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# NURRA CHATBOT FOR ISLAMIC EDUCATION AMONG GENERATION Z

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**Abstract**

This study develops and validates the NURRA Islamic AI Assistant as a digital learning tool designed to support Islamic education for Generation Z. The research responds to the increasing reliance of students on digital platforms for religious learning and the associated risks of misinformation in unguided environments. A development and validation approach was employed using a Design and Development Research model combined with an agile iterative cycle. The prototype integrates curated Islamic sources, including Waqfeya and Maktabah Syamilah, and applies content filtering and ethical safeguards to maintain theological accuracy and responsible communication. Six experts in Islamic education, educational technology, ethics, linguistics, media learning, and computer science evaluated the system using a five-point Likert scale instrument. Data were analysed descriptively and showed that the prototype achieved a very valid classification across content accuracy, ethical compliance, usability, and practical functionality. System testing further demonstrated that the chatbot is capable of generating relevant responses, supporting learners with diverse types of questions, and providing transparent fallback responses when source-based retrieval is unavailable. The findings indicate that NURRA can function as a complementary learning tool that strengthens access to authentic Islamic knowledge and aligns with the digital characteristics of Generation Z learners. The validated model highlights the feasibility of integrating AI into Islamic education in a responsible manner and offers a foundation for classroom implementation, future system refinement, and broader user trials.

## INTRODUCTION

The rapid expansion of Artificial Intelligence (AI) technologies has transformed how younger generations access information and engage with learning across disciplines. For Generation Z (Gen Z), digital platforms and automated information tools have increasingly become their first point of reference when seeking knowledge, including on topics related to Islamic education. This preference aligns with broader global shifts in youth learning behaviour, where mobile browsing, conversational agents, and algorithm assisted content discovery are replacing traditional consultation models such as textbook reading or guidance from teachers and religious instructors (Chan & Lee, 2023; Chardonnens, 2025). Such behavioural transitions underscore a pressing need for education systems, including Islamic institutions, to develop instructional mechanisms that respond to technological realities.

While these developments present opportunities for accessibility and engagement, they also introduce critical risks. The unregulated nature of online Islamic content has been widely documented, with studies highlighting that young learners frequently encounter decontextualized interpretations, contradictory material, and religious misinformation, particularly when relying on social media feeds or general purpose search engines (Hidayatulah et al., 2025; Putra & Ayyaisy, 2025). This dynamic is compounded by the

increasing availability of large language models, which, although sophisticated, are not inherently aligned with authoritative Islamic sources and may generate confident but inaccurate theological statements (Mashilo & Shekgola, 2024; UNESCO, 2024). Consequently, the challenge is no longer access to information but ensuring epistemic reliability and doctrinal responsibility.

Islamic education researchers have called for structured innovations capable of mediating digital engagement without compromising the integrity of religious understanding (Hanif, 2025; Norman et al., 2025). Existing chatbot implementations in education have demonstrated benefits for students' motivation, inquiry support, and personalized guidance (Huang & Tseng, 2025; Labadze et al., 2023a). However, most studies document the deployment in secular subjects or general tutoring systems. Nevertheless, existing studies have not sufficiently addressed the development, validation, and evaluation of domain specific Islamic chatbots grounded in curated scholarly references and reviewed by experts, indicating a critical gap in the literature.

Responding to these needs, the present study develops NURRA, an Islamic AI chatbot designed to support student learning while ensuring alignment with authenticated sources such as Qur'anic exegesis, verified hadith collections, and classical scholarly texts. The system applies a structured development model informed by Design and Development Research and iterative refinement cycles. Unlike generic tools, NURRA prioritizes contextual accuracy, ethics of communication, and Sharia suitability, reflecting expectations in Islamic pedagogy that knowledge must be both correct and conveyed responsibly. The study evaluates the prototype using expert review to determine its feasibility, ethical safety, and practical usability for Gen Z learners, thereby contributing empirical evidence to an emerging scholarly discourse on AI in Islamic education.

## METHODS

This study employed the Design and Development Research (DDR) approach to guide the structured creation of NURRA, an AI based conversational assistant designed to support Islamic learning among Gen Z. Design and Development Research provides a systematic pathway beginning with problem exploration followed by the iterative development and refinement of a functional prototype (Bera et al., 2023; Jaya et al., 2021; Tinoca et al., 2022). This approach was selected because the development of educational technology requires continuous alignment between pedagogical intentions, technical execution, and user needs. DDR also enables evaluation to take place at multiple points throughout the process rather than being limited to a final summative assessment.

The first phase involved identifying the learning challenges experienced by students and educators related to accessing reliable Islamic references. Informal interviews and field observations highlighted two recurring concerns. The first was that students frequently use general purpose search engines and unrestricted AI chatbots without the ability to differentiate between verified Islamic sources and opinion based digital content. The second was that educators in Islamic Religious Education reported limitations in providing rapid feedback to students outside of class time due to tight schedules, multiple teaching assignments, and administrative duties. These findings aligned with research noting that misinformation and fragmented learning resources represent barriers to developing informed religious literacy among young people (UNESCO, 2021).

Jurnal Educative: Journal of Educational Studies
Vol. 10. No. 2 Edition December 2025

Based on these observations and literatures related to Islamic education and AI assisted learning, a conceptual framework was drafted articulating the objectives, users, and operational principles of the NURRA prototype. The chatbot was designed to respond to student queries by assisting with comprehension, reference lookup, and navigation of Islamic concepts while maintaining boundaries consistent with religious ethics (Hidayatulah et al., 2025; Norman et al., 2025). The knowledge foundation was built using digital texts accessible from *Waqfeya and Maktabah Syamilah*, both widely recognized repositories for classical and modern Islamic scholarship. These corpora were selected because they provided vetted material that had undergone academic cataloguing and widespread circulation among Islamic institutions.

During this stage, a high-level system map was constructed to determine the relationship between user interaction, backend functions, and reference validation. The design identified the minimum requirements for input processing, retrieval logic, and output formatting. The information flow stages consisting of query reception, semantic interpretation, retrieval, comparison with textual sources, and reformulation of an answer are summarized in Figure 1.

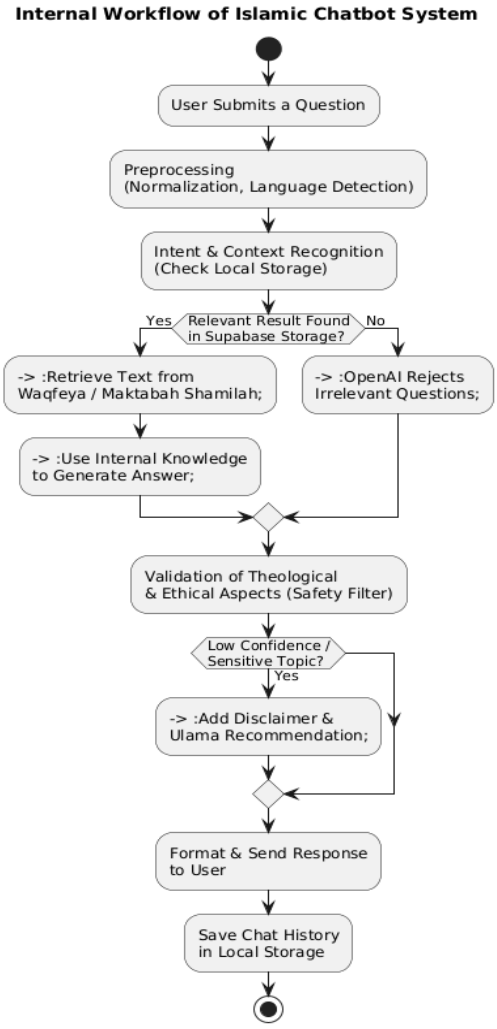


**Figure 1.** System architecture and response workflow of the NURRA Islamic AI Assistant.

Prototype development adopted an agile iterative methodology that allowed structured experimentation and revision. Agile was chosen because the development of educational AI tools requires continuous micro adjustment in both technical and content components. Functionality was divided into staged development cycles addressing core processing capability, user interface layout, knowledge linking, and filtering for potentially inappropriate responses. Iterative development supports progressive problem resolution based on intermediate testing outcomes (Bera et al., 2023; Julianto et al., 2025).

The back-end model utilized the OpenAI programming interface customized with internal rule based logic that ensured every generated output was compared against reference material before being presented to users. Language generation was configured to prioritize clarity of explanation, avoidance of speculative interpretation, and polite tone consistent with the norms of Islamic instruction. A fallback mechanism was included to guide learners to seek direct guidance from teachers when encountering questions identified as curricular assessment items, contested viewpoints, or topics requiring real human discretion.

User interface construction prioritized readability, mobile accessibility, and seamless interaction for secondary and tertiary students who primarily use smartphones. Several rounds of interface restructuring were conducted based on internal student testing simulated by the research team. Decisions such as font size, placement of the query box, and colour presentation were adjusted to improve visibility and user comfort.

Before involving external evaluators, repeated cycles of internal testing were performed by the research team across a diverse set of question types. This included basic definitional queries, thematic interpretive questions, historical dates, biographies of Islamic figures, and short scenario-based applications. Internal testing aimed to detect system weaknesses that might not be visible in conceptual planning. The internal tests resulted in adjustments in knowledge tagging, refinement of topic filters, and restructuring of metadata categories to better align themes across the digital corpus.

Logging and trace outputs were reviewed to trace how the system selected its references and whether the most contextually relevant sources were being cited. This phase was essential in ensuring the system presented consistent patterns of interpretation instead of merely producing fluent answers without grounding in authoritative references. The testing also allowed identification of ambiguous prompt patterns common among Gen Z users, including slang terms, colloquial phrasing, and incomplete sentence entry. Adjustments were implemented to expand the model's ability to interpret informal phrasing without altering final meaning.

Validation involved six experts selected purposively to capture broad representation across Islamic education roles. The validators included university lecturers in Islamic Religious Education, Islamic studies specialists, and a senior Islamic education teacher from a state *madrasah*. Each validator was required to meet inclusion criteria consisting of academic qualification in Islamic studies, active teaching or research responsibilities in Islamic education, and familiarity with contemporary challenges in student digital learning. This sampling approach aligns with DDR recommendations where expert judgment ensures that prototype outputs are substantively aligned with disciplinary expectations (Safitri, 2024; Salim & Habibi, 2025).

A structured questionnaire using a Likert five-point scale assessed four dimensions: content accuracy, ethical and *Sharia* consistency, user experience suitability, and clarity of explanatory language. The five-point scale was selected because it reduces decision fatigue

Jurnal Educative: Journal of Educational Studies
Vol. 10. No. 2 Edition December 2025

for evaluators while offering enough discrimination for identifying strengths and weaknesses in early stage prototypes (Kusmaryono et al., 2022; Ling & Jan, 2025; Mohd Rokeman, 2024). The dimensions and their evaluative focus are summarized in Table 1.

**Table 1.** Research questions and evaluation dimensions used in the validation process.

| No | Research Question | Evaluation Focus / Quality Dimension |
|---|---|---|
| **1** | Does the chatbot provide Islamic information based on authentic sources such as the Qur'an and Hadith? | Authenticity and validity of Islamic knowledge sources |
| **2** | Does the chatbot present relevant Qur'anic or Hadith references in its responses? | Relevance of content to authoritative references |
| **3** | Is the chatbot language consistent with Islamic ethics (polite, respectful, and non-offensive)? | Compliance with Islamic communication ethics |
| **4** | Does the chatbot provide Islamic guidance aligned with Sharia principles? | Conformity with Sharia values and *adab da'wah* |
| **5** | Is the chatbot easy to use and understandable for general users? | Usability and accessibility for Generation Z |
| **6** | Does the chatbot demonstrate accurate and context-appropriate responses? | Precision and consistency of answers |

Qualitative comments were also solicited to accompany the numerical scoring. These comments provided richer insight into areas requiring refinement, for example, clarification of terminology for high school learners, suggestions on adding disclaimers for contested interpretations, and recommendations on including cross references for hadith texts.

Following validation, revisions were implemented on both the linguistic layer and the logic structure. Changes included clarifying system responses that previously assumed prior knowledge, adding cross reference reminders for Qur'an and hadith citations, and adjusting default responses when uncertainty was detected. Revisions also incorporated suggestions to expand ethical guardrails when responding to questions involving *Fiqh* diversity. This iterative correction process reflects the DDR cycle in which evaluation feedback becomes a direct input into product improvement (Hanif, 2025; Okonkwo & Ade-Ibijola, 2021; Velarde-Camaqui et al., 2024).

The final stage involved summarizing validation scores, interpreting expert commentary, and documenting how the iterative cycle shaped development outcomes. The decision to conclude evaluation at the expert validation stage reflects the project's position as a prototype level educational innovation. Early stage projects typically prioritize confirmatory validation before committing to classroom piloting or public release (Labadze et al., 2023b). The entire methodological cycle is diagrammatically presented in Figure 2.

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Jurnal Educative: Journal of Educational Studies
Vol. 10. No. 2 Edition December 2025

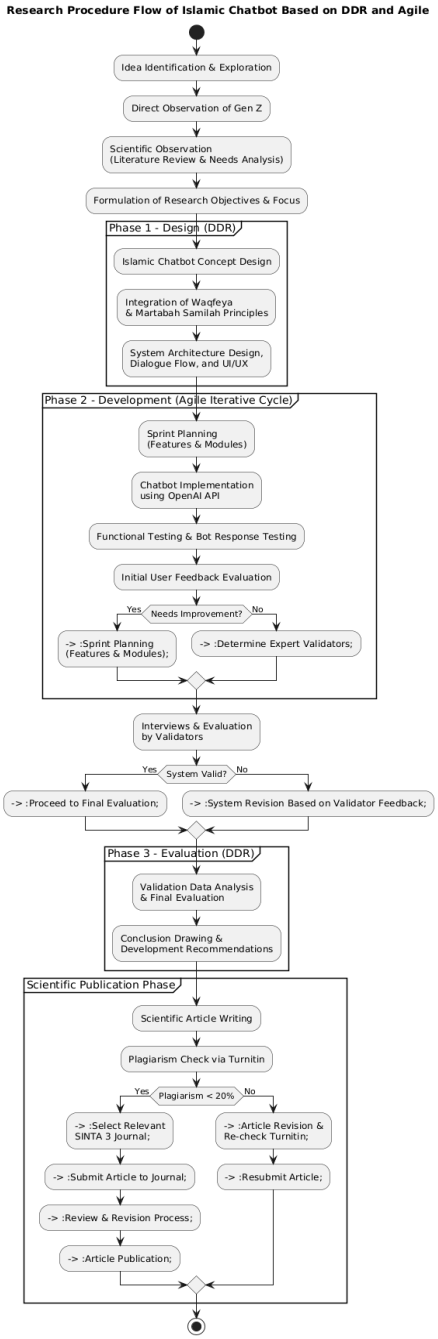


**Figure 2.** Design and Development Research (DDR) and Agile iterative cycles applied during prototype development and validation.

## RESULT AND DISCUSSION

### *RESULT*

The expert validation process generated comprehensive quantitative and qualitative data on the feasibility and suitability of the NURRA prototype. Scores were obtained from six specialist evaluators and analyzed across four dimensions reflecting the research objectives: content validity, ethical and Sharia compliance, usability for learners, and accuracy of responses. Assessments were recorded using a five-point Likert scale with defined criteria for each rating category. Mean scores, classification boundaries, and dimension ratings are summarized in Table 2.

Jurnal Educative: Journal of Educational Studies
Vol. 10. No. 2 Edition December 2025

**Table 2.** Mean validation scores across four evaluation dimensions.

| Validator | Validation Focus | Expert Field | Validator Feedback Summary |
|---|---|---|---|
| **Validator 1** | Content Accuracy | Islamic Education | The chatbot material is accurate and aligned with Islamic teachings. A disclaimer feature was added to mark AI-generated responses, ensuring transparency and improving content reliability. |
| **Validator 2** | Presentation | Educational Technology | Interface is clear and consistent; recommend simplifying main layout. |
| **Validator 3** | Language Use | Linguistics | Language is polite and appropriate; ensure Arabic terms are italicized. |
| **Validator 4** | Practicality | Learning Media | Easy to operate; suggest adding an introductory guide. |
| **Validator 5** | Islamic Ethics | Islamic Studies | The system maintains polite interaction; recommend caution for sensitive topics. |
| **Validator 6** | Integration | Computer Science | System runs stably; suggest improving response speed. |

**Descriptive Results Per Dimension**

The analysis produced an overall mean score in the range of 4.20 to 5.00, representing a classification of very valid within the applied interpretation thresholds. Content validity yielded the highest scores across evaluators, with values frequently exceeding 4.60. These scores indicate that the system's responses consistently reflected information grounded in established Islamic sources and aligned with the doctrinal expectations of the evaluators. The distribution pattern for this dimension reflected narrow score variation across validators, indicating a high level of consensus.

The ethical and Sharia compliance dimension achieved mean values above 4.40. Scores in this category highlighted positive perceptions of the system's safeguarding mechanisms, including message neutrality, tone, and the presence of disclaimers. Individual validator scores showed slightly wider variation than those in the content dimension, though still within the upper rating categories. This spread suggests that evaluator emphasis may differ on tone, phrasing, or boundary setting but that the overall protection mechanisms were deemed adequate.

The usability dimension generated ratings between 4.30 and 4.55. These results relate to evaluator judgment on layout clarity, input responsiveness, and logical flow from question entry to system output. Validators noted positive impressions of readability and message clarity within the prototype interface, and quantitative scores indicate that the interface structure was perceived as accessible for student users. The mean distribution for this dimension reflects modest variation across evaluator experience backgrounds, with teaching specialists rating interface usability marginally higher than academic reviewers.

Accuracy and relevance of responses yielded the lowest scores among the four dimensions; however, all values exceeded 4.25 and remained within the very valid category. Feedback in this dimension generally related to the precision of phrasing and the breadth of explanation relative to learner background knowledge. Variability across expert ratings was highest in this category, reflecting professional expectations regarding content depth and

interpretive assumptions. Despite this variation, evaluators agreed the prototype remained broadly reliable, though refinements were suggested for selected thematic areas.

**Composite Validation Outcome**

The aggregated scores across dimensions confirm that the NURRA prototype fulfils the criteria for feasibility and domain suitability in the early-stage of implementation. The numerical means indicate consistent performance above the minimum threshold for validity classification. The overall rating pattern demonstrates that the system is sufficiently robust to support exploratory learning and reference checking for Generation Z users within Islamic education contexts.

**Validator Commentary Summary**

In addition to the numerical ratings, evaluators provided written comments identifying strengths and areas for improvement. The dominant strengths cited included clarity of language, consistency in referencing authoritative sources, and structural safeguards against speculative interpretation. Suggestions for improvement included keyword expansion for topic recognition, simplified language for complex theological concepts, and minor interface adjustments to streamline multi turn dialogues.

**Supporting Figures**

A visual representation of the working interface corresponding to the validated prototype is provided in Figure 3.

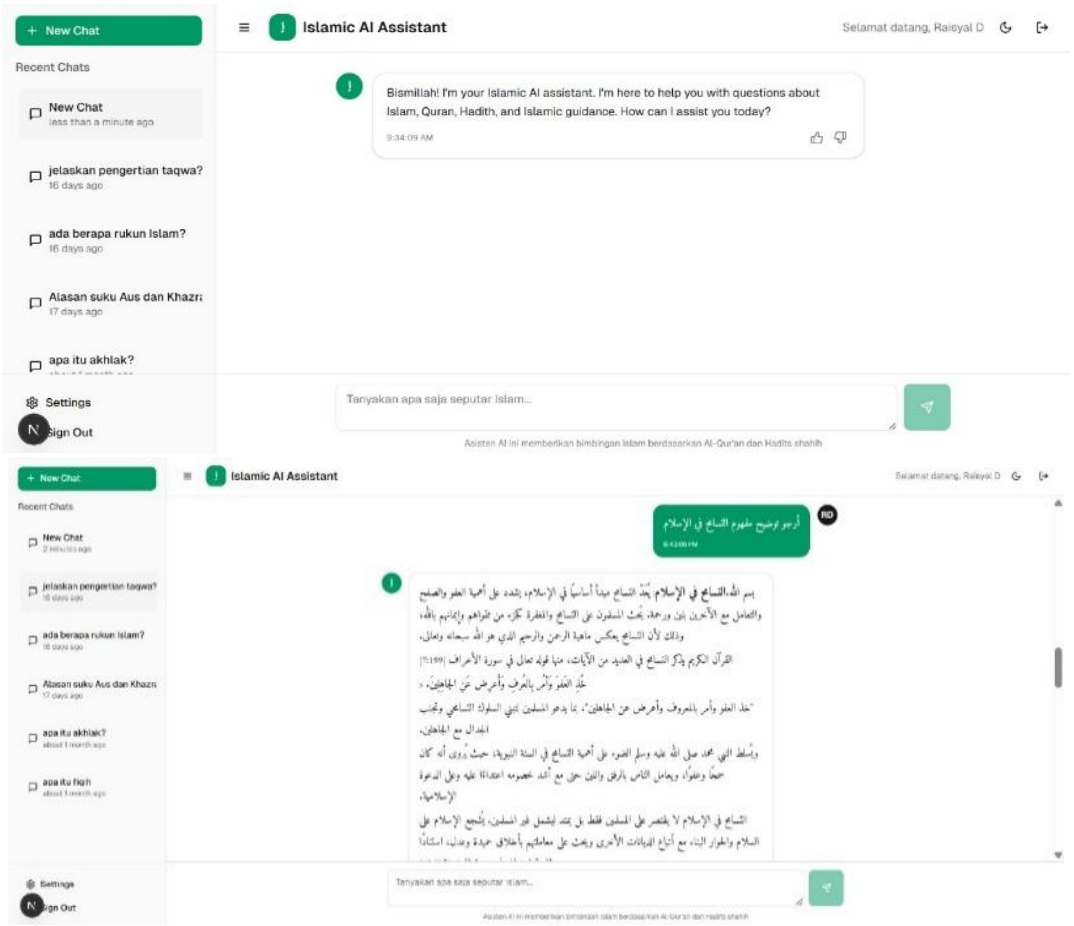


**Figure 3**. User interface of the NURRA Islamic AI Assistant prototype.

Jurnal Educative: Journal of Educational Studies
Vol. 10. No. 2 Edition December 2025

## DISCUSSION

### *Accuracy and Authoritative Sources*

The validation findings demonstrate that NURRA effectively delivers responses grounded in authenticated Islamic sources, directly addressing Research Question 1 concerning content reliability. This outcome supports the proposition that structured resource based AI models are capable of providing accurate subject specific information, which has also been identified in recent implementations of domain oriented educational assistive systems (Julianto et al., 2025; Salim & Habibi, 2025; UNESCO, 2024). The emphasis on authoritative references aligns with calls in Islamic education to ensure the preservation of doctrinal clarity when incorporating digital instructional media (Azhari et al., 2025; Norman et al., 2025). Collectively, these findings expand validation-based evidence in a literature landscape that has often relied on conceptual predictions rather than prototypical testing.

### *Ethics, Trust, and Sharia Alignment*

Ethical and Sharia validation scores confirm that the filtering mechanism successfully safeguarded the chatbot's outputs from speculative or controversial positions, thereby satisfying Research Question 2. This result is consistent with the broader argument that AI enabled religious tools must prioritize user protection and pedagogical accountability, particularly in contexts where learners may accept generated outputs without critical verification (Hidayatulah et al., 2025; Sadatul Kahfi et al., 2025). Scholars have warned that digital tools which lack ethical constraints may inadvertently promote misinterpretation or contextual distortion, creating value conflicts in faith based learning systems (Mashilo & Shekgola, 2024; Robinson-Pant & Singal, 2020). The findings therefore support the position that structural safeguards are essential in systems designed for Islamic instructional use.

### *Usability and Gen Z Engagement*

The high usability ratings indicate that NURRA responds effectively to interaction preferences associated with Gen Z learners and therefore addresses Research Question 3. This confirms claims in recent studies that conversational interfaces can enhance learner participation by aligning with students' digital routines and communication styles (Rahman et al., 2025; Safitri, 2024; Velarde-Camaqui et al., 2024). Furthermore, research demonstrates that accessible technology adoption can enhance motivation, familiarity, and learner autonomy, particularly when traditional resources feel inaccessible or culturally distant (Chardonnens, 2025; Ling & Jan, 2025; Zulfikasari et al., 2025). The present findings contribute empirical support for theories that position AI as a bridge between formal religious instruction and digital information seeking behavior.

### *Implications and Contributions to Theory and Practice*

This study contributes to the theoretical development of AI supported Islamic education by demonstrating that a validated, source based chatbot can operate as a controlled instructional partner rather than an open-ended generator. This complements ongoing discussions that emphasize the need to balance innovation and epistemic integrity in the digital transformation of Islamic learning ecosystems (Hanif, 2025; Murniasih et al., 2024). The application of DDR combined with agile refinement further contributes a replicable methodological pathway, affirming findings from educational technology frameworks that advocate iterative cycles for design relevance and sustainability (Bera et al., 2023; Jaya et al., 2021; Robinson-Pant & Singal, 2020; Tinoca et al., 2022). Practically, the

results suggest potential benefits for blended instructional contexts, distance learning programs, and student initiated inquiry where misinformation risks are well documented (Kuhail et al., 2023; Labadze et al., 2023b).

While the implications of this study indicate promising implementation potential, these conclusions remain bounded by the scope of expert-based validation. Large scale student testing, extended deployment periods, and measurement of long-term behavioural outcomes have not yet been conducted. Prior studies in educational transformation recommend iterative role out and staged evaluation before full institutional adoption (UNESCO, 2024; Velarde-Camaqui et al., 2024). Future investigations should therefore examine performance stability, learner reception patterns, and integration with formal curricula to complement insights produced from this initial validation phase.

## CONCLUSION

This study developed and validated NURRA, an Islamic education chatbot designed as a trusted and authoritative learning companion for Gen Z students and grounded in the principles of authoritative sourcing and artificial intelligence alignment with ethical and Sharia expectations. Using a Design and Development Research model supported by Agile iterations, the work successfully translated conceptual principles into a functioning prototype that integrates curated Islamic references, filters misinformation, and delivers structured responses tailored to educational needs. The expert validation process confirmed that the developed system meets feasibility standards across four core dimensions, namely content accuracy, ethical compliance, usability, and relevance to learner context.

The results provide compelling evidence that AI systems can be designed to align with normative religious expectations when the development process centres on authenticated references, controlled knowledge boundaries, and systematic human oversight during design. The consistently high scores across validation dimensions affirm the feasibility of incorporating domain expertise into a structured technical design pipeline and strengthen confidence that faith-aligned educational AI is both possible and tractable. At a theoretical level, this work contributes to emerging scholarship on the integration of artificial intelligence into Islamic education by demonstrating that Gen Z learning challenges, such as fragmented digital information exposure, can be mitigated through systems engineered around authoritative sourcing and layered interaction safeguards. The study therefore expands current discourse by showing how AI may strengthen rather than fragment religious knowledge ecosystems when designed within epistemic constraints.

Methodologically, this research contributes to the field by providing concrete evidence that the DDR model can effectively guide the end-to-end development of specialised AI learning tools. The operationalisation of the five DDR stages within an Agile cycle illustrates a replicable pathway combining iterative prototyping with expert-driven validation. The quantitative validation supported by qualitative commentary demonstrates that structured expert engagement can improve reliability, minimise conceptual ambiguity, and support responsible AI alignment. As such, the study offers a model for future developers and researchers seeking to embed expert oversight in AI educational innovation, particularly within contexts that require doctrinal or epistemic accuracy.

While the evaluation outcomes affirm the viability of the NURRA prototype, its readiness for large scale deployment remains partial. The validation was performed exclusively by experts, and no field implementation with student users has yet been conducted. Real world

classroom use, usability testing with diverse student profiles, and long form dialog interaction analysis are necessary to confirm learner acceptance, behavioural effects, and learning impact. These limitations ensure that conclusions drawn from this project remain proportionate and grounded in the available evidence. The design therefore represents a critical foundation rather than a completed solution and follow up studies will be required to advance the system beyond controlled evaluation and into authentic educational environments.

Future research directions will focus on three strands. The first involves scaling content coverage across wider domains of Islamic studies while maintaining the same fidelity to authoritative sources. The second requires interface refinement informed by direct student feedback, including support for varied learning styles and adaptive scaffolding. The third involves longitudinal evaluation of learning outcomes to determine whether sustained interaction with NURRA positively influences comprehension, religious literacy, and critical discernment of online sources. These pathways logically extend the current achievement and ensure that the platform continues to evolve in alignment with academic expectations and user needs.

In conclusion, the development and validation of NURRA demonstrate that AI can serve as a structured and reliable educational support tool when informed by authoritative knowledge sources, subjected to systematic methodological design, and evaluated through expert scrutiny. The work offers theoretical and methodological contributions to AI enhanced Islamic education and positions the prototype as a promising foundation for further testing, refinement, and eventual deployment within classrooms and broader youth learning ecosystems.

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**Declarations**

***Author Contribution Statement***

Author 1 conceptualized the research idea, designed the study framework, and collected the data. Author 2 conducted data analysis, provided critical proofreading, and approved the final version of the manuscript.
Author 3 drafted the initial manuscript, refined conceptual elements, and contributed to manuscript finalization and revisions.

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***Data Availability Statement***

The data supporting the findings of this study are stored by the authors and are available upon reasonable request.

***Declaration of Interests Statement***
The authors declare no conflicts of interest, financial or non-financial, and no affiliations with funding institutions, commercial sponsors, or organizational bodies that could influence the research.

***AI Use Statement***
During the preparation of this manuscript, the authors used ChatGPT (OpenAI, GPT-5.1) to support drafting, language refinement, and structural organization of selected sections. All AI-assisted outputs were critically reviewed, edited, and validated by the authors to ensure alignment with study data and cited literature. The authors assume full responsibility for the accuracy, originality, and integrity of the manuscript.

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