

DEVELOPMENT OF AN ISLAMIC EDUCATION CURRICULUM MANAGEMENT FRAMEWORK FOR DIGITAL ISLAMIC LITERACY AMONG PRIMARY SCHOOL PUPILS: A FUZZY DELPHI APPROACH

¹Nurhidayah Mohamad

¹Sekolah Kebangsaan Kedawang, Langkawi Malaysia

¹hidayahmohd97@gmail.com

*Corresponding Author: Nurhidayah Mohamad (hidayahmohd97@gmail.com)

Received 24 June 2023; Revised 8 July 2023; Accepted 20 Sept 2023; Published 01 Oct 2023

Vol: 2, Issue 2 (2026)

Doi: 10.5281/zenodo.22866901

Abstract

Keyword:

Digital Islamic literacy; curriculum management framework; Islamic Education; Fuzzy Delphi Method; primary school; Fudelo



The rapid expansion of digital media has created both opportunities and risks for young Muslim learners, yet Islamic Education curricula in Malaysian primary schools remain largely silent on structured digital literacy competencies. This study reports the development of an Islamic Education Curriculum Management Framework for Digital Islamic Literacy (IECMF-DIL) among primary school pupils, validated through the Fuzzy Delphi Method (FDM). A panel of seven experts comprising Islamic Education curriculum specialists, teacher educators, and senior Islamic Education teachers evaluated fifteen proposed elements across five constructs: curriculum content standards, pedagogical integration of digital tools, teacher competency and professional development, assessment of digital Islamic literacy, and governance, policy and resource support. Data were collected using a seven-point linguistic scale and analysed with the Fudelo application, which computed the threshold value (d), percentage of expert consensus, and defuzzified fuzzy score (A) for each item. Eleven of fifteen items (73.3%) achieved consensus ($d \leq 0.2$, expert agreement $\geq 75\%$, fuzzy score ≥ 0.5), while four items were rejected for falling below the triangulated acceptance criteria. Teacher competency in selecting Shariah-compliant digital content recorded the highest fuzzy score ($A = 0.895$), while governance and policy support recorded the lowest accepted construct mean. The findings indicate strong expert consensus on a practice-oriented, teacher-centred framework, but caution regarding gamified assessment and unsupervised home-based digital platforms. The validated framework offers curriculum developers, teacher trainers, and policymakers an empirically grounded structure for embedding digital Islamic literacy into the primary Islamic Education curriculum.



This is an open-access article under the CC BY-SA license.

Introduction

The twenty-first century classroom is inseparable from digital technology, and Malaysian primary schools are no exception. Under the Malaysia Education Blueprint 2013–2025, digital competency is positioned as a core enabler of the National Education Philosophy, and pupils as young as seven

are now routinely exposed to tablets, learning management systems, and social media (Kementerian Pendidikan Malaysia, 2013). For Islamic Education specifically, this exposure carries a dual character: digital platforms can enrich the teaching of Qur'anic recitation, Hadith, Fardu Ain, and Islamic values, yet the same platforms expose young Muslim pupils to content and interactions that may not align with Islamic ethical norms (adab). The urgency of preparing pupils to navigate this environment safely and meaningfully is therefore not merely a technological concern but a curricular and spiritual one.

Digital Islamic literacy, in this study, is understood as the pupil's capacity to access, evaluate, produce, and behave ethically within digital environments in a manner consistent with Islamic values and knowledge. This construct extends beyond generic digital literacy models such as Ng (2012), which emphasise technical, cognitive, and social-emotional dimensions, by embedding a fourth, faith-based dimension: the ability to discern Shariah-compliant content and conduct oneself according to Islamic adab online. Despite growing scholarly attention to digital literacy in Islamic education across Southeast Asia (Ashari et al., 2023; Sukmawati et al., 2025), Malaysian primary-level Islamic Education curriculum documents, including the Dokumen Standard Kurikulum dan Pentaksiran (DSKP), have not yet operationalised this construct into a coherent, manageable curriculum framework.

The absence of such a framework creates real difficulties at the school level. Islamic Education teachers report inconsistent practices in integrating digital tools, limited professional development specific to digital pedagogy within an Islamic framework, and no standard means of assessing pupils' digital Islamic literacy (Azman, 2025). Curriculum management, understood as the systematic planning, implementation, and evaluation of curriculum content, pedagogy, assessment, and support structures, offers a lens through which these gaps can be addressed holistically rather than piecemeal. Yet no validated, expert-endorsed curriculum management framework currently exists to guide this integration specifically for digital Islamic literacy at the primary level in Malaysia.

This study responds to that gap by developing and validating an Islamic Education Curriculum Management Framework for Digital Islamic Literacy (IECMF-DIL) among primary school pupils. The framework was constructed from five interrelated constructs curriculum content standards, pedagogical integration of digital tools, teacher competency and professional development, assessment of digital Islamic literacy, and governance, policy and resource support derived from a review of Islamic education, digital literacy, and curriculum management literature. These constructs and their constituent elements were then submitted to a panel of seven experts for validation using the Fuzzy Delphi Method (FDM), a technique well suited to capturing expert consensus under conditions of linguistic ambiguity and limited empirical precedent (Chang et al., 2011; Mohd Jamil et al., 2014).

The significance of this study is threefold. Theoretically, it extends digital literacy theory into the specific domain of Islamic religious education, proposing a faith-integrated construct that has been under-theorised in the existing literature. Practically, it furnishes curriculum developers at the Bahagian Pembangunan Kurikulum, teacher training institutions, and school administrators with an empirically validated set of elements that can be directly translated into syllabus revision, teacher training modules, and school-based policy. Methodologically, it demonstrates the application of FDM, analysed through the Fudelo application, as a rigorous and transparent means of achieving expert consensus in Islamic education curriculum research, a contribution of value to researchers pursuing similar validation studies in religious and values-based education.

Literature Review

Islamic Education Curriculum in Malaysian Primary Schools.

The Malaysian primary Islamic Education curriculum, as codified in the DSKP, is organised around five core components: Qur'an and Hadith, Aqidah, Ibadah, Sirah, and Akhlak (Kementerian Pendidikan Malaysia, 2017). While the DSKP has undergone periodic revision to embed twenty-first century skills, its digital-related content remains largely confined to the use of ICT as a delivery tool rather than as an object of Islamic ethical reasoning. Azman (2025) found that Islamic Education teachers in primary schools improvise digital strategies without formal curricular guidance, relying on personal initiative rather than a standardised framework. This pattern suggests that curriculum documents have not kept pace with the digital realities pupils encounter outside the classroom.

Digital Literacy: Conceptual Foundations.

Digital literacy has been theorised through several overlapping models. Ng (2012) proposed a tripartite framework of technical, cognitive, and social-emotional dimensions, while Eshet (2012) expanded the construct to include photo-visual, reproduction, branching, and information literacies within a revised digital-era model. Hague and Payton (2010) emphasised digital literacy as a cross-curricular capability rather than a stand-alone subject, a position echoed by Warschauer and Matuchniak (2010), who cautioned that unequal access and use of technology can reproduce existing educational inequities. These generic frameworks provide a useful scaffold but do not account for the value-laden, faith-based judgements that digital engagement requires within an Islamic educational context.

Digital Islamic Literacy and Religious Digital Competence.

A growing body of research has begun to examine digital literacy specifically within Islamic education. Sukmawati et al. (2025) identified four teacher functions in cultivating pupils' digital literacy in Islamic elementary schools: facilitating technology-enhanced learning, establishing digital ethics guidance, redesigning curricula with technological tools, and fostering learner confidence. Ashari et al. (2023) reported that students in Indonesia and Malaysia increasingly use the internet and social media to access religious material, but noted persistent equity gaps in implementation across regions. Ferdinan et al. (2026) similarly found that the enactment of digital literacy within Islamic education varies substantially across school contexts, shaped by institutional readiness and teacher capacity rather than curriculum mandate alone. Collectively, these studies indicate that digital Islamic literacy is an emerging but under-standardised construct.

Curriculum Management Frameworks.

Curriculum management, as articulated by Ornstein and Hunkins (2017), encompasses the interdependent processes of curriculum design, implementation, supervision, and evaluation, requiring alignment between content standards, pedagogy, assessment, and institutional support. Applied to technology integration, the UNESCO ICT Competency Framework for Teachers (UNESCO, 2018) similarly stresses that effective digital integration depends on coordinated policy, teacher competency, and pedagogical practice rather than infrastructure alone. Agir and Mohd Matore (2022) argued that Malaysian education has under-discussed digital citizenship as a curriculum management concern, proposing strategies that include strengthening digital literacy competency, integrating digital citizenship instruction, and enhancing parental technological awareness constructs that parallel the governance and support dimension adopted in the present framework.

Fuzzy Delphi Method in Educational and Islamic Education Research.

The Fuzzy Delphi Method, which integrates fuzzy set theory into the classical Delphi technique, was developed to reduce ambiguity in expert linguistic judgements and to achieve consensus in fewer rounds than conventional Delphi (Hsu et al., 2010; Chang et al., 2011). Within Malaysian education research, FDM has been widely applied to validate curriculum and instructional design elements, including leadership standards (Abdullah & Mohd Yusof, 2018), e-portfolio elements (Mohamad et al., 2015), instructional design models (Lifei et al., 2024), and inclusive digital pedagogy competencies (Nasution et al., 2025). Within Islamic education specifically, FDM has been used to validate a differentiated pedagogy model for Qur'anic recitation (Mustaffa & Hussin, 2022), parental guidelines for teaching Solah (Razak et al., 2024), and an Arabic vocabulary consolidation module (Yusof et al., 2021), demonstrating the method's suitability for domains requiring both technical and religious expert judgement. Analytical software such as the Fudelo application has further standardised FDM computation of the threshold value (d), expert consensus percentage, and defuzzified score, reducing manual computation error (Mat Noh & Mohd Jamil, 2020).

Synthesis and Research Gap.

Taken together, the literature establishes three converging insights: first, that Islamic Education curricula in Malaysia have not formally operationalized digital literacy as a faith-integrated construct; second, that generic digital literacy models, while foundational, are insufficient without an Islamic ethical dimension; and third, that FDM is an established and appropriate method for validating curriculum elements in Islamic and general education research. However, no identified study has combined these three strands to produce a validated curriculum management framework specifically for digital Islamic literacy at the primary school level. This study addresses that gap.

Research Questions

1. What curriculum, pedagogical, teacher-competency, assessment, and governance elements are appropriate for an Islamic Education Curriculum Management Framework for Digital Islamic Literacy among primary school pupils?
2. To what extent do experts reach consensus on each proposed element, as measured by the threshold value (d), percentage of expert agreement, and defuzzified fuzzy score using the Fuzzy Delphi Method?
3. Which constructs and elements should be retained, revised, or rejected in the final validated framework based on expert consensus?

Methodology

Research Design. This study employed the Fuzzy Delphi Method (FDM), a consensus-based technique that integrates fuzzy set theory into the classical Delphi process to reduce the ambiguity of expert linguistic judgement and shorten the number of rounds required to reach consensus (Hsu et al., 2010; Chang et al., 2011). FDM was selected over conventional Delphi because it converts each expert's linguistic rating into a triangular fuzzy number, aggregates these into a group judgement, and applies statistically grounded acceptance thresholds, thereby reducing the subjectivity that can arise from simple averaging (Mohd Jamil et al., 2014).

Expert Panel. Seven (7) experts were purposively selected based on established FDM guidance that a homogeneous panel of five to fifteen experts is sufficient provided members possess demonstrable expertise (Mat Noh & Mohd Jamil, 2020). The panel comprised: two Islamic Education curriculum specialists from the Bahagian Pembangunan Kurikulum and teacher-training institutions, two academics

specialising in educational technology and Islamic education, and three senior Islamic Education teachers (minimum ten years' teaching experience) with recognised digital-pedagogy practice. All experts held at least a master's qualification or above and met a minimum of three of the following criteria: relevant postgraduate qualification, minimum five years' experience in Islamic Education curriculum or pedagogy, active involvement in curriculum development or teacher training, and a publication or documented practice record in digital or Islamic education.

Instrument. Fifteen elements were generated from the literature review and grouped under five constructs: (A) Curriculum Content Standards, (B) Pedagogical Integration of Digital Tools, (C) Teacher Competency and Professional Development, (D) Assessment of Digital Islamic Literacy, and (E) Governance, Policy and Resource Support. Each element was rated by experts on a seven-point linguistic scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"), following the standard FDM linguistic-to-fuzzy conversion scale.

Data Analysis Using the Fudelo Application. Expert responses were entered into the Fudelo application, a Malaysian-developed software tool purpose-built for Fuzzy Delphi data analysis, which automates the computation of triangular fuzzy numbers, the threshold value (d), percentage of expert consensus, and the defuzzified fuzzy score for each item and construct. The FDM analysis proceeded through the following detailed steps:

1. Linguistic-to-fuzzy conversion. Each expert's 1–7 rating was converted into a triangular fuzzy number (m_1, m_2, m_3) using the standard seven-point fuzzy conversion scale (e.g., a rating of 7 = (0.9, 1.0, 1.0); a rating of 1 = (0, 0, 0.1)).
2. Aggregation of fuzzy numbers. For each item, the group triangular fuzzy number was computed as: m_1 = minimum of all experts' m_1 values; m_2 = average (mean) of all experts' m_2 values; m_3 = maximum of all experts' m_3 values.
3. Computation of the threshold value (d). The distance between each expert's individual fuzzy number and the group aggregated fuzzy number was calculated using the vertex method: $d(m,n) = \sqrt{\frac{1}{3}((m_1-n_1)^2+(m_2-n_2)^2+(m_3-n_3)^2)}$. The mean d-value across all seven experts was then computed per item. An item is considered to have reached expert consensus if the mean d-value ≤ 0.2 (Chang et al., 2011).
4. Percentage of expert consensus. The proportion of experts whose individual d-value fell at or below 0.2 was calculated per item. A minimum of 75% expert agreement was required for an item to be retained (Mohd Jamil et al., 2014).
5. Defuzzification (fuzzy score, A). Each item's aggregated triangular fuzzy number was defuzzified into a single crisp fuzzy score using $A = (m_1 + m_2 + m_3) / 3$. An item required a fuzzy score ≥ 0.5 (the mid-point of the fuzzy scale) to be accepted (α -cut value).
6. Triangulated acceptance decision. An item was accepted only when it simultaneously satisfied all three criteria: (i) threshold value $d \leq 0.2$, (ii) expert consensus $\geq 75\%$, and (iii) fuzzy score $A \geq 0.5$. Items failing any one criterion were rejected or flagged for a second Delphi round.
7. Ranking of accepted items. Accepted items were ranked in descending order of fuzzy score (A) within each construct and across the overall instrument, indicating relative priority for curriculum framework inclusion.
8. Construct-level aggregation. The mean fuzzy score of all accepted items within a construct was computed to represent the construct's overall priority in the final framework.

Only one Delphi round was required in this study, as all items achieved either clear acceptance or clear rejection against the triangulated criteria, consistent with FDM's design efficiency advantage over conventional Delphi (Hsu et al., 2010).

Ethical Considerations. Expert participation was voluntary, preceded by informed consent, and responses were anonymised prior to Fudelo data entry to minimise social-desirability bias and preserve the independence of expert judgement consistent with Delphi methodology principles.

Findings

5.1 Expert Panel Profile. Seven experts validated the instrument. Table 1 shows their distribution by category and Table 2 their years of experience, following standard FDM reporting practice (Mohd Jamil et al., 2014).

Table 1: Number of Experts by Category

No.	Expert Category	n
1	Islamic Education Curriculum Specialist (BPK / Teacher Training Institute)	2
2	Academic – Educational Technology / Islamic Education	2
3	Senior Islamic Education Teacher (≥ 10 yrs, digital pedagogy practice)	3
Total		7

Table 2: Expert Panel Experience Period

Experience Period	Number of Experts
5–10 years	2
11–20 years	3
21–29 years	2
Total	7

All experts met at least three of the four selection criteria set out in Section 4.2 (postgraduate qualification, ≥ 5 years' relevant experience, involvement in curriculum development or teacher training, and a documented practice or publication record in digital or Islamic education).

5.2 Threshold Value (d) Analysis. Using the seven-point linguistic scale, each expert's rating for all fifteen items was converted into a triangular fuzzy number and compared against the group aggregated fuzzy number to obtain the threshold value (d), computed by the Fudelo application. Table 3 shows the individual d-value of each expert for every item, with the average d per item in the final row.

Table 3: Threshold Value (d) per Expert per Item (Fudelo Output)

Expert	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3	E1	E2	E3
1	0.118	0.025	0.115	0.117	0.116	0.245	0.118	0.116	0.088	0.117	0.120	0.130	0.016	0.120	0.163
2	0.033	0.120	0.115	0.117	0.116	0.167	0.108	0.116	0.126	0.041	0.120	0.130	0.016	0.101	0.258
3	0.118	0.025	0.238	0.041	0.122	0.245	0.118	0.116	0.088	0.117	0.101	0.251	0.123	0.120	0.258
4	0.033	0.025	0.129	0.117	0.116	0.275	0.245	0.049	0.126	0.117	0.120	0.130	0.016	0.120	0.163
5	0.118	0.120	0.115	0.117	0.240	0.167	0.118	0.116	0.088	0.041	0.101	0.218	0.016	0.101	0.258
6	0.118	0.025	0.238	0.041	0.116	0.245	0.118	0.116	0.126	0.117	0.120	0.251	0.123	0.120	0.258
7	0.033	0.120	0.115	0.117	0.116	0.167	0.108	0.116	0.126	0.117	0.120	0.130	0.016	0.120	0.163
Avg d	0.082	0.066	0.152	0.095	0.135	0.216	0.133	0.106	0.110	0.095	0.115	0.177	0.047	0.115	0.217

Table 3 shows that eleven of fifteen items recorded an average threshold value below 0.2 ($d \leq 0.2$), satisfying the first FDM condition, while four items (A3, B3, D3, E3) exceeded the 0.2 threshold.

5.3 Percentage of Expert Consensus. The second FDM condition requires that at least 75% of experts record an individual d-value ≤ 0.2 for an item to be retained. Table 4 presents the number and percentage of experts meeting this condition per item.

Table 4: Findings of Percentage of Expert Consensus per Item

Item	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3	E1	E2	E3
No. Experts $d \leq 0.2$	7	7	5	7	6	3	6	7	7	7	7	4	7	7	3
Percent $d \leq 0.2$	100%	100%	71%	100%	86%	43%	86%	100%	100%	100%	100%	57%	100%	100%	43%

	Value
Total Expert Ratings $d \leq 0.2$	90 out of 105
Total Percentage $d \leq 0.2$	85.7%

Eleven items achieved $\geq 75\%$ expert consensus. The four items below the threshold — A3 (71%), B3 (43%), D3 (57%), and E3 (43%) failed the second FDM condition and were not carried forward to the final framework.

5.4 Triangular Fuzzy Number Conditions, Defuzzified Score, and Ranking. The third FDM condition requires defuzzification of each item's aggregated triangular fuzzy number into a fuzzy score (A), with $A \geq 0.5$ needed for acceptance. Table 5 presents the complete triangulated result combining all three FDM conditions.

Table 5: Triangular Fuzzy Number Conditions, Fuzzy Score, and Item Ranking

Construct	Item	m1	m2	m3	Avg d	Consensus	A	Rank	Decision
C. Teacher Competency & PD	C2	0.70	0.99	1.00	0.106	100%	0.895	1	Accepted
B. Pedagogical Integration	B1	0.70	0.97	1.00	0.095	100%	0.890	2	Accepted
D. Assessment	D1	0.70	0.97	1.00	0.095	100%	0.890	3	Accepted
A. Curriculum Content	A1	0.70	0.96	1.00	0.082	100%	0.886	4	Accepted
A. Curriculum Content	A2	0.70	0.94	1.00	0.066	100%	0.881	5	Accepted
E. Governance & Support	E1	0.70	0.93	1.00	0.047	100%	0.876	6	Accepted
B. Pedagogical Integration	B2	0.50	0.89	1.00	0.135	86%	0.795	7	Accepted
C. Teacher Competency & PD	C1	0.50	0.86	1.00	0.133	86%	0.786	8	Accepted
D. Assessment	D2	0.50	0.84	1.00	0.115	100%	0.781	9	Accepted
E. Governance & Support	E2	0.50	0.84	1.00	0.115	100%	0.781	10	Accepted
C. Teacher Competency & PD	C3	0.50	0.81	1.00	0.110	100%	0.771	11	Accepted
A. Curriculum Content	A3	0.50	0.90	1.00	0.152	71%	0.800	12	Rejected
D. Assessment	D3	0.30	0.73	1.00	0.177	57%	0.676	13	Rejected
B. Pedagogical Integration	B3	0.10	0.56	0.90	0.216	43%	0.519	14	Rejected
E. Governance & Support	E3	0.10	0.50	0.90	0.217	43%	0.500	15	Rejected

Acceptance requires all three FDM conditions simultaneously: (i) average threshold value $d \leq 0.2$; (ii) expert consensus $\geq 75\%$; (iii) fuzzy score $A \geq 0.5$. An item meeting only the fuzzy-score condition (e.g., A3, D3) is still rejected if it fails the threshold or consensus condition.

5.5 Overall Consensus Outcome. Of fifteen elements evaluated, eleven (73.3%) met all three FDM conditions and were retained in the validated framework. The item with the strongest overall consensus was C2, “Teacher competency in selecting Shariah-compliant digital content and applications” ($d = 0.106$, 100% consensus, $A = 0.895$), followed closely by B1 and D1 (both $A = 0.890$). The four rejected items A3, B3, D3, and E3 each recorded expert consensus below 75% (ranging from 43% to 71%), despite three of the four still exceeding the $A \geq 0.5$ midpoint, confirming that the consensus and threshold conditions not the fuzzy score alone were decisive in the rejection decision.

Discussion

The dominance of the Teacher Competency and Professional Development construct, and particularly item C2 (Shariah-compliant digital content selection, $A = 0.895$, rank 1), affirms the literature's consistent positioning of the teacher as the pivotal agent in digital Islamic literacy implementation (Sukmawati et al., 2025; Azman, 2025). Experts appear to judge that curriculum content and infrastructure are necessary but insufficient without teachers competent to filter, adapt, and model digital content according to Islamic values a finding consistent with the UNESCO (2018) ICT Competency Framework's emphasis on teacher-mediated technology integration over infrastructure alone.

The strong endorsement of curriculum content items (A1, A2) reinforces the theoretical position that digital literacy in Islamic education cannot be treated as a generic, values-neutral skillset (Ng, 2012; Eshet, 2012) but must be explicitly anchored in Qur'an, Hadith, and adab content, echoing Ashari et al. (2023) and Ferdinan et al. (2026), who found that religious digital engagement is most effective when explicitly scaffolded within curriculum content rather than left to incidental exposure.

The rejection of A3 (cross-curricular linkage with ICT/Digital Literacy subjects) is notable, as it suggests experts prefer digital Islamic literacy to be embedded within the Islamic Education subject itself rather than distributed across subject boundaries possibly reflecting concern that cross-curricular delivery dilutes accountability for the Islamic ethical dimension, a concern consistent with Agir and Mohd Matore's (2022) observation that digital citizenship integration in Malaysian schools remains fragmented across subjects and agencies.

The rejection of B3 (gamified hafazan assessment) and D3 (peer/self-assessment on open digital platforms) points to expert caution regarding assessment approaches that reduce teacher oversight of Islamic content evaluation. This is consistent with FDM findings elsewhere in Islamic education research, such as Razak et al. (2024), where experts favoured structured, teacher- or parent-mediated components over open-ended or gamified alternatives when religious content was involved.

The rejection of E3 (parental-monitoring platforms) at the lowest fuzzy score ($A = 0.500$) among all items suggests that, while governance and infrastructure support (E1, E2) were strongly endorsed, experts were more hesitant to formalise home-based digital monitoring as a school curriculum element, likely reflecting concerns about feasibility, privacy, and the school's limited authority over home environments rather than a rejection of parental involvement in principle.

Taken together, the pattern of acceptance and rejection describes a framework that experts consider should be teacher-centred, content-explicit, and institutionally supported, while remaining cautious of elements that decentralise oversight of religious content to gamified platforms, cross-curricular arrangements, or the home environment without structured school mediation. This nuanced consensus profile extends the digital literacy literature (Ng, 2012; Hague & Payton, 2010) by demonstrating that faith-based curriculum validation surfaces priorities teacher mediation and content fidelity that are less prominent in secular digital literacy models.

Conclusion and Recommendations

This study developed and validated an Islamic Education Curriculum Management Framework for Digital Islamic Literacy (IECMF-DIL) among primary school pupils using the Fuzzy Delphi Method, analysed through the Fudelo application, with a panel of seven experts. Of fifteen proposed elements across five constructs, eleven achieved triangulated expert consensus ($d \leq 0.2$, agreement $\geq 75\%$, fuzzy score ≥ 0.5) and were retained in the final framework, led by teacher competency in selecting Shariah-compliant digital content ($A = 0.895$) and formative digital assessment aligned with DSKP standards ($A = 0.890$). The validated framework confirms that digital Islamic literacy at the primary level should be curriculum-embedded, teacher-mediated, and institutionally supported, while approaches that decentralise oversight of religious content — gamified assessment, unstructured cross-curricular delivery, and unsupervised home platforms — require further development before inclusion.

Recommendations for Practice:

1. The Bahagian Pembangunan Kurikulum should revise the primary Islamic Education DSKP to explicitly embed the eleven validated elements, prioritising teacher-competency standards and content-specific digital ethics.
2. Teacher training institutes should develop continuous professional development (CPD) modules focused on Shariah-compliant digital content selection and formative digital assessment practice.
3. School administrators should prioritise dedicated ICT infrastructure for Islamic Education lessons (E1) as a governance-level enabling condition rather than treating it as a general-ICT matter.

Recommendations for Future Research:

1. Future studies should conduct a second Delphi round or triangulate the rejected items (A3, B3, D3, E3) through qualitative expert interviews to determine whether refinement, rather than outright rejection, would achieve consensus.
2. A larger, more geographically diverse expert panel, and a subsequent quantitative validation with practising Islamic Education teachers and pupils, would strengthen the generalisability of the framework beyond expert consensus alone.
3. Longitudinal research is recommended to evaluate the framework's impact on pupils' actual digital Islamic literacy outcomes once implemented at the school level.

Limitations. As an expert-consensus study, the findings reflect the judgement of a purposively selected panel of seven experts and have not yet been empirically tested with teachers or pupils; the framework should therefore be regarded as a validated foundation for further empirical and implementation research rather than a fully field-tested instrument.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

Acknowledgement

The authors would like to express their sincere appreciation to all experts, teachers, and educational practitioners who contributed their valuable time, knowledge, and insights to this study.

References

- Adibah, L. A., Hafizah, Z. (2021). The creativity practice of islamic education teachers in 21st century learning. *ASEAN Comparative Education Research Journal on Islam and Civilization*, 4(1), 40-54. <https://spaj.ukm.my/acerj/index.php/acer-j/article/view/67>
- Abdullah, J. B., & Mohd Yusof, S. I. (2018). A Fuzzy Delphi Method: Developing high-performance leadership standard for Malaysian school leaders. *Journal of Education and Social Sciences*, 9(2), 1–10.
- Agir, N., & Mohd Matore, M. E. E. (2022). Literasi dan kewarganegaraan digital: Konsep dan strategi implementasi dalam pendidikan di Malaysia. *Malaysian Journal of Social Sciences and Humanities*, 7(3), e001367. <https://doi.org/10.47405/mjssh.v7i3.1367>
- Ashari, M. K., Faizin, M., & Shiddiq, J. (2023). Religious digital literacy of students in Indonesia and Malaysia. *TADRIS: Jurnal Pendidikan Islam*, 18(1), 189–210. <https://doi.org/10.19105/tjpi.v18i1.8794>
- Azman, N. (2025). Digital teaching strategies of Islamic education teachers: A case study in primary schools. *International Journal of Learning, Teaching and Educational Research*, 24(3), 1–20.
- Buckingham, D. (2015). Defining digital literacy: What do young people need to know about digital media? *Nordic Journal of Digital Literacy*, 10(Jubileumsnummer), 21–35.
- Chang, P.-L., Hsu, C.-W., & Chang, P.-C. (2011). Fuzzy Delphi method for evaluating hydrogen production technologies. *International Journal of Hydrogen Energy*, 36(21), 14172–14179. <https://doi.org/10.1016/j.ijhydene.2011.05.045>
- Eshet, Y. (2012). Thinking in the digital era: A revised model for digital literacy. *Issues in Informing Science and Information Technology*, 9, 267–276.
- Ferdinan, F., Fattah, A., Nashir, A., Muthaharah, S., & Waeno, M. (2026). Examining the enactment of digital literacy in Islamic education across two school contexts in Indonesia and Thailand. *Discover Education*, 5(1), Article 764. <https://doi.org/10.1007/s44217-026-02044-1>
- Hague, C., & Payton, S. (2010). Digital literacy across the curriculum. *Futurelab*.
- Hsu, Y.-L., Lee, C.-H., & Kreng, V. B. (2010). The application of Fuzzy Delphi Method and Fuzzy AHP in lubricant regenerative technology selection. *Expert Systems with Applications*, 37(1), 419–425. <https://doi.org/10.1016/j.eswa.2009.05.068>
- Kementerian Pendidikan Malaysia. (2013). *Pelan Pembangunan Pendidikan Malaysia 2013–2025 (Pendidikan Prasekolah hingga Lepas Menengah)*. Kementerian Pendidikan Malaysia.
- Kementerian Pendidikan Malaysia. (2017). *Dokumen Standard Kurikulum dan Pentaksiran (DSKP): Pendidikan Islam Sekolah Rendah. Bahagian Pembangunan Kurikulum*.
- Koehler, M. J., Mishra, P., & Cain, W. (2013). What is technological pedagogical content knowledge (TPACK)? *Journal of Education*, 193(3), 13–19.
- Lifei, L., Mohd Jamil, M. R., & Idris, N. (2024). Fuzzy Delphi Method (FDM) for developing components of the Classroom Activity-based Instructional Design (CAID) model in teaching Chinese as a foreign language. *International Journal of Modern Education*, 6(23), 210–223. <https://doi.org/10.35631/IJMOE.623020>
- Livingstone, S. (2012). Critical reflections on the benefits of ICT in education. *Oxford Review of Education*, 38(1), 9–24.
- Mat Noh, N., & Mohd Jamil, M. R. (2020). *Aplikasi kaedah Fuzzy Delphi dalam penyelidikan sains sosial*. Universiti Pendidikan Sultan Idris Press.
- Mohamad, S. N. A., Embi, M. A., & Nordin, N. (2015). Determining e-portfolio elements in learning process using Fuzzy Delphi analysis. *International Education Studies*, 8(9), 171–176. <https://doi.org/10.5539/ies.v8n9p171>
- Mohd Jamil, M. R., Siraj, S., Hussin, Z., Mat Noh, N., & Abdul Sapar, A. (2014). *Pengenalan asas kaedah Fuzzy Delphi dalam reka bentuk kajian penyelidikan*. Universiti Pendidikan Sultan Idris Press.

- Mustaffa, Z., & Hussin, Z. (2022). Reka bentuk pembangunan model pedagogi terbeza berasaskan elemen kandungan pelajaran Tilawah Al-Quran sekolah rendah di Malaysia: Pendekatan Fuzzy Delphi. *Sains Insani*, 7(1), 61–70. <https://doi.org/10.33102/sainsinsani.vol7no1.380>
- Nasution, H. P., Mohd Jamil, M. R., Md Zalli, M. M., Novita, V., Nursiah, N., Purnami, S., Mat Noh, N., & Idris, N. (2025). Strategic decision-making in TVET higher education: Applying the Fuzzy Delphi technique to foster inclusive digital pedagogy in Indonesia-Malaysia. *Jurnal Inovasi Teknologi Pendidikan*, 12(2), 231–242. <https://doi.org/10.21831/jitp.v12i2.86318>
- Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education*, 59(3), 1065–1078. <https://doi.org/10.1016/j.compedu.2012.04.016>
- Nurul Nadia Abd Aziz, Yazid, Z. N. A., Bakar, A. A., Hashim, J. N., Aziz, M. A., & Ramli, F. (2025). Malaysian quality childcare unveiled through Fuzzy Delphi: What do parents want? *International Journal of Research and Innovation in Social Science*, 9(1), 2615–2625. <https://doi.org/10.47772/IJRISS.2025.9010211>
- Ornstein, A. C., & Hunkins, F. P. (2017). *Curriculum: Foundations, principles, and issues* (7th ed.). Pearson.
- Razak, A., Kamaruddin, K., Tengku Sharima, T. P. N., & Mohd Jamil, M. R. (2024). An analysis of the Fuzzy Delphi Method (FDM) for developing effective parental guidelines in teaching practical Solah at home for 6-year-old children. *Proceedings of the 4th International Conference on Communication, Language, Education and Social Sciences (CLESS 2023)*, 203–213.
- Sukmawati, S., Muthmainna, M., Harmiati, H., & Safira, S. (2025). Digital literacy in Islamic elementary education: The role of teachers in strengthening student competencies. *Journal of Indonesian Islamic Studies*, 5(1), 47–56.
- UNESCO. (2018). *UNESCO ICT competency framework for teachers* (Version 3). UNESCO.
- Warschauer, M., & Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of Research in Education*, 34(1), 179–225.
- Wok, W. C., Mohd Jamil, M. R., Idris, N., Md Aris, N., Othman, M. S., & Md Zalli, M. M. (2025). Application of the Fuzzy Delphi Method in evaluating a Malay language writing skills model for Orang Asli schools in Malaysia. *International Journal of Research and Innovation in Social Science*, 9(7), 4082–4096. <https://doi.org/10.47772/IJRISS.2025.907000330>
- Yusap, M. M., Nasir, M. K. M., & Adnan, N. H. (2024). Design and development of NumFlex application for number system learning: A DDR approach with Fuzzy Delphi Method. *International Journal of Research and Innovation in Social Science*, 8(9), 1904–1921. <https://doi.org/10.47772/IJRISS.2024.8090157>
- Yusof, N., Baharudin, H., Hamzah, M. I., & Abdul Malek, N. I. (2021). Fuzzy Delphi Method application in the development of i-Aqrān module for Arabic vocabulary consolidation. *Ijaz Arabi Journal of Arabic Learning*, 4(2), 331–351. <https://doi.org/10.18860/IJAZARABI.V4I2.12050>

Publisher: CLM Publishing Resources Malaysia



Open Access: This article is licensed under a [Creative Commons Attribution 4.0](https://creativecommons.org/licenses/by/4.0/) International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

Data Availability Statement: All relevant data are within the manuscript and its [Supporting Information](#) files.