the highest SD within this dimension.

Table 2 shows that the TR profile is driven primarily by TR5 “Interested in learning about new technology” ( $M = 4.70$ ;  $SD = 0.535$ ), which is the item with the highest mean across the entire instrument. Two other items are also high: TR3 “Already use digital platforms regularly” ( $M = 4.50$ ) and TR1 “Comfortable with technological devices” ( $M = 4.47$ ). This pattern portrays PAI teachers as active technology users who feel reasonably comfortable with digital devices and possess strong intrinsic motivation to continually learn about new technologies.

The only relative weakness within this dimension is TR4 “Confident in technical troubleshooting” ( $M = 3.90$ ;  $SD = 0.960$ ), which has the highest standard deviation among all TR items. This indicates that advanced technical autonomy is not yet evenly distributed: some teachers are confident in resolving technical issues independently, whereas others still rely heavily on external assistance. This profile is consistent with (Harsanti et al., 2025), who found that Indonesian teachers’ basic digital literacy is generally adequate, but more complex technical skills remain challenging for certain groups. Variation on TR4 can also be interpreted in light of the bimodal demographic pattern in the sample: very junior teachers tend to be more technically autonomous, while very senior teachers are stronger pedagogically; ideally, these two profiles would complement each other through MGMP-based collaboration. This within-sample complementarity points to a systemic opportunity: rather than designing uniform, one-size-fits-all training programmes, professional development for PAI teachers should adopt a differentiated, peer-learning model in which technical confidence and pedagogical depth are treated as interchangeable assets. The MGMP structure, which already brings teachers across experience levels together, provides an organisationally ready platform for such an approach, a point that previous TPACK studies in Indonesian contexts have not yet operationalized specifically for PAI (Emawati et al., 2025).

### Perceived Usefulness (PU): A Stable Basis for Acceptance

The PU dimension captures the extent to which teachers perceive AI-gamification as beneficial for Qur’anic learning, in terms of student motivation, learning outcomes, and spiritual relevance. Its three items reflect beliefs that AI-gamification can increase students’ motivation (PU1), improve learning outcomes (PU2), and remain relevant without diminishing the spiritual value of Qur’anic learning (PU3). Overall, this dimension records an average achievement of 82.0%, placing it in the Very High category and making it the second strongest dimension after Technical Readiness.

Table 3. Descriptive Statistics for Perceived Usefulness (PU) Items (N = 30)

Code	Statement	M	SD	Category
PU1	AI-gamification increases students' motivation to learn the Qur'an	4.20	0.587	Very High
PU2	AI-gamification improves students' Qur'anic learning outcomes	4.00	0.610	High
PU3	AI-gamification is relevant without reducing the spiritual value of learning the Qur'an	4.10	0.597	Very High

As shown in Table 3, the three PU items cluster within a relatively homogeneous mean range (4.00–4.20), with low and nearly uniform standard deviations (0.587–0.610). This homogeneity indicates that beliefs about the usefulness of AI-gamification are not confined to a small subset of teachers but are broadly shared across the sample. In other words, there is a stable consensus that AI-gamification is not merely a visually attractive feature but is genuinely perceived as supporting students' motivation, understanding, and learning achievement.

Within the Technology Acceptance Model (Davis, 1989), high perceived usefulness represents a key psychological precondition for technology adoption by teachers. (Harsanti et al., 2025) confirm that perceived usefulness functions as an important mediator between school digital leadership and teachers' intentions to use AI in teaching. In this context, the finding that PU is at a Very High level suggests that the main barriers to AI-gamification adoption among PAI teachers are more likely to be structural and capacity-related (training, infrastructure, institutional support) rather than rooted in doubts about the pedagogical value of the technology itself.

This finding extends the TAM-based literature in a theoretically meaningful direction. (Davis, 1989) originally established perceived usefulness as a predictor of behavioral intention to use technology, but that framework was developed in secular, organizational computing contexts. The present data suggest that in value-laden Islamic educational settings, perceived usefulness operates through an additional layer: teachers do not merely ask "will this help me teach better?" but rather "will this help students learn the Qur'an in a way that is spiritually legitimate?" The near-uniform PU scores across all three items, including PU3 on spiritual relevance (M = 4.10), indicate that both instrumental and normative dimensions of usefulness are simultaneously active in this sample. This dual-layer usefulness perception is not captured by standard TAM instruments, and represents a theoretically distinctive feature of technology adoption in Islamic educational contexts that future instrument development should explicitly model. Practically, this finding reframes the intervention priority: since motivational and attitudinal foundations are already solid, investment in training and infrastructure is likely to yield higher returns than attitudinal change programmes.

### Content Readiness (CR): Strong Content with Gaps in Updating

The CR dimension captures teachers' readiness in terms of Qur'anic content mastery and its ongoing renewal. Its four items encompass mastery of *tajwid* (CR1), understanding of verse meanings (CR2), engagement with up-to-date Qur'anic pedagogical methodologies (CR3), and the ability to adapt content into digital formats (CR4). Overall, this dimension records an achievement

of 79.0%, indicating strong core content competence while revealing room for improvement in content updating and adaptation.

Table 4. Descriptive Statistics for Content Readiness (CR) Items (N = 30)

Item	Statement	Mean	SD	Min	Max
CR1	In-depth mastery of tajwid	4.37	0.615	3	5
CR2	Understands tafsir and verse meanings	3.97	0.615	2	5
CR3	Keeps up with current Qur'anic methodologies	3.70	0.702	2	5
CR4	Able to adapt content into digital formats	3.77	0.679	2	5

Note. CR3 has the lowest mean across the entire TRAIGE instrument.

As shown in Table 4, CR1 “In-depth mastery of *tajwid*” has the highest mean within this dimension (M = 4.37; SD = 0.615), consistent with the expectation that PAI teachers possess a strong scholarly foundation in Qur’anic recitation. However, the means decline on items related to updating and adaptation: CR2 “Understands *tafsir* and verse meanings” (M = 3.97), CR4 “Able to adapt content into digital formats” (M = 3.77), and especially CR3 “Keeps up with current Qur’anic methodologies”, which records the lowest mean across the entire TRAIGE instrument (M = 3.70; SD = 0.702). The downward pattern from CR1 to CR3 suggests that mastery of classical Qur’anic content is relatively stronger than teachers’ engagement with newer, research-informed pedagogies, particularly those linked to digital media.

Within the TPACK framework, this phenomenon can be interpreted as a weakness in *Technological Content Knowledge* (TCK): teachers master the content well but are not yet fully accustomed to adapting that content into technology-mediated formats and approaches (Mishra & Koehler, 2006). (Saputro et al., 2025) report a similar pattern among PAI teachers in Karanganyar, namely a gap between deep Islamic content expertise and the ability to transform that content into digital learning designs. In the present sample, this gap appears more pronounced among senior teachers, who are strong on CR1 but relatively weaker on CR3 and CR4, while junior teachers tend to show the opposite pattern.

This inverse relationship between content depth and content currency is not merely a demographic artifact; it reflects a structural gap in how Qur'anic teacher professional development has historically been organized in Indonesia. Pre-service Islamic education training programmes have traditionally prioritized classical tajwid mastery and talaqqi methodology, with comparatively little attention to pedagogical renewal or digital content adaptation (Artha et al., 2025). As a result, the very experience that makes senior teachers authoritative in tajwid (CR1) simultaneously predicts their relative distance from contemporary digital methods (CR3, CR4). This pattern suggests that Content Readiness cannot be strengthened through generic digital literacy training alone; what is needed is a domain-bridging approach that helps experienced teachers specifically translate their deep Qur'anic expertise into technology-mediated formats, a type of professional development that, to the authors' knowledge, has not yet been systematically designed or evaluated in the Indonesian PAI context. Developing such an approach could directly address the TCK gap identified here and would be a high-value target for the intervention design in Study 3 of the Transformative Tilawah programme.

### Institutional Readiness (IR): The Support–Capacity Paradox

The IR dimension assesses the extent to which school environments support AI-gamification implementation through three aspects: availability of technological infrastructure (IR1), school leadership support for innovation (IR2), and provision of training or technical support for teachers (IR3). On average, IR records an achievement of 79.1%, similar to CR and PR, but at the item level it reveals the most critical dynamics for policy.

Table 5. Descriptive Statistics for Institutional Readiness (IR) Items (N = 30)

Item	Statement	Mean	Median	SD	Min	Max
IR1	Technological infrastructure is adequate	3.80	4.00	0.925	2	5
IR2	School leadership supports innovation	4.30	5.00	0.952	2	5
IR3	Training/technical support is provided	3.77	4.00	1.040	1	5

Note. IR2 (Median = 5.00) and IR3 (SD = 1.040) together illustrate the support–capacity paradox at the institutional level.

Table 5 shows that IR2 “School leadership supports innovation” has a high mean ( $M = 4.30$ ; Median = 5.00), ranking among the three highest items in the entire instrument. This indicates that, in terms of perception, teachers feel that principals provide support and space for innovation, including the use of educational technology. In contrast, IR3 “Training/technical support is provided” has a lower mean ( $M = 3.77$ ) and the highest standard deviation of all items ( $SD = 1.040$ ), with scores ranging from 1 to 5, reflecting a sharp polarization: some teachers work in schools that are very active in providing training and technical support, while others receive almost no such support.

IR1 “Technological infrastructure is adequate” ( $M = 3.80$ ;  $SD = 0.925$ ) occupies a moderate position, suggesting that the availability of devices and internet connectivity in schools cannot be considered strong but is not entirely inadequate either. Taken together, IR1, IR2, and IR3 give rise to what this study terms the *support–capacity gap*: principals are perceived as having the willingness (support) to encourage innovation, but institutional capacity to translate that support into concrete, domain-specific training and technical assistance remains limited and uneven. This finding aligns with (Anggraini et al., 2025) and (Mane, 2025), who highlight that the failure of educational technology implementation is often rooted not in teacher attitudes but in the absence of targeted, sustained professional development programmes at the school level.

What distinguishes the support–capacity gap identified here from the generic institutional readiness deficits reported in the broader literature (Anggraini et al., 2025; Mane, 2025) is its domain-specific character. The gap is not simply between leadership willingness and resource availability in general; it is specifically a gap between leaders who endorse technology innovation abstractly and an institutional infrastructure that has never been designed to support AI-gamification for Qur'anic content specifically. PAI is a subject with unique logistical and normative requirements: recitation practice demands audio-capable environments, tajwid assessment requires real-time feedback tools, and the spiritual register of the content places constraints on the gamification design that school administrators may not fully appreciate. This means that generic school-level ICT support is insufficient: what PAI teachers need is subject-specific technical support and training that acknowledges the epistemological demands of their discipline. The sharp

polarization on IR3 (SD = 1.040; range 1–5) further indicates that access to such support is currently determined more by school type and network position than by teacher need, a distributional inequity that is particularly acute for teachers in private and rural schools, as reflected in the qualitative data. Addressing this inequity requires policy intervention at the level of MGMP coordination and district educational offices, not merely at the individual school level.

### Pedagogical Readiness (PR): The Most Critical yet Weakest Dimension

The PR dimension focuses on teachers' pedagogical readiness, specifically, their ability to understand and design the integration of AI-gamification into Qur'anic learning, link it to learning theory, and evaluate its effectiveness. Its five items cover understanding AI-gamification integration (PR1), designing gamified activities (PR2), understanding modern, student-centred learning theories (PR3), evaluating the effectiveness of technology (PR4), and understanding principles of AI-based personalization (PR5). Among the five TRAIGE dimensions, PR has the lowest achievement (78.9%) and can therefore be viewed as the most critical area requiring attention.

**Table 6.** Descriptive Statistics for Pedagogical Readiness (PR) Items (N = 30)

Item	Statement	Mean	SD	Min	Max
PR1	Understands integration of AI-gamification in Qur'anic learning	3.77	0.626	2	5
PR2	Able to design gamified learning activities	3.97	0.809	2	5
PR3	Understands modern, student-centred learning theories (SCL)	3.93	0.785	3	5
PR4	Able to evaluate the effectiveness of technology	3.97	0.669	3	5
PR5	Understands AI-based personalization for students	4.10	0.759	2	5

**Note.** PR1 is the item that most directly measures competence in integrating AI-gamification.

Table 6 shows that PR1 “Understands integration of AI-gamification in Qur'anic learning” has the lowest mean in this dimension (M = 3.77; SD = 0.626). This indicates that some teachers still feel they lack sufficient understanding of how to concretely combine AI-gamification with lesson objectives, content, and classroom learning sequences. By contrast, PR5 “Understands AI-based personalization for students” has a higher mean (M = 4.10; SD = 0.759), while items such as PR2 “Able to design gamified learning activities” (M = 3.97) and PR3 “Understands modern, student-centred learning theories (SCL)” (M = 3.93) occupy intermediate positions.

This pattern suggests that, at the conceptual level, teachers are relatively familiar with general principles such as personalization, student-centred learning, and the importance of instant feedback, but feel less confident when these principles must be translated into concrete, AI-gamification-based learning designs. In TPACK terms, this reflects weaknesses in *Technological Pedagogical Knowledge* (TPK) and *Technological Pedagogical Content Knowledge* (TPCK): teachers are beginning to understand what AI-gamification is and what its pedagogical potential might be, but lack sufficient experience and support to design authentic, consistent Qur'anic learning scenarios that leverage this technology (Mishra & Koehler, 2006). Emawati (2025) report a similar pattern, noting that TPK and TPCK intersections are the most challenging and require explicit, structured mentoring in teacher training programmes.

The PR profile, when read against the broader TRAIGE data, reveals a specific and actionable pattern: teachers are not uniformly underprepared pedagogically, but rather face a concentrated bottleneck in integration design—the ability to translate conceptual understanding of AI-

gamification into concrete, sequenced lesson plans for Qur'anic learning. PR5 (AI-based personalization understanding,  $M = 4.10$ ) is notably higher than PR1 (AI-gamification integration in Qur'anic learning,  $M = 3.77$ ), suggesting that general pedagogical concepts have been absorbed but context-specific application has not yet been practiced. This distinction has a direct implication for training design: the problem is less about building conceptual awareness, which is already reasonably present, and more about providing structured, subject-specific design scaffolding. In practical terms, this points toward workshop formats that use authentic PAI lesson contexts as design cases, rather than generic edtech workshops that introduce tools without addressing the constraints of Qur'anic content. (Schmid et al., 2020) note that short TPACK instruments can serve as diagnostic tools to identify exactly these integration bottlenecks; the PR profile of TRAIGE fulfills precisely this diagnostic function. This finding thus does not merely confirm that pedagogical readiness is the weakest dimension; it specifies where the weakness is concentrated and, by extension, where targeted intervention is most likely to produce measurable improvement.

### Thematic Analysis: Four Themes of PAI Teacher Readiness

Reflexive thematic analysis of 30 open-ended survey responses and 5 interview transcripts generated four interrelated themes. These themes do not stand apart from the quantitative findings; rather, they help explain the “stories behind the numbers” observed in the TRAIGE profiles. High scores on Technical Readiness (TR) and Perceived Usefulness (PU) portray teachers who are personally familiar with technology and who believe in the benefits of AI-gamification, whereas moderate scores on Content Readiness (CR), Institutional Readiness (IR), and Pedagogical Readiness (PR) point to gaps in content updating, institutional support, and pedagogical design. Through qualitative analysis, these gaps are unpacked into four more concrete themes: (1) infrastructural and policy constraints; (2) device deficits and student perceptual resistance; (3) gaps in AI-gamification–specific training; and (4) conditional spiritual compatibility.

Thematic Map: Four Themes of Islamic Education Teacher Readiness (N=30)  
Source: Reflexive Thematic Analysis (Braun & Clarke, 2019)

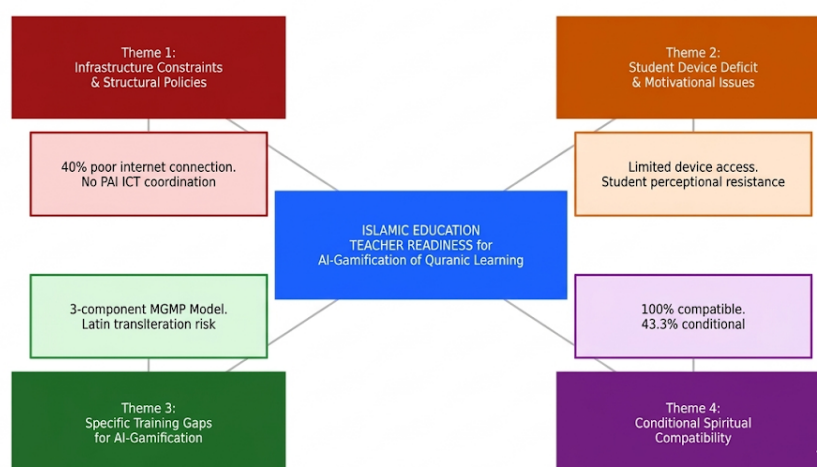


Figure 4. Reflexive Thematic Map: Four Main Themes of PAI Teacher Readiness (N = 30)

### Infrastructural and Structural Policy Constraints

The first theme captures barriers arising from structural conditions at the school level, particularly the uneven quality of ICT infrastructure and the absence of specific technical policies for PAI instruction. This theme appears repeatedly in the narratives of approximately 40% of respondents who rate their school internet quality as Fair to Very Poor, and it helps contextualize why IR1 “Technological infrastructure is adequate” sits only at a moderate level ( $M = 3.80$ ;  $SD = 0.925$ ). The barriers are layered: they concern not only connection speed, but also the absence of ICT coordinators who understand the specific characteristics of Islamic content, so that infrastructure management and policy predominantly prioritise general subjects and administrative needs rather than the specific requirements of Qur’anic learning. P3 (a senior female teacher at a state SMP in Bandung with 20 years of experience) articulates these constraints sharply:

“I already know how to use the apps, but the school WiFi is not strong enough when 30 students connect at the same time, in the end we go back to conventional methods. It’s not that we are unwilling, but the system doesn’t support us.”

This statement reveals a paradox that is crucial for policy: high individual readiness (strong TR) cannot be converted into pedagogical practice when infrastructural capacity is insufficient. The theme thus directly corroborates the quantitative profile of IR and strengthens the argument that institutional readiness, rather than teacher attitude, often becomes the deepest bottleneck in technology implementation.

This finding is consistent with (Anggraini et al., 2025), who show that unequal access to infrastructure is one of the most persistent obstacles in the implementation of educational technology in Indonesia, especially in schools that are under-resourced financially and geographically. At the same time, variation in scores on IR3 “The school provides training/technical support” ( $M = 3.77$ ;  $SD = 1.040$ ) suggests that in a small subset of schools, a better support ecosystem has begun to emerge, while in others teachers are left to struggle on their own. Thus, Theme 1 demonstrates that individual teacher readiness will not translate into consistent classroom practice as long as infrastructural barriers and structural policy gaps at the institutional level are not addressed seriously.

### Device Deficits and Student Perceptual Resistance

The second theme challenges the assumption that all Generation Alpha students are automatically ready and have adequate access to AI-gamification-based educational technology. Several teachers report that in their classes, the number of students who have capable devices and stable internet data is far below the common impression that “now every child has a gadget”. This situation is consistent with the quantitative finding that IR1 is only in the Moderate category ( $M = 3.80$ ;  $SD = 0.925$ ), as well as school internet quality data, which 40% of respondents rate as Fair to Very Poor. P2 (a teacher at a state SMP in Bandung) describes this condition very concretely:

“My students are very active on TikTok and Instagram, but when I asked them to install a tilawah app for homework, only half of them had a smartphone capable of running it. The others didn’t have enough data quota.”

This quote illustrates a local paradox of Generation Alpha: they intensively use social media, but not all of them are in an equal position to access educational technologies that require higher device specifications and larger data quotas.

Beyond access issues, this theme also reveals perceptual resistance among some students toward the idea of “gamifying” the Qur’an. P3 reports that several students question whether it is appropriate to turn the Qur’an into a “game”, not because they reject technology, but because they hold a strict understanding of *adab* toward the Qur’an. This finding broadens our understanding of Muslim Generation Alpha: their closeness to popular digital media does not automatically translate into acceptance of religiously oriented educational technology. Their acceptance appears to depend on how teachers frame the purposes, values, and boundaries of AI-gamification use in Qur’anic learning.

### Gaps in AI-Gamification–Specific Training

The third theme explains why the Pedagogical Readiness (PR) dimension and certain aspects of Institutional Readiness (IR) tend to be weak points, namely the absence of training that specifically targets the integration of AI-gamification into Qur’anic learning. Almost all interviewees state that they have attended generic ICT training (for example, on video-conferencing platforms, LMSs, or general quiz applications), but have never received training that truly focuses on the use of AI-gamification for *tilawah*, *tajwid*, *tartil*, and *tahfidz*. P5 (a senior teacher and MGMP PAI chair in Bandung Regency) formulates teacher training needs in three interrelated layers:

“First, the technical layer, how to operate specific platforms such as Tarteel, Quran.com, or Zekr. Second, the pedagogical layer, how to design lesson plans that integrate these tools without sacrificing the principles of *talaqqi* and teacher–student interaction. Third, the assessment layer, how to evaluate students’ *tajwid* and memorisation competence using AI feedback in an accurate and fair way.”

This three-layer model essentially reflects three key intersections within TPACK: Technological Knowledge (TK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPCK). It is important to note that the model emerges from the reflections of field practitioners rather than from a theoretical framework imposed by researchers, thereby providing a strong basis for designing training curricula grounded in authentic needs.

Another distinctive finding comes from P1 (a senior teacher at a state SMP in Bandung with 24 years of teaching experience), who identifies a specific pedagogical risk related to application design:

“I’m worried that students will memorise from the Latin script on the screen, they can recite correctly when the app is there, but they can’t read from the *mushaf*.”

This risk of dependence on Latin transliteration has direct implications for the design standards of AI-based Qur’anic learning technology: ideally, interfaces should prioritise Arabic text as the primary representation, while Latin text functions only as limited support. Consequently, PAI teacher training cannot stop at the operational aspects of using applications; it must also develop critical literacy regarding technology design, so that teachers are able to choose and utilise

applications that preserve the integrity of *mushaf* recitation and the epistemological principles of Qur'anic sciences.

### Conditional Spiritual Compatibility

The fourth theme reveals the most surprising and at the same time most important finding: all 30 respondents state that AI-gamification is compatible with Qur'anic values. This means that, in principle, PAI teachers do not reject technology on the basis of creed (*aqidah*) or jurisprudence (*fiqh*); their concerns are instead largely related to pedagogy and *adab*. However, 13 respondents (43.3%) explicitly stipulate certain conditions so that the use of AI-gamification remains within the bounds of Islamic values. One form of conditionality comes from P1, who emphasises the importance of preserving the spiritual dimension of *tilawah*:

“Technology must strengthen, not replace, the inner relationship between the reciter and the Qur'an, there is a dimension of *khushu* that cannot be digitised.”

P3 adds conditions related to *adab*: students must still be in a state of ritual purity, maintain proper posture, and show respect toward the Qur'an even when reading from a screen. Meanwhile, P4 highlights the risk of a shift in learning orientation when gamification places too much emphasis on points and rankings:

“Gamification can make children compete to collect points rather than to understand meaning. If the orientation shifts from process to mere achievement, we have lost the essence of Qur'anic learning itself.”

Taken together, these statements show that the compatibility declared by teachers is “conditional”: technology is accepted as long as it operates within a framework of *adab*, maintains a process-oriented focus, and does not diminish the dimensions of *khushu* and reverence toward the Qur'an. This finding is consistent with (Septyandi & Utomo, 2025) who find that perceived spiritual compatibility plays an important moderating role in the relationship between perceived usefulness and technology use intention in the context of digital worship. Likewise, (Syaifuddin & Junaedi, 2025) assert that IT media integration in the Islamic Education curriculum must position technology as serving the aims of Islamic character education, not the other way around. In the context of this study, conditional spiritual compatibility emerges as a normative resource: it provides a set of practical criteria for teachers, application developers, and policymakers to design AI-gamification implementations that are religious, ethical, and sustainable.

Beyond the four main themes, three implementation insights with high novelty emerged from the in-depth interviews. First, P2 describes an implementation model that has been successfully applied:

“I project the *Tartil* app onto the classroom Smart TV. Students take turns reading in front of the microphone, the AI immediately gives *tajwid* corrections, and all students learn from each correction.”

This *collective AI feedback* model creatively integrates the precision of AI technology with the communal *talaqqi* tradition, producing an approach that does not replace teacher–student interaction but rather extends its reach. Second, P3 reveals an affective dimension that is absent from conventional technology readiness models: the use of AI as a private, non-judgmental practice space, which allows students with psychological trauma from previous experiences of reading

Qur'anic passages in front of the whole class to gradually build their self-confidence. This indicates that AI-gamification holds affective scaffolding potential that goes beyond its cognitive function. Third, the three-component training model proposed by P5 offers a practical blueprint rooted in authentic field needs, a contribution that can be directly adopted as an MGMP PAI training curriculum.

Integration of quantitative and qualitative data through a merging strategy (Creswell & Clark, 2017) produces three meta-inferences that go beyond what each data type can reveal on its own.

**First meta-inference: Individual–institutional gaps as the deepest barrier.**

High TR and PU scores confirm that teachers are individually ready and willing. However, the low score on IR3 ( $M = 3.77$ ;  $SD = 1.040$ ), corroborated by Themes 1 and 3, convergently indicates that institutions are not yet able to translate this individual readiness into actual practice. In the terminology of Organizational Readiness Theory (Holt et al., 2007), this represents a condition in which individual readiness far outpaces organizational readiness, a misalignment which, if left unaddressed, will continue to produce professional frustration among teachers who are ready but under-supported.

**Second meta-inference: A “technically ready, pedagogically weak” profile as a population characteristic.**

The quantitative superiority of TR over PR depicts teachers who are relatively confident with technology but less assured in designing AI-gamification pedagogically. Theme 3 clarifies that the root problem is not a lack of generic ICT training, but rather the absence of training that bridges technical skills with authentic, AI-based Qur'anic instructional design. This finding aligns with (Ismail et al., 2025) and (Emawati et al., 2025), who show that the TPK and TPCK intersections within TPACK are the most persistently weak points, implying that the necessary interventions are not merely additional technical training, but domain-specific pedagogical training focused on Qur'anic content.

**Third meta-inference: Spiritual compatibility as a resource, not a barrier.**

The fact that 100% of respondents accept AI-gamification as compatible with Qur'anic values constitutes highly valuable social capital for accelerating adoption. However, the conditionalities articulated by 43.3% of respondents should not be interpreted as resistance, but rather as a design guide for implementation: technology must operate within a framework of adab, maintain a process-oriented focus, and avoid sacrificing the spiritual dimension of Qur'anic learning. (Septyandi & Utomo, 2025) find a similar mechanism in the context of digital worship among Gen-Z Muslims, while (Syarifuddin & Junaedi, 2025) provide a conceptual framework that positions technology as serving the aims of Islamic character education. Together, these studies confirm that spiritual conditionality is not a technical obstacle but a normative guide that actually ensures the relevance and sustainability of adoption.

The findings of this study can be positioned in relation to the prior studies reviewed in the Introduction in three specific and analytically distinct ways: confirming, extending, and partially diverging from earlier work.

First, the technically-ready-yet-pedagogically-weaker profile directly confirms (Cheah et al., 2025) argument that the critical gap in AI integration is not technology access but pedagogical integration competence. Where Cheah et al. identified this pattern across a broad K–12 sample in general education contexts, the present study confirms it specifically in the PAI domain and adds domain-specific precision: the bottleneck is concentrated not in general pedagogical knowledge but in the capacity to design AI-gamification-based learning sequences for tajwid, tartil, and tahfidz content a competence that generic edtech training has never addressed. This narrows and sharpens Cheah et al.'s finding rather than simply replicating it.

Second, the support–capacity gap corroborates (Harsanti et al., 2025) finding that Indonesian teachers' digital readiness gaps are primarily non-infrastructure in character, relating to self-confidence and perceived relevance to their specific subject. The present data extend this insight structurally: the gap is not only psychological but also institutional, manifesting as a divergence between leadership endorsement of innovation (IR2,  $M = 4.30$ ) and the absence of domain-specific training provision (IR3,  $M = 3.77$ ;  $SD = 1.040$ ). This finding also partially diverges from Harsanti et al. insofar as the PAI sample does not show a deficit in perceived usefulness or self-confidence about technology in general teachers' PU scores are high (82.0%) but rather a structural failure of the institutional environment to convert individual readiness into classroom practice. The ethical tension identified in recent scholarship between enthusiasm for AI-enabled innovation and concerns that generic digital-skills training is insufficient also emerges in Theme 3. Recent 2025 studies indicate that teacher preparation for AI must go beyond generic ICT competence by integrating ethical understanding, AI pedagogy, assessment literacy, and context-sensitive instructional knowledge. Extending this line of work, the present study finds that PAI teachers have already articulated a domain-specific three-layer training model technical, pedagogical, and assessment grounded in the needs of Qur'anic learning rather than in generic ICT upskilling (Chiu et al., 2025; Huwer et al., 2025; Setiyawan et al., 2025; Tagare et al., 2025; Tan et al., 2025).

Third, the conditional spiritual compatibility finding provides the first classroom-readiness empirical evidence for (Amri, 2025) theoretical argument that perceived value-alignment functions as a significant moderator of technology adoption in Islamic educational settings. Amri's argument was developed on a conceptual and integrative basis; the present data confirm it empirically within a teacher readiness profile: 100% acceptance of AI-gamification combined with 43.3% explicit conditionality on adab, process orientation, and spiritual preservation constitutes precisely the value-alignment mechanism Amri describes, now grounded in field data from practicing PAI teachers. This moves the construct from theoretical proposition to empirically observable readiness variable, and represents the study's most theoretically distinctive contribution to the Islamic education technology literature, one that prior general technology acceptance studies (Baah et al., 2023) (Hastuti & Agustina, 2023) could not produce because they were conducted without a spiritual compatibility dimension.

## Conclusion

This study shows that PAI teachers in the sample demonstrate a high level of readiness to integrate AI-gamification into Qur'anic learning ( $M = 81.50$ ; 81.5%), with 86.6% of respondents

falling within the two highest readiness categories. Among the five TRAIGE dimensions, Technical Readiness emerged as the strongest foundation (87.2%, Very High), while Pedagogical Readiness appeared as the weakest, although it remained within the High category (78.9%). These findings indicate that the principal challenge is no longer basic technological acceptance, but the capacity to design pedagogically sound AI-gamification-based instructional sequences for Qur'anic content. At the structural level, the study identified a support–capacity gap: school leaders were widely perceived as supportive of innovation (IR2,  $M = 4.30$ ; Median = 5.00), yet the provision of AI-gamification-specific training and technical support remained limited and uneven (IR3,  $M = 3.77$ ;  $SD = 1.040$ ). In relation to spiritual compatibility, all respondents regarded AI-gamification as compatible with Qur'anic values, although 43.3% emphasized that its implementation must remain conditioned by digital *adab*, process orientation, and preservation of the spiritual dimension of *tilawah*.

The study makes three proportionate contributions. First, the TRAIGE instrument ( $\alpha = 0.925$ ; Excellent internal consistency, George & Mallery, 2003), supported by preliminary reliability evidence and expert-reviewed content validity, provides a purpose-built diagnostic tool for assessing PAI teacher readiness for AI-gamification in Qur'anic learning, an instrument type not previously available in this context. Second, the findings identify two diagnostically important constructs, namely the technically-ready but pedagogically-weaker profile and the support–capacity gap, both of which can guide future professional development design in comparable PAI settings. Third, the notion of conditional spiritual compatibility extends the discussion of technology adoption in Islamic education by showing that acceptance is not merely a matter of utility, but also of alignment with Islamic pedagogical and ethical values. In practical terms, these findings imply that professional development should be organized around a three-layer model covering technical operation, pedagogical integration, and AI-based assessment; that school leadership support must be matched by concrete budget allocation and structured training programs; and that AI-platform developers should treat teacher-identified concerns, such as dependence on Latin transliteration and a points-over-process orientation, as core design considerations for Qur'anic learning applications in Indonesia.

At the same time, this study remains contextually bounded. The sample was small ( $n = 30$ ), network-based, and geographically concentrated in Greater Bandung, so the findings should be interpreted as a contextually rich diagnostic baseline rather than as a generalizable prevalence estimate. In addition, the relatively limited period of data collection did not allow longitudinal observation of changes in teacher readiness, while the qualitative component, although based on purposive variation, still represented a restricted range of perspectives. Future studies should therefore involve larger and more geographically representative samples, more rigorous psychometric validation of the TRAIGE instrument, including confirmatory factor analysis, and longitudinal designs capable of tracing changes in readiness over time. Such work is necessary to test the broader validity of the readiness profile identified here and to support the development of intervention models for AI-gamification in Qur'anic learning.

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