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Responding to the Crisis of Religious Literacy among Generation Z in the Era of Algorithmic Islam: Developing a Deep Learning-Based Islamic Education Model

Milana Abdillah Subarkah
Universitas Muhammadiyah Tangerang, Indonesia

Sri Hastuti
Universitas Muhammadiyah Tangerang Indonesia

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Abstract

The expansion of digital technology and algorithm-driven platforms has transformed the ways Generation Z encounters and interprets religious knowledge, creating new challenges for Islamic education. Although digital media broaden access to religious information, they also encourage the spread of fragmented narratives, misinformation, and uncritical patterns of religious learning. This study aims to examine the crisis of religious literacy experienced by Generation Z in the era of algorithmic Islam and to develop a deep learning-based Islamic education model capable of strengthening critical religious literacy. Using an Educational Design Research (EDR) approach, the study was conducted from March to May 2026 in four Islamic educational institutions in Banten Province, Indonesia. Twenty-five participants, including school principals, Islamic Religious Education teachers, and parents, were selected through purposive sampling. Data were collected through semi-structured interviews, classroom observations, focus group discussions, document analysis, expert validation, and limited model implementation. The findings indicate that existing Islamic Religious Education remains predominantly transmission-oriented and has not adequately addressed the epistemological complexities of digitally mediated religious environments. The study subsequently developed the Deep Learning-Based Critical Religious Literacy (DL-CRL) Model, which comprises five interconnected dimensions: critical inquiry, digital religious verification, reflective dialogue, collaborative knowledge construction, and transformative religious engagement. Limited implementation demonstrated improvements in students' ability to evaluate religious information, verify digital sources, and construct evidence-based religious arguments. The proposed model offers an integrative pedagogical framework that connects Islamic educational values, deep learning, and digital religion studies to support religious literacy among Generation Z.

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INTRODUCTION

The development of digital technology has changed the landscape of religious learning in unprecedented ways. For many young Muslims, religious understanding is no longer acquired primarily through mosques, schools, or direct interactions with religious scholars, but through social media feeds, online communities, and algorithmically curated content. As members of Generation Z, today's adolescents are deeply embedded in digital environments where information is produced and disseminated at extraordinary speed (Szymkowiak et al., 2021; Woods et al., 2022). This transformation has expanded opportunities to access diverse religious knowledge while simultaneously raising concerns about the credibility and accuracy of the information encountered (Putra et al., 2024; Sati et al., 2025; Whyte, 2022). Digital platforms increasingly determine which religious messages gain visibility and influence public opinion, often prioritizing popularity over scholarly authority (Andok, 2024; Henry, 2021). Consequently, religious learning is becoming inseparable from technological infrastructures that shape how individuals interpret and internalize Islamic teachings. These developments have stimulated scholarly debates regarding the future direction of Islamic education in contemporary society.

*** Corresponding author:**
Milana Abdillah Subarkah et al, Universitas Muhammadiyah Tangerang, Indonesia
milana.abdillah@umt.ac.id

The increasing dependence on algorithm-driven platforms has given rise to what many scholars describe as algorithmic Islam, a condition in which religious experiences and interpretations are significantly influenced by digital systems and computational logic (Ben Moussa et al., 2024; Umbrello, 2023). Through recommendation algorithms, users are continuously exposed to content aligned with their interests and previous online behavior (Brady et al., 2023; Chen, 2025). Although such personalization enhances user engagement, it may also limit encounters with alternative viewpoints and authoritative sources (Ledwich et al., 2022). Recent studies reveal that Generation Z frequently obtains religious information from short videos, podcasts, influencers, and artificial intelligence–assisted searches rather than from traditional educational institutions (Andok, 2024; Liu et al., 2025). In many cases, the popularity of religious messages is mistakenly equated with their theological validity. As a result, young people often navigate a digital religious environment characterized by fragmented narratives, selective exposure, and competing claims to authority (Choong, 2026; Golan & Don, 2022). This phenomenon illustrates the profound impact of algorithmic systems on contemporary religious life.

The rapid circulation of digital religious content has intensified concerns about the quality of religious literacy among younger generations. Religious literacy involves more than the acquisition of doctrinal knowledge; it encompasses the ability to interpret religious teachings critically, evaluate sources of information, and understand religion within broader social and cultural contexts (Marcus & Ralph, 2021; Saada & Magadlah, 2021; Ubani, 2025). Despite having greater access to information than any previous generation, many young Muslims continue to experience difficulties in distinguishing between verified religious knowledge and misleading online content (Rusli & Nurdin, 2022; Whyte, 2022). The abundance of information available on digital platforms does not automatically foster deeper understanding, as users often engage with religious messages in superficial and fragmented ways (Rhodes, 2022). This condition creates vulnerabilities to misinformation, ideological polarization, and simplistic interpretations of Islamic teachings. In the long term, insufficient religious literacy may weaken students' ability to respond wisely to social and technological changes. Therefore, strengthening critical religious literacy has become an urgent educational priority.

The challenges associated with declining religious literacy have significant implications for Islamic educational institutions. In many schools, religious instruction remains dominated by conventional approaches that emphasize memorization and one-way knowledge transmission (Altinyelken, 2021; Skrefsrud, 2022). Although digital technologies have entered classrooms, pedagogical innovation has not always kept pace with the changing realities of students' lives (McDiarmid & Zhao (赵勇), 2023; Mhlongo et al., 2023). Existing instructional practices often provide limited opportunities for learners to question information, compare diverse perspectives, or engage critically with contemporary issues (Ciampa et al., 2023; Morris, 2025; Omodan, 2025). At the same time, Islamic intellectual traditions have long encouraged reflective inquiry through concepts such as tafakkur, tadabbur, ta'aqqul, and ijtihad. These traditions demonstrate that critical and analytical thinking is deeply rooted in Islamic educational philosophy. Consequently, there is a growing need to develop educational models capable of connecting classical Islamic values with the demands of the digital age.

Scholars from different disciplines have explored the relationship between religion, technology, and youth culture over the last decade. Andok (2024) ,Cheong (2021), and Zaid et al. (2022) argue that digital technologies have transformed religious practices by reshaping the ways in which authority, identity, and community are constructed. Similar findings are reported by Evolvi & Giorda (2021), and Ibrahim (2024), who emphasize that online spaces increasingly influence the formation of Islamic subjectivity. Research conducted by Ding et al. (2025) and NOVAK & MATTES (2025) further demonstrates that younger generations experience religion through digitally mediated interactions that transcend geographical boundaries. In Indonesia, Askar et al. (2025) and Ju'subaidi et al. (2025) found that social media has become an important source of Islamic learning among students. Other studies have highlighted the importance of religious moderation and critical literacy in preventing extremism and intolerance among Generation Z (Takdir, 2025). Collectively, these studies confirm that religion and digital technology are becoming increasingly interconnected. Nevertheless, most of them focus on sociological changes rather than pedagogical responses within Islamic education.

Alongside the growing interest in digital religion, educational researchers have extensively discussed the potential of deep learning approaches in fostering meaningful learning experiences. Deep learning emphasizes conceptual understanding, critical reflection, collaboration, and the application of knowledge to real-life situations instead of relying solely on memorization (M. Elbashbishy, 2024). Systematic reviews have shown that deep learning environments contribute positively to higher-order thinking skills and students' capacity for independent learning (Bal & Öztürk, 2025; Bhuttah et al., 2024; Hamzah et al., 2025). Within the Indonesian context, Katsamakas et al. (2024) and Strielkowski et al. (2025) suggest that deep learning can provide an important foundation for educational transformation in the era of technological disruption. Moreover, recent studies in Islamic education advocate pedagogical models that integrate moral values, social engagement, and reflective inquiry (Falaqi et al., 2025; Karwadi et al., 2025). Despite these promising developments, empirical studies linking deep learning principles to the challenges of digital religious environments remain limited. The pedagogical implications of algorithmic Islam have therefore not been adequately addressed.

Several gaps can be identified from the existing literature. First, previous studies have generally examined digital religion, youth religiosity, and educational innovation as separate areas of inquiry, leaving their interconnections insufficiently explored (Golan & Don, 2022; Yalvaç Arıcı, 2025). Second, the influence of algorithmic systems on students' religious reasoning and epistemological awareness has received relatively little attention from scholars. Third, although religious literacy has become an increasingly important issue, few studies position it as a central objective of Islamic educational practice (Kolb, 2023; Saada & Magadlah, 2021). Finally, research on deep learning continues to be dominated by general educational contexts, with limited attempts to adapt its principles to Islamic education in the age of digital transformation. These limitations indicate the absence of an integrative pedagogical framework capable of responding to the crisis of religious literacy among Generation Z within algorithmically mediated environments. Addressing this gap is essential for ensuring that Islamic education remains relevant to contemporary social realities.

In response to these challenges, the present study aims to investigate the crisis of religious literacy experienced by Generation Z in the era of algorithmic Islam and to develop a Deep Learning-Based Critical Religious Literacy (DL-CRL) model for Islamic education. The study seeks to identify the educational consequences of algorithmically curated religious content while formulating a pedagogical framework that promotes critical inquiry, digital verification, reflective dialogue, collaborative learning, and transformative engagement. Theoretically, this research contributes to the growing body of scholarship by integrating perspectives from Islamic educational epistemology, deep learning theory, and digital religion studies. Practically, the proposed model is expected to provide guidance for teachers, school leaders, and policymakers in designing learning environments that strengthen students' critical engagement with religious information. More broadly, the study offers an alternative approach for reconstructing Islamic education in response to rapid technological change. By emphasizing critical religious literacy as a key educational competency, this research aspires to support the development of a generation that is intellectually grounded, socially responsible, and capable of navigating the complexities of contemporary digital life.

METHOD

Research Design

This study adopted a qualitative approach employing an Educational Design Research (EDR) framework to develop and refine a pedagogical model aimed at strengthening critical religious literacy among Generation Z in the context of algorithmic Islam. Educational Design Research was selected because it enables researchers not only to investigate educational problems but also to design, validate, and improve instructional innovations that respond to contemporary challenges. In line with the framework proposed, the research combined empirical inquiry with iterative model development, allowing theoretical perspectives from Islamic education, deep learning, and digital religion studies to be integrated into a coherent pedagogical framework. The study was organized into three interrelated phases: preliminary analysis and exploration, model design and construction,

and evaluation and reflection. Through these stages, the research sought to generate a practical and contextually relevant learning model capable of addressing the growing crisis of religious literacy among young Muslims in digitally mediated environments. To ensure methodological rigor, the study followed a systematic research procedure encompassing theoretical exploration, empirical investigation, model construction, implementation, and evaluation. The sequence of activities undertaken throughout the study is presented in Figure 1.

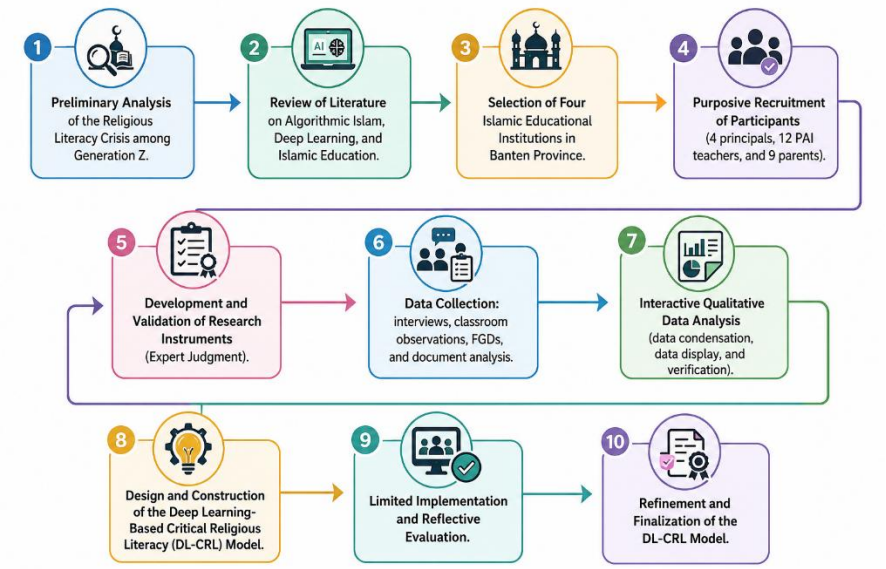

Figure 1. Educational Design Research Procedures for Developing the Deep Learning-Based Critical Religious Literacy (DL-CRL) Model

The research process began with a preliminary analysis of the challenges surrounding religious literacy in the era of algorithmic Islam, followed by an extensive review of relevant literature on digital religion, deep learning, and Islamic education. Subsequently, four Islamic educational institutions in Banten Province were selected, and participants were recruited through purposive sampling. After the research instruments had been designed and validated through expert judgment, data were collected using semi-structured interviews, classroom observations, focus group discussions, and document analysis. The collected data were then analyzed through an interactive qualitative approach involving data condensation, data display, and verification. The findings from these stages informed the design and development of the Deep Learning-Based Critical Religious Literacy (DL-CRL) Model, which was subsequently implemented on a limited scale, evaluated, and refined to produce the final pedagogical framework.

Research Setting and Participants

The study was conducted between March and May 2026 in four Islamic educational institutions located in Banten Province, Indonesia, namely MAN 1 Serang City, MAN 2 Tangerang City, Muhammadiyah Senior High School 1 Tangerang City, and Daar El-Qolam Modern Islamic Boarding School in Tangerang Regency. These institutions were purposively selected because they represent diverse educational settings that actively integrate digital technologies into learning activities and serve students belonging predominantly to Generation Z. Moreover, the selected institutions face similar challenges related to students' increasing engagement with religious content disseminated through social media platforms, video-sharing applications, and artificial intelligence–based search engines. The participants consisted of twenty-five individuals, including four school principals, twelve Islamic Religious Education teachers, and nine parents of Generation Z students. A purposive expert sampling strategy was employed to identify participants who possessed substantial experience and knowledge relevant to the research objectives. To be included in the study, participants were required to meet three criteria: (1) having at least five years of professional experience in Islamic education or educational leadership; (2) being actively involved in teaching, mentoring, or supervising Generation Z learners; and (3) demonstrating familiarity with digital technologies and their influence on religious learning. Participants who did not satisfy these criteria were excluded from the study. The diversity of participants allowed the researchers to obtain

comprehensive insights into the pedagogical and sociocultural dimensions of religious literacy in contemporary Islamic education.

Research Instruments and Validation

To capture the complexity of religious learning in algorithmically mediated environments, multiple instruments were employed. Semi-structured interview protocols were designed to explore participants' perceptions regarding changes in religious authority, patterns of digital religious consumption, and the pedagogical implications of algorithmic Islam. Classroom observation sheets were used to document instructional practices, student engagement, and the incorporation of digital technologies into Islamic Religious Education. In addition, two Focus Group Discussion (FGD) protocols facilitated collaborative reflection on the characteristics and feasibility of the proposed model. Documentary evidence, including lesson plans, instructional modules, and digital learning resources, was also analyzed to examine the extent to which existing pedagogical practices supported critical religious literacy. The development of research instruments was informed by key concepts derived from previous studies on deep learning pedagogy, religious literacy, digital religion, and Islamic educational philosophy. To establish content validity, the instruments were reviewed by five experts specializing in Islamic education, curriculum studies, educational technology, and qualitative research methodology. Their feedback focused on the relevance, clarity, and comprehensiveness of each instrument. Following the review process, several interview questions and observational indicators were revised to enhance conceptual alignment and contextual appropriateness. Given the qualitative nature of the study, trustworthiness was ensured through several strategies. Source triangulation was conducted by comparing information obtained from school principals, teachers, and parents, while methodological triangulation involved the integration of interviews, observations, FGDs, and document analysis. Member checking was employed by returning preliminary findings to selected participants for confirmation and clarification. Furthermore, peer debriefing sessions with external researchers were undertaken to minimize interpretive bias and strengthen analytical credibility.

Data Collection Procedures

Data collection was conducted in several consecutive stages. The initial phase focused on exploring the existing condition of religious literacy among Generation Z and identifying the influence of algorithmically curated digital content on students' religious understanding. During this stage, a comprehensive review of relevant literature was undertaken, institutional permissions were obtained, and the research instruments were finalized. The second phase involved fieldwork activities in the participating institutions, including semi-structured interviews with all participants, classroom observations, and two Focus Group Discussion sessions aimed at identifying pedagogical needs and evaluating the preliminary model design. Simultaneously, documentary materials, such as lesson plans, Islamic Religious Education modules, and digital learning resources, were collected and examined. The empirical findings generated during these activities served as the basis for constructing the Deep Learning-Based Critical Religious Literacy (DL-CRL) Model. Once the preliminary framework had been developed, the model was implemented on a limited basis in the participating institutions to examine its feasibility and pedagogical relevance. Observational notes, participants' reflections, and expert feedback obtained during the implementation phase were subsequently incorporated into the refinement process to improve the final version of the model.

Data Analysis

The data were analyzed using the interactive qualitative analysis model developed, which comprises data condensation, data display, and conclusion drawing and verification. All interview recordings, field notes, FGD transcripts, and documentary materials were first transcribed and organized into a comprehensive database. The researchers then conducted an open-coding process to identify recurring ideas and significant patterns related to religious literacy, digital religious practices, pedagogical challenges, and instructional innovation. The resulting codes were systematically grouped into broader categories and synthesized into thematic constructs that informed the development of the DL-CRL Model. Data displays in the form of matrices and conceptual maps were used to facilitate comparison across participants and research sites. Throughout the analytical process, interpretations were continuously refined through triangulation and

collaborative discussions among the research team. The final analysis generated five interconnected dimensions of the proposed model, namely critical inquiry, digital religious verification, reflective dialogue, collaborative knowledge construction, and transformative religious engagement. These dimensions collectively constitute an integrative pedagogical framework designed to strengthen critical religious literacy among Generation Z in the era of algorithmic Islam.

RESULTS AND DISCUSSION

Results

Characteristics of the Deep Learning-Based Islamic Education Model

The interview findings with school principals, Islamic Religious Education (IRE) teachers, and parents revealed that religious instruction in the four Islamic educational institutions selected for this study remains predominantly characterized by a knowledge-transmission approach. Most teachers deliver instructional materials through lectures, summary-based assignments, and assessments emphasizing lower-order cognitive skills, such as remembering and understanding basic Islamic concepts. These findings were further corroborated by the results of the Focus Group Discussions (FGDs), which identified a gap between the learning characteristics of Generation Z and the existing practices of Islamic Religious Education in schools. Participants agreed that students tend to acquire religious knowledge through social media platforms, short-form videos, Islamic podcasts, and artificial intelligence-based search engines. However, their abilities to verify the credibility of religious sources, compare different scholarly perspectives, and construct evidence-based arguments remain relatively limited. Documentation analysis of instructional materials indicated that among the 24 lesson plans and Islamic Religious Education modules examined, 79.2% primarily focused on memorization and conceptual understanding, whereas only 20.8% incorporated reflective activities, case studies, or contextual problem-solving tasks.

Based on the synthesis of interview data, FGDs, and instructional documents, this study identified five major characteristics of the Deep Learning-Based Islamic Education Model, namely critical inquiry, digital religious verification, reflective dialogue, collaborative knowledge construction, and transformative religious engagement. These components were designed to create meaningful learning experiences that enable students to develop critical religious literacy while responding effectively to the challenges of religious life in the era of algorithmic Islam. Contribution of the Model to Strengthening Critical Religious Literacy among Generation Z A limited implementation of the model was conducted with students in the four participating Islamic educational institutions over six instructional sessions. Observation findings revealed significant changes in students' interaction patterns during the learning process. At the initial stage, most students accepted religious information circulating on social media without verifying either the credibility of the sources or the scholarly authority behind the content. However, after participating in deep learning-based instruction, students demonstrated an increased ability to compare multiple religious references, identify biases embedded in social media algorithms, and relate contemporary religious issues to Islamic principles derived from the Qur'an, Hadith, and other authoritative Islamic literature.

Analysis of students' assignments also indicated improvements in the quality of religious argumentation. Prior to the implementation of the model, most students relied primarily on popular religious content disseminated through social media as the basis for their arguments. Following the implementation, students increasingly referred to Qur'anic exegesis, Hadith collections, fatwas issued by recognized religious institutions, and scholarly articles when analyzing contemporary religious issues in digital environments. Observation data further demonstrated an increase in students' active participation during classroom discussions. They became more willing to pose critical questions, provide evidence-based responses, and discuss diverse religious perspectives more openly. These findings suggest that the implementation of the deep learning-based model significantly contributed to strengthening Generation Z's critical religious literacy, particularly in terms of information evaluation, religious reflection, and decision-making grounded in authoritative Islamic sources.

Reconstruction and Validation of the Islamic Education Model in the Era of Algorithmic Islam

The reconstruction phase of the model involved an expert judgment process engaging 25 educational experts and practitioners, including school principals, Islamic Religious Education teachers, and parents. Validation results indicated that the proposed model possesses a high degree of relevance to the needs of religious education in the digital era. The experts particularly appreciated the integration of deep learning principles with Islamic educational values, especially regarding the enhancement of critical thinking skills, reflective religious engagement, and digital literacy competencies.

The limited implementation conducted across four Islamic educational institutions in Banten Province demonstrated that the developed approach effectively addressed challenges arising from the dominance of social media algorithms in shaping students' religious understanding. Based on expert feedback and field implementation results, the prototype model was refined and subsequently developed into the Deep Learning Based Critical Religious Literacy Model (DL-CRL Model). The model comprises five instructional stages: (1) Encountering Digital Religious Issues, (2) Critical Verification of Religious Sources, (3) Reflective Religious Dialogue, (4) Collaborative Knowledge Construction, and (5) Transformative Religious Engagement. The reconstructed and validated model is considered a promising pedagogical alternative for twenty-first-century Islamic education because it not only promotes normative religious understanding but also cultivates learners who possess critical thinking abilities, epistemological awareness, and competencies necessary for engaging wisely with religious information mediated by digital algorithms. Therefore, the proposed model has the potential to serve as an innovative pedagogical framework for strengthening critical religious literacy among Generation Z in the era of algorithmic Islam while contributing conceptually to the advancement of Islamic Religious Education studies amid ongoing digital transformation.

Table 1. Fidings Reaserch

Learning Stages	Student Activities	Competencies Developed
Encountering Digital Religious Issues	Identifying contemporary and viral religious issues	Digital awareness
Critical Verification of Religious Sources	Examining primary and secondary Islamic references	Information verification skills
Reflective Religious Dialogue	Participating in reflective discussions	Critical thinking
Collaborative Knowledge Construction	Developing collaborative projects	Collaboration and knowledge construction
Transformative Religious Engagement	Applying Islamic values in real-life contexts	Value internalization and social engagement

Overall, this study proposes a novel pedagogical framework termed the Deep Learning Based Critical Religious Literacy Model (DL-CRL Model), designed to enhance critical religious literacy among Generation Z within the context of algorithmic Islam. The model represents an integration of Islamic educational epistemology, deep learning theory, and contemporary studies on digital religion. It offers a promising alternative framework for Islamic Religious Education in the twenty-first century by fostering critical thinking, reflective engagement, digital religious verification, and the development of moderate and intellectually grounded religious identities.

Discusion

The findings suggest that Islamic Religious Education in the participating schools continues to rely heavily on conventional instructional patterns centered on knowledge transmission and memorization. Although such approaches remain important for introducing fundamental religious concepts, they appear increasingly inadequate for addressing the realities of Generation Z, whose religious experiences are shaped by digital technologies and algorithmically curated information. The discrepancy identified in this study reflects a broader educational challenge: while students inhabit highly connected digital spaces, classroom practices often remain detached from the epistemological transformations brought about by technological change. Similar concerns have been

raised by Altinyelken (2021) and Skrefsrud (2022), who argue that religious education frequently struggles to move beyond teacher-centered instruction. The integration of digital technologies into schools has likewise failed to produce meaningful pedagogical change in many contexts (McDiarmid & Zhao, 2023; Mhlongo et al., 2023). From the perspective of deep learning, education should enable learners to interpret, question, and apply knowledge critically rather than merely reproduce information (M. Elbashbishy, 2024). Consequently, the present findings underscore the need to rethink how Islamic education responds to the increasingly complex relationship between religion and digital culture.

An equally significant finding concerns the ways in which Generation Z accesses religious knowledge. Participants consistently reported that students turn to social media platforms, podcasts, short videos, and AI-assisted search tools as their primary sources of religious information. This pattern illustrates a profound shift in the location of religious authority, which is no longer confined to mosques, schools, or religious scholars but is increasingly dispersed across digital networks. Previous studies have shown that algorithmic systems shape users' exposure to information by prioritizing content that aligns with their interests and previous interactions (Brady et al., 2023; Ledwich et al., 2022). Within religious contexts, this process can reinforce selective exposure and create the impression that highly visible content is automatically more authoritative. Similar observations have been made by Andok (2024), Liu et al. (2025), and Zaid et al. (2022), who found that young Muslims frequently negotiate their religious identities through digital platforms. The present study extends these discussions by demonstrating that the problem is not simply the growing use of technology itself, but the absence of educational strategies that help students evaluate and contextualize the information they encounter.

The limited capacity of students to distinguish between credible and questionable religious sources further highlights the urgency of strengthening critical religious literacy. In practice, many students accepted viral religious messages without considering the reliability of the sources, the scholarly traditions behind them, or the broader social implications of the ideas being circulated. This finding reinforces the argument that religious literacy involves much more than familiarity with religious doctrines; it also requires interpretive skills, critical judgment, and contextual understanding (Marcus & Ralph, 2021; Saada & Magadlah, 2021; Ubani, 2025). Although digital technologies provide unprecedented access to information, access alone does not necessarily lead to deeper understanding. Rhodes (2022) has similarly noted that digital environments often encourage superficial engagement and reduce opportunities for critical reflection. In Indonesia, Rusli and Nurdin (2022) and Takdir (2025) likewise emphasize the importance of critical religious literacy in preventing misinformation, intolerance, and radical tendencies among younger generations. Taken together, these findings suggest that religious literacy should no longer be treated as a secondary outcome of Islamic education but rather as one of its central objectives.

Against this backdrop, the development of the Deep Learning-Based Critical Religious Literacy (DL-CRL) Model represents a meaningful attempt to bridge the gap between Islamic educational traditions and contemporary digital realities. The model integrates five complementary dimensions critical inquiry, digital religious verification, reflective dialogue, collaborative knowledge construction, and transformative religious engagement that collectively encourage students to engage with religion in a more thoughtful and responsible manner. Its conceptual foundation draws on the principles of deep learning, which emphasize understanding, reflection, collaboration, and the application of knowledge in authentic situations (M. Elbashbishy, 2024). Existing research has consistently shown that deep learning environments contribute to the development of higher-order thinking and independent learning capacities (Bal & Öztürk, 2025; Bhuttah et al., 2024; Hamzah et al., 2025). At the same time, recent scholarship in Islamic education has called for pedagogical models that combine intellectual inquiry with ethical and social engagement (Falaqi et al., 2025; Karwadi et al., 2025). By bringing these strands together, the DL-CRL model offers a framework that is both educationally relevant and grounded in the broader traditions of Islamic thought.

The implementation phase provides further evidence of the model's pedagogical potential. Over the course of the intervention, students gradually became more critical in assessing religious information and more attentive to the influence of algorithms on their digital experiences. Rather than accepting online content at face value, they began comparing different sources, questioning underlying assumptions, and identifying possible biases in the information presented to them. This

shift is particularly important because contemporary religious experiences are increasingly shaped by digital infrastructures that mediate access to knowledge and influence how religious authority is perceived (Ben Moussa et al., 2024; Umbrello, 2023). Similar trends have been documented by Cheong (2021), Ibrahim (2024), and Novak and Mattes (2025), who argue that digital technologies are transforming the ways religious identities and communities are constructed. However, unlike many previous studies that focus primarily on sociological change, the present research demonstrates that educational interventions can play an active role in helping students navigate these transformations more critically.

Changes in students' patterns of argumentation also reveal an important epistemological shift. Before the implementation of the model, students tended to rely on widely circulated social media content when discussing contemporary religious issues. After participating in the learning activities, they increasingly incorporated Qur'anic exegesis, Hadith literature, institutional fatwas, and academic sources into their analyses. This transition indicates that students were beginning to distinguish between popularity and credibility, an ability that has become increasingly important in digital environments where visibility often substitutes for expertise. Henry (2021) argues that digital societies require new forms of religious literacy capable of amplifying trustworthy sources while resisting misinformation. Likewise, Whyte (2022) demonstrates that religious authority in cyberspace is constantly negotiated among a wide range of actors. The findings of the present study support these arguments and further suggest that pedagogical innovation can help restore the role of evidence, scholarship, and critical reasoning in students' religious learning processes.

Another notable aspect of the DL-CRL model lies in its emphasis on dialogue and collaborative learning. Classroom observations revealed that students became more willing to express their opinions, ask questions, and engage constructively with different perspectives. Such developments are particularly relevant in digital environments that often encourage polarization and fragmented forms of interaction. Existing studies have noted that conventional educational practices frequently provide limited opportunities for learners to interrogate information and participate in meaningful discussions (Ciampa et al., 2023; Morris, 2025; Omodan, 2025). In contrast, collaborative learning creates spaces where knowledge can be negotiated collectively and where students learn to appreciate intellectual diversity. This contribution is especially important because much of the existing literature on digital religion has focused on changes in religious behavior while paying relatively little attention to how educational institutions might respond to those changes (Golan & Don, 2022; Yalvaç Arıcı, 2025). The findings therefore suggest that strengthening critical religious literacy requires not only technological competence but also dialogical and social skills.

Despite the encouraging results, the findings should be interpreted with caution. The study was conducted in four Islamic educational institutions in Banten Province, each characterized by different educational cultures and levels of technological integration. These contextual factors undoubtedly shaped both the implementation process and students' responses to the model. In addition, the relatively short period of implementation makes it difficult to determine whether the observed changes will persist over time. It is also possible that part of the students' enthusiasm was influenced by the novelty of the instructional approach itself. Nevertheless, the study offers an important contribution by proposing an integrative pedagogical framework that connects Islamic educational values, deep learning principles, and contemporary debates on digital religion. More broadly, the DL-CRL model demonstrates that Islamic education does not need to resist technological change; instead, it can engage with digital transformation in ways that strengthen students' intellectual maturity, critical awareness, and religious responsibility in an increasingly algorithmic world.

CONCLUSION

This study highlights that the crisis of religious literacy among Generation Z is closely linked to the increasing influence of algorithmically mediated digital environments, which shape how young Muslims access and interpret religious knowledge. While digital technologies broaden access to religious information, they also encourage fragmented understandings and reduce opportunities for critical engagement. The findings reveal that Islamic Religious Education remains largely transmission-oriented and has not fully addressed the epistemological challenges of the digital era. In response, this study developed

the Deep Learning-Based Critical Religious Literacy (DL-CRL) Model, which integrates the principles of Islamic educational epistemology, deep learning, and digital religion studies through five key dimensions: critical inquiry, digital religious verification, reflective dialogue, collaborative knowledge construction, and transformative religious engagement. The limited implementation suggests that the model can strengthen students' abilities to critically assess religious information, verify digital sources, and develop more reflective and contextual religious perspectives. Accordingly, the DL-CRL Model offers both a conceptual contribution to contemporary Islamic education and a practical framework for preparing Muslim learners to engage responsibly with the realities of algorithmic Islam.

AUTHOR CONTRIBUTIONS STATEMENT

Milana Abdillah Subarkah conceived the study, formulated the research design, and supervised the overall research process. Milana Abdillah Subarkah and Sri Hastuti conducted the fieldwork, including classroom observations, interviews, focus group discussions, and document collection across the participating Islamic educational institutions. Milana Abdillah Subarkah developed the analytical framework and designed the Deep Learning-Based Critical Religious Literacy (DL-CRL) model. Sri Hastuti contributed to the validation of the model and provided critical feedback on the pedagogical framework. Milana Abdillah Subarkah and Sri Hastuti interpreted the findings and drafted the manuscript. All authors participated in reviewing and revising the manuscript, approved the final version for publication, and agreed to be accountable for all aspects of the work.

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