

Development and Validation of the Technology-Integrated Sirah Teaching Model (PInTar Model) for Malaysian Primary Schools Using the Fuzzy Delphi Method

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ABSTRACT

The integration of digital technology has become increasingly important in contemporary education, including Islamic Education. However, Sirah instruction in Malaysian primary schools continues to rely largely on conventional teaching approaches, with limited guidance for systematic technology integration. This study aimed to develop and validate the PInTar Model, a technology-integrated instructional model designed to support Sirah teaching in primary schools. The study employed the Design and Development Research (DDR) approach, focusing on the design and development phase. The Fuzzy Delphi Method (FDM) was utilised to obtain expert consensus on the proposed model components and instructional elements. A panel of experts representing Islamic Education, Sirah Education, Educational Technology, Curriculum and Instruction, and Teacher Education participated in the validation process. Data were analysed using threshold value, percentage of expert consensus, and defuzzification value criteria. The findings confirmed the validity of six main components, namely Learner Analysis, Instructional Objectives, Selection of Methods, Media and Teaching Aids, Utilisation of Media and Teaching Aids, Active Student Engagement, and Integrated Assessment. Of the 95 proposed instructional elements, 91 were retained following expert validation. The findings indicate that the PInTar Model possesses strong content validity and provides a comprehensive framework for integrating technology into Sirah instruction. The study contributes to the advancement of Islamic Education by offering an empirically validated instructional model that integrates pedagogical, technological, and content dimensions to support meaningful technology-enhanced learning in primary school Sirah education.

Keywords: Sirah Education; Technology Integration; Islamic Education; Primary School; Instructional Model; Fuzzy Delphi Method; Design and Development Research.

INTRODUCTION

1.1 Digital Transformation in Education

The rapid advancement of digital technology has transformed educational practices worldwide, creating opportunities for more interactive, learner-centred, and meaningful learning experiences (Gabriel et al., 2022). Beyond facilitating access to information, digital technologies support the development of critical twenty-first-century competencies and encourage innovative approaches to teaching and learning (World Economic Forum, 2024). In Malaysia, this transformation has been reinforced through the Malaysian Digital Education Policy, which emphasises the enhancement of digital literacy, technological competence, and innovative pedagogical practices across all levels of education (Kementerian Pendidikan Malaysia [KPM], 2023). Consequently, teachers are increasingly expected to integrate technology effectively into instructional practices to enhance student engagement and learning outcomes (Azman et al., 2025; Ahmad & Rathakrishnan, 2025). This growing emphasis highlights the need for systematic technology integration across all educational disciplines, including Islamic Education.

1.2 Technology Integration in Islamic Education

Technology integration has become increasingly important in Islamic Education as educators seek to enhance students' engagement, motivation, and understanding of Islamic knowledge. The use of multimedia resources, digital storytelling, gamification, interactive applications, and online learning platforms has been shown to support more engaging and student-centred learning experiences (Azman et al., 2025; Romlah et al., 2024). Despite these advantages, the implementation of technology in Islamic Education remains inconsistent and is often influenced by teachers' digital competence, pedagogical readiness, and access to technological resources (Lim et al., 2024; Nasir et al., 2024). Furthermore, teachers frequently encounter difficulties in selecting and integrating appropriate digital tools into instructional practices in a systematic manner (Saili et al., 2024). These challenges highlight the need for a structured instructional framework to support meaningful and effective technology integration within Islamic Education classrooms.

1.3 The Importance of Sirah Education in Primary Schools

Sirah education constitutes a fundamental component of Islamic Education in Malaysian primary schools. Through the study of the life, character, leadership, and struggles of Prophet Muhammad SAW, pupils are exposed to Islamic values and exemplary behaviours that contribute to character formation and holistic development (Ajmain & Yusof, 2025; Azzam, 2025). Beyond acquiring historical knowledge, Sirah learning serves as a medium for nurturing faith, strengthening Islamic identity, and fostering the internalisation of moral values among young learners (Abubakar et al., 2025; Nasir & Teh, 2021). The significance of Sirah education is further reflected in its inclusion within the Islamic Education curriculum, where learning experiences are designed to encourage students to appreciate and emulate the noble character of the Prophet SAW in their daily lives (KPM, 2021). Therefore, effective Sirah instruction is essential not only for achieving curriculum objectives but also for supporting the broader goals of Islamic Education in developing knowledgeable, ethical, and value-oriented individuals.

1.4 Challenges in Sirah Teaching and Learning

Despite its importance, the teaching and learning of Sirah continue to face several challenges in primary school classrooms. Previous studies have reported that Sirah instruction is often delivered through conventional approaches that rely heavily on teacher explanations, textbooks, and factual memorisation (Abdullah, 2023; Ajmain et al., 2024). While such approaches may facilitate content delivery, they may limit students' active engagement and opportunities to develop meaningful understanding of historical events and Islamic values. The challenge becomes more evident as contemporary learners are increasingly exposed to digital technologies and interactive learning environments. This creates a mismatch between students' learning preferences and traditional instructional practices (Mokhtar et al., 2023; Nadzri & Makhsin, 2024). Previous studies have demonstrated that digital games, multimedia applications, and interactive learning resources can enhance students' motivation, participation, and learning experiences in Sirah education (Abdullah & Razak, 2021; Kamarazaman et al., 2021; Zahari et al., 2021). However, the integration of these technologies is often implemented in isolation and lacks a systematic pedagogical framework to guide instructional planning and implementation. Consequently, there remains a need for a structured approach that can support meaningful and effective technology-integrated Sirah instruction in primary schools.

1.5 Research Gap

Existing studies have extensively examined technology integration in education, digital competencies, and innovative pedagogical approaches within Islamic Education (Azman et al., 2025; Saili et al., 2024). Similarly, previous research has explored the effectiveness of various digital tools and technology-enhanced learning strategies in supporting Sirah instruction (Kamarazaman et al., 2021; Mokhtar et al., 2023; Nadzri & Makhsin, 2024). These studies provide valuable insights into the potential of technology to enhance teaching and learning practices within Islamic Education. However, the existing literature predominantly focuses on the use of specific technologies, instructional strategies, or teachers' technological competencies rather than the development of a comprehensive instructional model specifically designed for technology-integrated Sirah instruction in primary schools. Furthermore, limited attention has been given to the systematic validation of such a model through expert consensus to ensure its relevance, suitability, and practical applicability within the context of Islamic Education. Consequently, a gap remains in the availability of an empirically validated instructional framework that can guide teachers in planning, implementing, and evaluating technology-integrated Sirah instruction in a systematic and pedagogically meaningful manner. To address this gap, the present study develops and validates the PInTar Model as a technology-integrated instructional framework for Sirah education in Malaysian primary schools. The model is intended to provide a structured guide that aligns pedagogical principles, technological integration, learner engagement, and assessment practices within a coherent instructional framework.

1.6 Purpose of the Study

To address the identified gap, this study aimed to develop and validate the PInTar Model (Technology-Integrated Sirah Teaching Model) for Malaysian primary schools. The study employed the Design and Development Research (DDR) approach, focusing on the design and development phase, with validation conducted through the Fuzzy Delphi Method (FDM). The model was developed based on the integration of Constructivist Theory, the ASSURE Model, and the ICT-enhanced Teacher Development (ICT-eTD) Model to provide a systematic framework for technology-integrated Sirah instruction. Specifically, the study sought to identify and validate the main components of the PInTar Model, determine the instructional elements within each component, and establish their priority based on expert consensus. The findings are expected to contribute to the advancement of Islamic Education by providing an empirically validated instructional framework that supports meaningful technology integration in primary school Sirah education.

2. LITERATURE REVIEW

2.1 Sirah Education in Primary Schools

Sirah education is an important component of Islamic Education that aims to develop learners' understanding of the life, character, leadership, and struggles of Prophet Muhammad SAW. Beyond the acquisition of historical knowledge, Sirah learning plays a significant role in nurturing faith, strengthening Islamic identity, and fostering the internalisation of moral values among students (Ajmain & Yusof, 2025; Abubakar et al., 2025). Through meaningful engagement with Sirah narratives, learners are encouraged to emulate the exemplary character of the Prophet SAW and apply Islamic values in their daily lives (Nasir & Teh, 2021). Within the Malaysian primary school curriculum, Sirah constitutes an integral element of Islamic Education as outlined in the Curriculum and Assessment Standard Document (DSKP) (KPM, 2021). The teaching of Sirah is intended not only to enhance students' knowledge of Islamic history but also to cultivate positive attitudes, ethical behaviour, and value-based decision-making. Therefore, effective Sirah instruction is essential in supporting the broader objectives of Islamic Education and holistic student development. Despite its educational significance, previous studies have reported that Sirah instruction is often characterised by teacher-centred approaches that emphasise factual recall and textbook-based learning (Abdullah, 2023; Ajmain et al., 2024). Such practices may limit students' engagement and reduce opportunities for meaningful learning. Consequently, there is an increasing need for instructional approaches that promote active participation and deeper understanding of Sirah content. Recent studies suggest that digital technologies, multimedia applications, and interactive learning environments have considerable potential to enhance students' motivation, engagement, and learning experiences in Sirah education (Abdullah & Razak, 2021; Kamarazaman et al., 2021; Mokhtar et al., 2023).

2.2 Technology Integration in Islamic Education

The integration of technology has become an increasingly important agenda in Islamic Education, driven by the growing demand for digital learning environments and student-centred pedagogical approaches. Technology enables educators to diversify instructional strategies, facilitate access to learning resources, and create more engaging learning experiences that support students' understanding of Islamic content (Azman et al., 2025; Romlah et al., 2024). The use of multimedia presentations, digital storytelling, mobile applications, gamification, and online learning platforms has been found to enhance student engagement and promote meaningful learning within Islamic Education contexts (Zainol et al., 2025; Mahmud & Tamuri, 2023). From a pedagogical perspective, technology integration extends beyond the use of digital tools and requires the alignment of technology with instructional objectives, learning activities, and assessment practices. Effective technology integration enables teachers to create interactive learning environments that encourage collaboration, exploration, and active participation among learners (Azman et al., 2025). Such practices are consistent with contemporary educational approaches that emphasise learner-centred instruction and meaningful knowledge construction. Despite these potential benefits, previous studies have identified several challenges that hinder effective technology integration in Islamic Education, including limited digital competence, inadequate pedagogical readiness, insufficient technological infrastructure, and the absence of systematic instructional guidance (Lim et al., 2024; Nasir et al., 2024). Furthermore, teachers often encounter difficulties in selecting appropriate technologies and integrating them effectively into classroom instruction (Saili et al., 2024). These challenges highlight the need for a structured instructional framework capable of guiding teachers in implementing technology-enhanced learning within Islamic Education, particularly in the teaching of Sirah.

2.3 Constructivist Theory

Constructivist Theory provides the primary theoretical foundation for the development of the PInTar Model. The theory posits that knowledge is actively constructed by learners through interaction with their environment, experiences, and social engagement rather than being passively transmitted by teachers (Fosnot, 2013; Voon & Amran, 2021). Accordingly, learning occurs when learners actively participate in the process of exploring, interpreting, and constructing meaning from learning experiences. A central principle of constructivism is the emphasis on active learning, collaboration, inquiry, reflection, and authentic learning experiences. Learners are encouraged to engage in discussion, problem-solving, knowledge sharing, and interaction with various learning resources to develop meaningful understanding (Ahamad et al., 2022; Subramaniam & Mahmud, 2022). In technology-enhanced learning environments, digital technologies can facilitate these processes by providing opportunities for collaboration, exploration, and interactive learning experiences that support deeper knowledge construction. The application of Constructivist Theory is particularly relevant to Sirah education, where students are expected not only to acquire historical knowledge but also to interpret events, derive lessons, and internalise Islamic values for application in daily life. From this perspective, effective Sirah instruction should encourage active learner engagement and meaningful interaction with learning content rather than reliance on memorisation-oriented approaches. Therefore, Constructivist Theory provides a suitable theoretical foundation for guiding the

development of the PInTar Model, particularly in supporting the components of Learner Analysis, Active Student Engagement, and Integrated Assessment.

2.4 ASSURE Model

The ASSURE Model is one of the most widely recognised instructional design models for technology-integrated teaching and learning. Developed by Heinich et al. (2002), the model comprises six systematic stages, namely analysing learners, stating objectives, selecting methods, media and materials, utilising media and materials, requiring learner participation, and evaluating and revising instruction. The model provides a structured framework that assists teachers in planning, implementing, and evaluating technology-enhanced learning experiences. Previous studies have highlighted the effectiveness of the ASSURE Model in improving instructional quality, learner engagement, and the integration of technology into classroom practices (Lei, 2024). The systematic nature of the model enables teachers to align instructional objectives, learning activities, technological resources, and assessment strategies within a coherent instructional process. As a result, the ASSURE Model has been widely applied as a practical framework for designing meaningful technology-enhanced learning environments. The ASSURE Model served as a key instructional design reference in the development of the PInTar Model. Several components of the PInTar Model, including Learner Analysis, Instructional Objectives, Selection of Methods, Media and Teaching Aids, Utilisation of Media and Teaching Aids, Active Student Engagement, and Integrated Assessment, were adapted from the systematic stages proposed by ASSURE. Therefore, the model provides an important instructional foundation that supports the integration of pedagogical planning and technology-enhanced learning within Sirah education.

2.5 ICT-Enhanced Teacher Development (ICT-eTD) Model

The ICT-Enhanced Teacher Development (ICT-eTD) Model was introduced to support teachers in integrating information and communication technologies into educational practice. The model emphasises the development of teachers' technological competencies alongside pedagogical and content knowledge to facilitate effective technology-enhanced learning environments (Temechegn, 2011). Through this approach, teachers are encouraged to utilise digital technologies not merely as instructional tools but as resources that can enrich teaching and learning experiences. A key contribution of the ICT-eTD Model lies in its emphasis on the selection and utilisation of appropriate digital resources to support instructional objectives and learner needs. Previous studies have demonstrated that technology-focused professional development can enhance teachers' confidence, digital competence, and instructional effectiveness, thereby improving the quality of technology integration in educational settings (Temauggee et al., 2021; Kusriani et al., 2025). These findings suggest that effective technology integration requires not only technological access but also the capacity to apply technology meaningfully within pedagogical practices. In the present study, the ICT-eTD Model served as an important reference for incorporating technology-related elements into the PInTar Model. Elements associated with digital learning resources, multimedia applications, educational technologies, and technology-supported instructional activities were developed based on the principles of the ICT-eTD Model. Consequently, the model contributes to strengthening the technological dimension of the PInTar Model and supports the implementation of meaningful technology-integrated Sirah instruction.

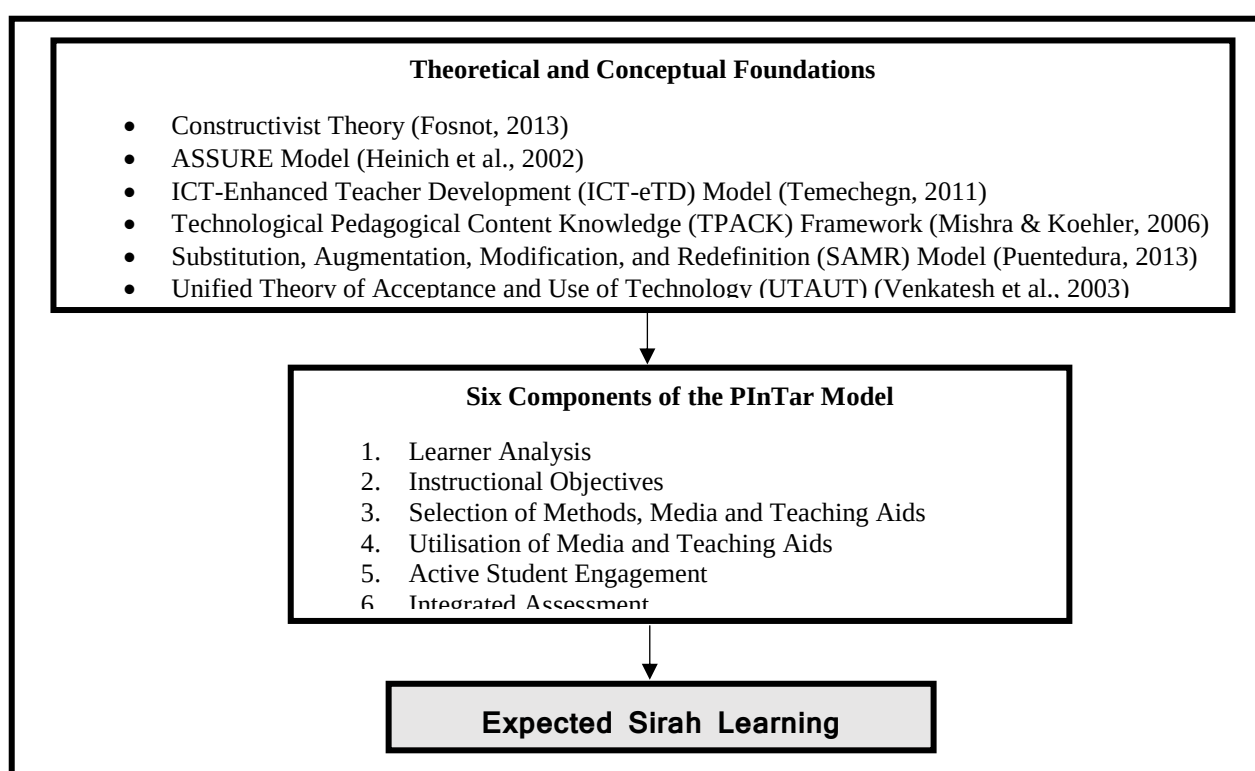
2.6 Development of the PInTar Model

The literature indicates that effective technology-integrated instruction requires the alignment of pedagogical principles, technological competencies, learner characteristics, and assessment practices. Constructivist Theory provides the theoretical basis for active and meaningful learning, while the ASSURE Model offers a systematic instructional design structure and the ICT-eTD Model emphasises technology integration and teachers' digital competence (Fosnot, 2013; Heinich et al., 2002; Temechegn, 2011). Collectively, these foundations provide complementary perspectives for designing technology-enhanced learning environments. Drawing upon these theoretical and conceptual foundations, the PInTar Model was developed to provide a structured framework for technology-integrated Sirah instruction in Malaysian primary schools. The development process involved the synthesis of literature related to Sirah education, instructional design, educational technology, and digital pedagogy, alongside findings obtained from the needs analysis phase. This synthesis enabled the identification of instructional components that are pedagogically relevant, technologically appropriate, and aligned with the learning objectives of Sirah education. The resulting model comprises six interrelated components, namely Learner Analysis, Instructional Objectives, Selection of Methods, Media and Teaching Aids, Utilisation of Media and Teaching Aids, Active Student Engagement, and Integrated Assessment. These components collectively support the planning, implementation, and evaluation of technology-integrated Sirah instruction. To ensure their relevance and suitability, the proposed components and instructional elements were subsequently subjected to expert validation through the Fuzzy Delphi Method.

2.7 Conceptual Framework of the PInTar Model

The conceptual framework of the PInTar Model was developed through the integration of several complementary theoretical and conceptual foundations, namely Constructivist Theory (Fosnot, 2013), the ASSURE Model (Heinich et al., 2002), the ICT-Enhanced Teacher Development (ICT-eTD) Model (Temechegn, 2011), the Technological Pedagogical Content Knowledge (TPACK) Framework (Mishra & Koehler, 2006), the Substitution, Augmentation, Modification, and Redefinition (SAMR) Model (Puentedura, 2013), and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). These theoretical and conceptual foundations collectively informed the pedagogical, technological, instructional, and behavioural dimensions of the model. Through the synthesis of these foundations and the findings from the needs analysis phase, six core components of the PInTar Model were identified and subsequently validated through the Fuzzy Delphi Method (FDM). The validated model is expected to facilitate meaningful technology-integrated Sirah instruction and ultimately contribute to enhanced student engagement, understanding of Sirah content, internalisation of Islamic values, and meaningful learning outcomes.

Figure 1 Conceptual Framework of the PInTar Model



3. RESEARCH QUESTIONS

Based on the identified research gap and the conceptual framework underpinning the development of the PInTar Model, this study was guided by the following research questions:

RQ1: What are the main components of the PInTar Model for technology-integrated Sirah instruction in Malaysian primary schools as validated by experts?

RQ2: What instructional elements should be retained within each component of the PInTar Model based on expert consensus?

4. METHODOLOGY

4.1 Research Design

This study employed the Design and Development Research (DDR) approach to develop and validate the PInTar Model for technology-integrated Sirah instruction in Malaysian primary schools. DDR is widely recognised as an appropriate approach for developing educational models because it systematically integrates theoretical foundations, empirical evidence, and validation procedures throughout the development process (Richey & Klein, 2014; Jamil & Noh, 2024). The overall study consisted of three phases: (i) Needs Analysis, (ii) Design and Development, and (iii) Usability Evaluation. However, this article focuses specifically on Phase II, which involved the design, development, and validation of the PInTar Model. The model was developed through the synthesis of

relevant theories, instructional design models, technology integration frameworks, and findings from the needs analysis phase. The development process was guided by Constructivist Theory, the ASSURE Model, the ICT-Enhanced Teacher Development (ICT-eTD) Model, the Technological Pedagogical Content Knowledge (TPACK) Framework, the Substitution, Augmentation, Modification and Redefinition (SAMR) Model, and the Unified Theory of Acceptance and Use of Technology (UTAUT). These foundations informed the identification of the model components and instructional elements. Subsequently, the Fuzzy Delphi Method (FDM) was employed to obtain expert consensus and validate the proposed components and elements of the PInTar Model.

4.2 Development of the PInTar Model

The development of the PInTar Model was conducted in two stages. The first stage focused on the identification and development of the main model components, while the second stage involved the development of instructional elements within each component.

Stage 1: Development of Main Components

The main components of the PInTar Model were identified through an extensive review and synthesis of relevant literature, educational theories, curriculum documents, and technology integration frameworks. The development process was guided by Constructivist Theory, the ASSURE Model, the ICT-Enhanced Teacher Development (ICT-eTD) Model, the Technological Pedagogical Content Knowledge (TPACK) Framework, the Substitution, Augmentation, Modification and Redefinition (SAMR) Model, and the Unified Theory of Acceptance and Use of Technology (UTAUT). This process resulted in the identification of six preliminary components: (i) Learner Analysis, (ii) Instructional Objectives, (iii) Selection of Methods, Media and Teaching Aids, (iv) Utilisation of Media and Teaching Aids, (v) Active Student Engagement, and (vi) Integrated Assessment. These components were subsequently subjected to expert validation using the Fuzzy Delphi Method.

Stage 2: Development of Instructional Elements

Following the validation of the main components, instructional elements were developed based on the findings of the needs analysis phase, constructivist learning principles, Sirah curriculum requirements outlined in the KSSR Islamic Education curriculum, technology integration literature, and relevant instructional design frameworks. Through this process, 95 instructional elements were generated and organised under the six proposed components prior to expert evaluation. These elements were subsequently assessed by the expert panel to determine their relevance, suitability, and priority for inclusion in the final version of the PInTar Model.

4.3 Participants

The study involved 13 experts selected through purposive sampling. Purposive sampling is widely recommended in Delphi-based studies because it enables the selection of individuals who possess specialised knowledge, extensive professional experience, and expertise relevant to the research domain (Tongco, 2007; Tajik et al., 2025). The expert panel comprised individuals from diverse educational backgrounds, including Islamic Education, Sirah Education, Educational Technology, Curriculum and Instruction, Teacher Education, and Educational Research. The inclusion of experts from multiple disciplines ensured comprehensive evaluation of the proposed model from pedagogical, technological, curricular, and subject-specific perspectives. All experts possessed substantial professional and academic experience in their respective fields. Their expertise enabled them to evaluate the relevance, suitability, clarity, and practicality of the proposed components and instructional elements of the PInTar Model. The selection of a multidisciplinary expert panel was considered essential to establish the content validity of the model and ensure its applicability within the context of technology-integrated Sirah instruction in Malaysian primary schools.

4.4 Research Instrument

A structured Fuzzy Delphi questionnaire was developed specifically for this study to obtain expert consensus on the proposed components and instructional elements of the PInTar Model. The instrument was developed based on the literature review, findings from the needs analysis phase, and the theoretical and conceptual foundations underpinning the model. The questionnaire consisted of two sections. Section A focused on the validation of the six proposed components of the PInTar Model, namely Learner Analysis, Instructional Objectives, Selection of Methods, Media and Teaching Aids, Utilisation of Media and Teaching Aids, Active Student Engagement, and Integrated Assessment. Section B focused on the validation of the instructional elements developed under each component. Experts were required to evaluate the relevance and suitability of each component and element for technology-integrated Sirah instruction in Malaysian primary schools. All items were assessed using a seven-point linguistic scale ranging from strongly disagree to strongly agree. The responses were subsequently converted into Triangular Fuzzy Numbers (TFNs) for analysis using the Fuzzy Delphi Method.

4.5 Data Collection Procedure

The data collection process commenced after obtaining the consent of the selected experts to participate in the study. Each expert was provided with an information sheet outlining the objectives of the study, a description of the PInTar Model, definitions of the proposed components and instructional elements, and instructions for completing the questionnaire. The Fuzzy Delphi questionnaire was subsequently distributed to the experts for evaluation. Experts were requested to independently assess the relevance and suitability of the proposed model components and instructional elements based on their professional knowledge and experience. Independent evaluation was essential to minimise potential bias and ensure that the consensus reflected individual expert judgement. Upon completion, the responses were collected and transformed into Triangular Fuzzy Numbers (TFNs) for analysis using the Fuzzy Delphi Method. The analysed data were then used to determine the level of expert consensus and to validate the components and instructional elements of the PInTar Model.

4.6 Data Analysis

The data were analysed using the Fuzzy Delphi Method (FDM), which combines the systematic consensus-building process of the Delphi technique with fuzzy set theory to reduce ambiguity in expert judgement and enhance the reliability of decision-making (Ciptono et al., 2019; Mustaffa & Hussin, 2022). The experts' responses were transformed into Triangular Fuzzy Numbers (TFNs) and analysed using three established acceptance criteria. First, the threshold value (d) was calculated to determine the degree of agreement among experts. A threshold value of $d \leq 0.20$ indicated an acceptable level of consensus. Second, the percentage of expert consensus was calculated, with a minimum agreement level of 75% required for item acceptance. Third, the defuzzification value was computed to determine the priority and importance of each component and instructional element, whereby a value of α -cut ≥ 0.50 indicated acceptance (Mustaffa & Hussin, 2022; Ridhuan et al., 2023). An item was retained only when all three acceptance criteria were satisfied. The accepted components and instructional elements were subsequently ranked according to their defuzzification values, with higher values indicating stronger expert agreement regarding their importance within the PInTar Model. The analysis resulted in the validation of the model components, the selection of instructional elements, and the determination of element priority levels within the final structure of the PInTar Model.

5. FINDINGS

5.1 Validation of the Main Components of the PInTar Model (RQ1)

Research Question 1 (RQ1)

What are the main components of the PInTar Model for technology-integrated Sirah instruction in Malaysian primary schools as validated by experts?

To address RQ1, the six proposed components of the PInTar Model were evaluated by a panel of experts using the Fuzzy Delphi Method (FDM). The evaluation was conducted to determine the relevance and suitability of each component for inclusion in the model. Consistent with established FDM procedures, components were accepted if they achieved a threshold value (d) of ≤ 0.20 , expert consensus of at least 75%, and a defuzzification value of ≥ 0.50 . Table 1 presents the results of expert consensus on the proposed main components of the PInTar Model.

Table 1 Expert Consensus on the Main Components of the PInTar Model

No.	Main Component	Defuzzification Value	Threshold Value (d)	Expert Consensus (%)	Decision
1	Learner Analysis	0.938	0.071	92	Accepted
2	Instructional Objectives	0.967	0.000	100	Accepted
3	Selection of Methods, Media and Teaching Aids	0.951	0.040	100	Accepted
4	Utilisation of Media and Teaching Aids	0.931	0.082	92	Accepted
5	Active Student Engagement	0.951	0.040	100	Accepted
6	Integrated Assessment	0.946	0.056	92	Accepted

Table 1 presents the results of the expert validation for the six proposed components. The findings indicate that all components satisfied the established FDM acceptance criteria and were therefore retained in the final structure of the PInTar Model. The threshold values ranged from 0.000 to 0.082, indicating a high degree of consistency in expert judgements. Similarly, the percentage of expert consensus ranged from 92% to 100%, exceeding the minimum requirement of 75%, while all defuzzification values were substantially higher than the acceptance value of 0.50. Among the six components, *Instructional Objectives* recorded the highest defuzzification value (0.967),

followed by *Selection of Methods, Media and Teaching Aids* and *Active Student Engagement* (0.951). In contrast, *Utilisation of Media and Teaching Aids* recorded the lowest defuzzification value (0.931), although it remained well above the required acceptance threshold. Overall, the results demonstrate strong expert agreement regarding the relevance and suitability of all six components for technology-integrated Sirah instruction in Malaysian primary schools. The validated components comprise Learner Analysis, Instructional Objectives, Selection of Methods, Media and Teaching Aids, Utilisation of Media and Teaching Aids, Active Student Engagement, and Integrated Assessment. These findings provide empirical support for the inclusion of all six components in the final version of the PInTar Model.

5.2 Validation of the Instructional Elements of the PInTar Model (RQ2)

Research Question 2 (RQ2)

What instructional elements should be retained within each component of the PInTar Model for technology-integrated Sirah instruction in Malaysian primary schools?

To address RQ2, a total of 95 instructional elements identified through the needs analysis, literature review, curriculum analysis, and theoretical synthesis were evaluated by a panel of experts using the Fuzzy Delphi Method (FDM). The evaluation aimed to determine the relevance and suitability of each instructional element for inclusion in the final version of the PInTar Model. Consistent with established FDM procedures, elements were accepted if they achieved a threshold value (d) of ≤ 0.20 , expert consensus of at least 75%, and a defuzzification value exceeding 0.50 (Ramlan Mustapha & Ghazali Darussalam, 2018; Mustaffa & Hussin, 2022; Ridhuan et al., 2023). The validated instructional elements covered multiple dimensions of technology-integrated Sirah instruction, including learner characteristics, instructional objectives, teaching methods, digital media, teaching aids, technology-supported learning activities, student engagement strategies, and assessment practices. Examples of validated elements included analysing students' digital readiness and prior Sirah knowledge, formulating measurable instructional objectives, employing technology-supported instructional methods such as storytelling and gamification, selecting appropriate digital media and teaching aids, facilitating active learner participation through interactive activities, and implementing both formative and summative assessment strategies.

Table 2 Summary of Accepted Instructional Elements by Component of the PInTar Model

To determine which instructional elements should be retained within the PInTar Model, a total of 95 proposed elements were evaluated by the expert panel using the Fuzzy Delphi Method. The accepted elements were distributed across nine sub-components representing the six main components of the model. Table 2 presents the summary of instructional elements that satisfied all FDM acceptance criteria and were retained in the final model structure.

Main Component	Subcomponent	Number of Accepted Elements
Learner Analysis	-	10
Instructional Objectives	-	7
Selection of Methods, Media and Teaching Aids	Selection of Methods	12
	Selection of Media	11
	Selection of Teaching Aids	11
Utilisation of Media and Teaching Aids	-	13
Active Student Engagement	-	14
Integrated Assessment	Formative Assessment	6
	Summative Assessment	7
Total		91

The findings revealed that 91 of the 95 proposed instructional elements satisfied all FDM acceptance criteria and were therefore retained in the final structure of the PInTar Model. This represents a retention rate of 95.8%, indicating a high level of expert consensus regarding the relevance, suitability, and practical applicability of the proposed instructional elements for technology-integrated Sirah instruction in Malaysian primary schools. The high retention rate further suggests that the elements developed through the integration of empirical findings, curriculum requirements, and theoretical foundations were largely consistent with expert expectations and contemporary instructional needs. Among the validated categories, Active Student Engagement recorded the highest number of accepted elements ($n = 14$), followed by Utilisation of Media and Teaching Aids ($n = 13$) and Selection of Methods ($n = 12$). These findings indicate that experts placed considerable emphasis on learner-centred instructional practices and meaningful technology utilisation as essential components of effective Sirah instruction. The substantial number of accepted elements relating to engagement, instructional methods, and

technology-supported learning activities suggests that technology integration should function not merely as a mechanism for content delivery but also as a means of promoting active participation, interaction, collaboration, and reflective learning experiences.

REPRESENTATIVE VALIDATED INSTRUCTIONAL ELEMENTS ACROSS COMPONENTS

Table 3 Representative Examples of Validated Instructional Elements Across Components. As the final model comprises 91 validated instructional elements, presenting every element individually would exceed the scope of a journal article. Therefore, Table 3 provides representative examples of validated elements retained within each component to illustrate the breadth and nature of the instructional framework.

Component	Validated Instructional Elements
Learner Analysis	Assess students' ability to use technology independently; identify students' readiness to use digital devices; evaluate students' basic digital application skills; identify dominant learning styles; determine students' attitudes towards technology-integrated Sirah learning; assess access to internet connectivity and digital devices; monitor students' technology usage patterns; collaborate with parents to support digital learning.
Instructional Objectives	Foster students' appreciation of the exemplary character of Prophet Muhammad (PBUH); identify significant events in the Prophet's biography (Sirah); promote the application of Sirah values in daily life; develop leadership qualities based on the Prophet and his companions; cultivate cooperation and brotherhood; encourage effective communication based on prophetic practices; internalise lessons from the Sirah to strengthen adherence to the Sunnah.
Selection of Methods	Storytelling; information-seeking discovery learning; gamification; digital quizzes; role play; video-based learning; brainstorming; collaborative learning; project-based learning; question-and-answer technique; problem-based learning; simulation.
Selection of Media	Infographics; animated videos; presentation applications; mobile learning applications; interactive digital games; augmented reality resources; audiovisual materials; YouTube/YouTube Kids content; visual communication design applications; geospatial applications; educational television programmes.
Selection of Teaching Aids	Artificial Intelligence (AI) tools; digital quiz applications; digital flashcards; computers, laptops and tablets; digital textbooks; digital projectors; interactive smartboards; digital display screens; audio systems; Learning Management Systems (LMS); microphones.
Utilisation of Media and Teaching Aids	Use gamified learning activities; implement interactive learning platforms (e.g., Kahoot!, Quizizz); employ digital infographics to reinforce Sirah values; utilise digital textbooks as reference materials; integrate interactive videos; use geospatial technologies to visualise historical locations; employ digital flashcards; facilitate collaborative activities through smartboards; use multimedia presentations; integrate augmented reality experiences; assign technology-supported projects through LMS platforms.
Active Student Engagement	Participate in digital Sirah quizzes; produce reflective responses after viewing animated Sirah videos; explore and present historical locations using digital maps; create digital infographics; engage in collaborative smartboard activities; participate in digital learning games; perform role-play activities using interactive videos; collaborate on LMS-based projects; use digital flashcards for revision; complete multimedia-based learning activities; explore Sirah content through augmented reality.
Formative Assessment	Participate in Sirah-related digital games and reflective discussions; complete self-assessment questionnaires through Google Classroom; undertake interactive mobile quizzes; explain Sirah events using digital flashcards; engage in multimedia-supported discussions; provide feedback following animated Sirah video activities.
Summative Assessment	Written examinations; interactive digital storytelling tasks; technology-supported classroom presentations; learning portfolio development; audiovisual Sirah presentations; short academic writing tasks; technology-based final projects.

REJECTED ELEMENTS

Although most elements were accepted, four elements failed to satisfy one or more of the established FDM acceptance criteria and were therefore excluded from the final model structure.

Table 4 Summary of Rejected Instructional Elements

Although the majority of the proposed elements were accepted, a small number failed to satisfy one or more of the established FDM acceptance criteria. Table 4 summarises the distribution of instructional elements that were excluded from the final version of the PInTar Model.

Component	Number of Rejected Elements
Learner Analysis	2
Instructional Objectives	1
Formative Assessment	1
Total	4

The exclusion of these elements reflects the effectiveness of the Fuzzy Delphi Method as a systematic mechanism for refining educational models through expert consensus. Elements that failed to achieve the required level of agreement were considered less relevant or less suitable for the intended instructional context. Consequently, their removal strengthened the overall content validity of the model by ensuring that only elements receiving strong expert endorsement were retained.

Table 5 Final Distribution of Validated Instructional Elements in the PInTar Model

Following the validation process, the accepted instructional elements were reorganised according to the six main components of the PInTar Model. Table 5 presents the final distribution of validated elements that constitute the completed model structure.

Main Component	Final Number of Elements
Learner Analysis	10
Instructional Objectives	7
Selection of Methods, Media and Teaching Aids	34
Utilisation of Media and Teaching Aids	13
Active Student Engagement	14
Integrated Assessment	13
Total Elements	91

Following the validation process, the final structure of the PInTar Model comprised six validated components and 91 instructional elements. The largest concentration of validated elements was found within the component of Selection of Methods, Media and Teaching Aids ($n = 34$), followed by Active Student Engagement ($n = 14$), Utilisation of Media and Teaching Aids ($n = 13$), and Integrated Assessment ($n = 13$). This distribution demonstrates that the model provides a balanced instructional framework encompassing learner analysis, instructional planning, technology integration, learner engagement, and assessment practices. The validated elements collectively formed the final version of the PInTar Model and subsequently served as the foundation for the usability evaluation phase of the Design and Development Research (DDR) process.



6. DISCUSSION

The present study sought to develop and validate the PInTar Model as a technology-integrated instructional framework for Sirah education in Malaysian primary schools. The findings provide strong empirical evidence supporting the validity of the proposed model, as all six components and 91 instructional elements achieved the established acceptance criteria through the Fuzzy Delphi Method. These findings suggest that effective technology-integrated Sirah instruction requires a comprehensive instructional framework that systematically aligns pedagogical planning, technological integration, learner engagement, and assessment practices within a coherent teaching and learning process. The validation of the six core components demonstrates that technology integration in Islamic Education should not be viewed merely as the adoption of digital tools, but rather as a pedagogically driven process that supports meaningful learning experiences. The acceptance of components such as Learner Analysis, Instructional Objectives, Selection of Methods, Media and Teaching Aids, Utilisation of Media and Teaching Aids, Active Student Engagement, and Integrated Assessment reflects expert consensus that successful technology integration requires careful alignment between learner characteristics, curriculum goals, instructional strategies, digital resources, and evaluation processes. This finding reinforces the proposition of the ASSURE Model that technology-enhanced instruction should be systematically designed to ensure instructional coherence and effectiveness (Heinich et al., 2002; Lei, 2024). Furthermore, it supports recent studies indicating that technology integration yields meaningful educational outcomes only when pedagogical considerations remain central to instructional planning (Azman et al., 2025; Siyam et al., 2025).

A particularly significant finding is the strong expert endorsement of the Active Student Engagement component, which recorded the highest number of accepted instructional elements. This result reflects a growing recognition that contemporary Sirah instruction should move beyond traditional teacher-centred approaches that emphasise factual memorisation toward more learner-centred pedagogies that encourage active participation, exploration, collaboration, and reflection. Such a shift is consistent with Constructivist Theory, which posits that learners construct knowledge through active interaction with learning experiences and social environments (Fosnot, 2013). Within the context of Sirah education, active engagement enables students not only to understand historical events but also to analyse their significance, derive moral lessons, and internalise Islamic values for application in daily life. Consequently, the findings suggest that meaningful Sirah learning is enhanced when students become active participants in the learning process rather than passive recipients of information. The strong validation of elements related to the utilisation of media and teaching aids further highlights the increasing importance of digital pedagogy within Islamic Education. Experts recognised the value of integrating multimedia applications, digital storytelling, educational games, online learning platforms, and interactive learning resources to support instructional objectives and enhance learner engagement. This finding reflects broader developments in twenty-first-century education, where digital technologies are increasingly viewed as tools for promoting collaboration, creativity, communication, and critical thinking rather than simply facilitating content delivery. The acceptance of these elements suggests that technology-enhanced Sirah instruction should provide learners with opportunities

to interact with content in multiple formats, thereby enriching understanding and increasing motivation. This finding is consistent with contemporary perspectives on digital learning and supports the Technological Pedagogical Content Knowledge (TPACK) framework, which emphasises the integration of technological, pedagogical, and content knowledge in effective instructional practice (Mishra & Koehler, 2006; Phillips et al., 2025).

Another important implication of the findings relates to the integration of multiple theoretical and conceptual foundations in the development of the PInTar Model. Unlike previous studies that often focus on a single instructional model or technology integration framework, the present study synthesised Constructivist Theory, the ASSURE Model, the ICT-Enhanced Teacher Development Model, TPACK, SAMR, and UTAUT into a unified instructional framework. This integration enabled the model to address multiple dimensions of technology-integrated instruction, including learner needs, instructional design, technological competence, technology transformation, and technology acceptance. Consequently, the PInTar Model extends existing literature by offering a holistic framework that combines pedagogical, technological, and content-related considerations within a single instructional model specifically designed for Sirah education. This multidimensional integration represents a significant contribution to the field of Islamic Education, where empirically validated technology-integrated instructional models remain limited. The findings also demonstrate the effectiveness of the Fuzzy Delphi Method as a rigorous validation approach in educational model development. The retention of 91 instructional elements and the exclusion of four elements that failed to satisfy the established acceptance criteria indicate that the model underwent a systematic refinement process based on expert consensus. This filtering mechanism enhanced the content validity of the model by ensuring that only elements considered relevant, practical, and contextually appropriate were retained. The findings therefore support previous studies that highlight the value of FDM in strengthening the validity and credibility of educational innovations through structured expert evaluation (Ciptono et al., 2019; Mustaffa & Hussin, 2022).

From a practical perspective, the validated PInTar Model offers a structured instructional guide that can assist teachers in planning, implementing, and evaluating technology-integrated Sirah lessons. The model provides a systematic framework for selecting appropriate instructional strategies, digital resources, learning activities, and assessment methods that align with curriculum objectives and learner needs. This contribution is particularly relevant within the context of Malaysia's Digital Education Policy, which emphasises the integration of digital technologies into teaching and learning across all educational disciplines. Therefore, the PInTar Model has the potential to support teachers, curriculum developers, teacher educators, and policymakers in enhancing the quality and effectiveness of technology-enhanced Islamic Education. Overall, the findings indicate that the PInTar Model represents a valid, comprehensive, and contextually relevant instructional framework for technology-integrated Sirah education in Malaysian primary schools. By integrating pedagogical principles, technological considerations, learner engagement strategies, and assessment practices within a coherent structure, the model contributes both theoretically and practically to the advancement of Islamic Education in the digital era.

7. CONCLUSION

This study developed and validated the PInTar Model as a technology-integrated instructional framework for Sirah education in Malaysian primary schools. Guided by the Design and Development Research (DDR) approach and validated through the Fuzzy Delphi Method (FDM), the study successfully established six main components and 91 instructional elements that collectively support the planning, implementation, and assessment of technology-integrated Sirah instruction. The findings demonstrated strong expert consensus regarding the relevance and suitability of the proposed components and instructional elements. The validated model integrates learner analysis, instructional planning, technology selection, active learner engagement, and assessment practices within a coherent instructional structure. As such, the PInTar Model offers a systematic framework that can support meaningful technology integration while addressing the instructional needs of contemporary Sirah education. The study contributes to the growing body of knowledge on technology integration in Islamic Education by providing an empirically validated instructional model specifically designed for primary school Sirah instruction. The model may serve as a practical guide for teachers, curriculum developers, and educational stakeholders seeking to enhance the effectiveness of technology-enhanced learning within Islamic Education.

Limitations and Future Studies

Several limitations should be acknowledged. First, the study focused exclusively on the design and development phase of the Design and Development Research (DDR) approach. Although the model was validated through expert consensus using the Fuzzy Delphi Method, the findings primarily reflect expert perspectives rather than actual classroom implementation. Second, the expert panel was limited to individuals with expertise in Islamic Education, Sirah Education, Educational Technology, Curriculum and Instruction, and related fields within the Malaysian educational context. Therefore, the generalisability of the findings to other educational settings should be interpreted with caution. Future studies should examine the effectiveness of the PInTar Model through

classroom implementation involving primary school teachers and students. Empirical investigations may also explore the impact of the model on student engagement, learning outcomes, digital literacy, and the development of higher-order thinking skills. In addition, future research could evaluate the applicability of the model in other areas of Islamic Education and across different educational contexts.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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