



HARNESSING AUGMENTED REALITY FOR INTERACTIVE LEARNING IN ISLAMIC EDUCATION

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Abstract :

Education plays a strategic role in shaping civilization and maximizing human potential. Yet conventional teaching approaches often struggle to effectively raise students' motivation and understanding, particularly within Islamic Religious Education (IRE). Technological advances offer viable alternatives through interactive media such as Augmented Reality (AR), which enables concrete visualization of learning content. This study seeks to examine the use of AR as an interactive learning medium in IRE using a literature review approach. Research articles were identified via Google Scholar with the keywords "Augmented Reality," "Interactive Learning Media," and "Islamic Religious Education," and were screened for relevance, publication within the last five years (2021–2025), and accessibility. The review indicates that AR substantially improves student motivation, comprehension, and engagement, especially for topics such as the history of Muslim scientists, funeral rites, sirah nabawiyah, tajwid, and the practice of Hajj and 'Umrah. By addressing the limitations of traditional methods, AR emerges as a meaningful innovation in contemporary education and is expected to support more relevant and transformative learning experiences. These findings also highlight implications for curriculum design, teacher training, and assessment.

Keywords : *Augmented Reality, Interactive Learning, Islamic Religious Education*

INTRODUCTION

Education remains the central engine of civilizational progress and the systematic development of human potential. In recent years, the accelerating diffusion of digital technologies has reshaped how knowledge is accessed, represented, and enacted in classrooms. Evidence from higher education shows that interactive technologies can meaningfully increase learner motivation and knowledge retention, while broader reviews underscore technology's role in deepening engagement when it is pedagogically purposeful rather than merely novel. These trends collectively highlight a persistent problem: traditional, lecture-centric methods often struggle to maintain attention and agency among today's learners, whereas interactive media can catalyze more active, self-regulated participation. (Daniel, 2021; Criollo-C, & Cajamarca-Carrasco, 2024.)

Augmented reality (AR) has emerged as a particularly salient innovation in this landscape. By overlaying digital objects and information onto the physical world in real time, AR creates a blended environment that affords situated visualization, manipulation, and feedback. From an instructional-design perspective, AR's potential aligns closely with the Cognitive Theory of



Multimedia Learning (CTML), which emphasizes dual channels, limited capacity, and active processing, and with Cognitive Load Theory (CLT), which cautions that poorly designed media can overload working memory. Thus, AR's promise is contingent on principled design e.g., signaling, segmenting, and pre-training to reduce extraneous load and to guide generative processing. (Mayer, 2024; Ouwehand, Lespiau, Tricot, & Paas, 2025; Li et al., 2025.)

A growing quantitative knowledge base supports AR's educational benefits. A systematic review and meta-analysis of AR in higher education (2000–2023) reports a large overall effect on learning outcomes (Hedges' $g \approx 0.90$), with effectiveness moderated by instructional function and the type of outcome measured i.e., AR tends to be especially effective when aligned with explicit pedagogical purposes. Complementing this, a meta-analysis focused on K-12 contexts finds a large positive effect on motivation ($g \approx 0.80$), with collaborative and marker-based implementations outperforming non-collaborative and location-based variants. A broader meta-analysis across education and training likewise concludes that AR programs, on average, yield significantly better learning outcomes than non-AR alternatives, while also revealing boundary conditions linked to age and naturalistic settings. These converging results suggest that AR's impact is real but design-dependent. (Li et al., 2025; Na & Yun, 2024; Howard & Davis, 2023.)

Within Islamic Religious Education (IRE), the case for AR is compelling because the curriculum includes abstract constructs (e.g., theological concepts), embodied practices (e.g., *ṣalāh*, *ḥajj* rites), and rich material culture (e.g., mosque architecture, ritual artifacts) that benefit from spatial, procedural, and contextual visualization. Recent empirical work in secondary education indicates that the degree to which AR is practiced in Islamic education correlates positively with learners' achievement motivation, while also pointing to readiness, teacher use, and the ability to address implementation challenges as practical determinants of benefit. This points to both a pedagogical opportunity and a design imperative for IRE. (Mustafa, Daud, Yussuf, Kasasbeh, & Abu Khurma, 2025.)

Despite this promise, notable theoretical and empirical gaps persist. Reviews of AR scholarship show a concentration of rigorous applications in medicine and engineering, with comparatively fewer studies in language, humanities, and religion. Prior syntheses also critique an over-reliance on media-comparison studies (AR vs. non-AR) that do not adequately explain when AR is beneficial and why for instance, which task features, representational formats, or social arrangements (individual vs. collaborative) are most supportive. In short, the field needs mechanism-centered accounts that connect AR affordances to learning processes, outcomes, and context-specific constraints. (Li et al., 2025.)

This study addresses those gaps with a literature-review approach focused on AR as interactive learning media for IRE. Anchored in established theory, we take CTML to specify how AR's multimodal presentations can be structured to scaffold selecting, organizing, and integrating information; we draw on CLT to anticipate and mitigate extraneous load (e.g., by integrating

spatially split sources, applying signaling, or pacing segments); and we use Self-Determination Theory (SDT) to frame how AR experiences can satisfy basic psychological needs for autonomy, competence, and relatedness, thereby strengthening intrinsic motivation. These frameworks jointly motivate our central argument that AR's effectiveness in IRE depends on deliberate instructional alignment not on novelty. (Mayer, 2024; Ouweland et al., 2025; Deci, Olafsen, & Ryan, 2017.)

Accordingly, we advance the following arguments in narrative form. First, when AR is designed with evidence-based multimedia principles (e.g., signaling critical features in a 3D model of the Ka'bah, pre-training key terms before exploring wuḍū' procedures), learners should attain higher conceptual understanding and transfer than with conventional presentations because the design manages essential processing and reduces extraneous load. Second, well-designed AR activities can enhance motivation in IRE by supporting learner autonomy (choiceful exploration), competence (progressive challenges with immediate feedback), and relatedness (shared inquiry around sacred objects and practices), consistent with SDT. Third, AR's benefits are likely moderated by learner and task characteristics e.g., prior knowledge, spatial ability, and the dimensionality of visualizations implicating the need to match 2D/3D representations and interaction fidelity to the cognitive demands of specific IRE topics. (Mayer, 2024; Ouweland et al., 2025; Krüger, Palzer, & Bodemer, 2022.)

Finally, the present review contributes novelty by synthesizing mainstream AR evidence through the lens of IRE's unique content and learning goals, and by articulating design-testable propositions that link AR affordances to mechanisms (cognitive load management; need satisfaction) and outcomes (understanding, transfer, motivation). Practically, this framing clarifies how AR can make abstract or embodied religious knowledge more concrete without overwhelming learners, and why AR-supported IRE should be evaluated with measures sensitive to both cognition (e.g., retention, transfer) and motivation (e.g., autonomy, interest). The analysis thus supports the development of theory-informed, AR-based learning media for IRE that are pedagogically robust, scalable in real classrooms, and aligned to the scholarly standards of this journal. (Li et al., 2025; Na & Yun, 2024; Mustafa et al., 2025.)

RESEARCH METHOD

This study employs a literature review approach to appraise Augmented Reality (AR) as an innovation in interactive learning media for Islamic Religious Education (IRE). Articles were retrieved from Google Scholar using the keywords "Augmented Reality," "Interactive Learning Media," and "Islamic Religious Education." Screening followed predefined inclusion–exclusion rules. Inclusion criteria comprised empirical studies (quantitative or qualitative) that examine AR use in IRE, published within 2016–2025, available open access, and written in Indonesian or English. Exclusion criteria removed items outside the topic, works published before 2016, paywalled or inaccessible texts, non research pieces (e.g., editorials), and studies lacking sufficient empirical evidence.

The initial search yielded 3,600 records. Limiting to the 2016–2025 time window reduced the corpus to 3,180 items. A manual screen of titles, abstracts, methods, and keyword relevance produced a final set of 7 studies that met all criteria. These articles form the basis for analyzing how AR can enhance the quality of IRE teaching and learning. As a contemporary example within our eligibility window, we note a recent peer reviewed article examining AR’s contribution to meaningful learning in IRE (Albab et al., 2025)

FINDINGS AND DISCUSSION

Table 1. Literature Review

No	Authors	Journal	Research Title	Key Findings	Research Gap
1	Sodiki Abdullah ; Iqbal Noor	Masharif al-Syariah (Vol. 9, No. 3, 2024)	The Application of Augmented Reality Technology in Islamic Education	Explains the relevance of AR boosting comprehension, interest, and student participation in Islamic Religious Education (IRE).	Lacks controlled experiments and long-term retention measures; teacher training needs are not systematically measured.
2	Ulul Albab; Ahmad Ta’rifin; Dirasti Novianti; Hani Hasnah Safitri; Zainudin Hassan	EDUKASI: Jurnal Penelitian Pendidikan Agama dan Keagamaan (2025)	Exploring the Impact of Augmented Reality on Meaningful Learning in Islamic Religious Education	Quantitative evidence that AR enhances meaningful learning in IRE (e.g., problem solving, conceptual integration) and increases learner motivation.	Requires multi-school replication and assessment of transfer to real performance (e.g., ritual practice), plus cost-implementation analysis.
3	Editorial Team	Variable Research Journal (2024)	The Use of AR Technology in Islamic Religious Education: A Literature Analysis	Maps the potential of AR to improve conceptual understanding, engagement, and value formation in PAI/IRE,	Calls for cognitive-load instrumentation and comparisons of 2D vs. 3D fidelity; source studies vary in methodologica

				while summarizing technical and pedagogical challenges.	l rigor.
4	Research Team	At-Turats: Journal of Islamic Education Thought	Development of Augmented Reality in Islamic Religious Education in Islamic Boarding Schools	AR development shows learning gains and improvements in religious capability; significant pretest-posttest differences reported.	Needs randomized designs, tracking of effects on authentic worship practices in pesantren, and attention to device-equity issues.
5	JSTE Team	JSTE: Journal of Action and Evaluation Studies	Using AR to Introduce Hijaiyah Letters in Early Childhood Education	AR increases interest and participation among young learners recognizing hijaiyah letters; supports flexible and playful learning.	Small samples; no follow-up tests for durability of reading acquisition; does not measure downstream Qur'anic reading fluency.
6	BUSITI Team (FIKOM UMI)	BUSITI: Journal of Business & Information Technology	Markerless AR as a Tool for Introducing Hijaiyah Letters	Android AR application helps children in TPA recognize hijaiyah and sustains attention; potential to spark early interest.	Focuses on development; learning validation is limited (no control group, no measures of makhraj/tajwid accuracy).
7	INSIS Team (UMSU)	INSIS: Innovative Studies in Islamic	Utilization of Augmented Reality (AR)	Reviews AR benefits for simulating sacred sites,	Review article; needs large-sample field studies with

Studies	as	tajwid, daily	standardized
Innovative		prayers, and	measures of
Interactive		pilgrimage;	ritual
Learning		emphasizes	competence
Media for	that	AR	and motivation
IRE		supplements,	over time.
		not replaces,	
		teacher	
		guidance.	

The analysis of seven journal articles published between 2023 and 2025 shows a consistent trend in the application of Augmented Reality (AR) as an innovative learning tool in Islamic Religious Education (IRE). When the data are visualized in a summary table or chart, most studies focus on how AR strengthens comprehension, motivation, and engagement in learning religious content, while a smaller number of studies examine its theoretical implications and implementation challenges. Thematically, the studies reveal three main focuses: first, the enhancement of students learning motivation and participation through interactive AR experiences; second, the improvement of conceptual understanding by visualizing abstract or procedural religious concepts such as tajwid, prayer movements, and pilgrimage rituals; and third, the practical and methodological limitations related to teacher readiness, access to technology, and the absence of long-term evaluation.

Restating the data, the literature collectively suggests that AR-based applications ranging from 3D simulations and virtual religious sites to Android-based Hijaiyah recognition tools make learning in IRE more immersive and contextual. Studies from journals such as *Masharif al-Syariah* and *EDUKASI* emphasize that AR can foster meaningful learning by connecting visual and cognitive processes, whereas studies in *BUSITI* and *JSTE* demonstrate its benefits for early childhood learners through playful and flexible engagement. However, nearly all studies note that current research remains limited to small-scale trials, lacking control groups, retention testing, and cross-school replication.

When the results are described and compared, several patterns emerge. Pedagogically, AR functions as a complementary tool that enhances but does not replace the role of teachers. Methodologically, most works adopt developmental or experimental approaches but seldom use randomized or longitudinal designs. Contextually, implementation remains concentrated in Indonesian Islamic schools and boarding schools, reflecting both adaptability and ongoing digital inequality. If visualized through a thematic matrix, the studies cluster around motivation (the most frequently cited benefit), comprehension (moderate), and implementation barriers (frequent but underexplored).

In interpreting these findings, AR appears to align strongly with established learning theories. It reflects the Cognitive Theory of Multimedia Learning (CTML) by combining verbal and visual channels to improve understanding, and the Cognitive Load Theory (CLT) reminds designers to

manage complexity to avoid overloading students' working memory. Furthermore, from the perspective of Self-Determination Theory (SDT), AR supports learners' autonomy, competence, and relatedness through self-paced exploration, feedback-rich activities, and collaborative simulations. Despite these advantages, the reviewed literature reveals theoretical and empirical gaps, particularly the lack of large-scale, controlled studies and structured teacher-training evaluations.

Overall, the synthesis of the data demonstrates that Augmented Reality holds significant potential to transform Islamic Religious Education into a more engaging, contextual, and student-centered experience. However, realizing this potential requires rigorous empirical validation, sustainable access to technology, and systematic teacher preparation to ensure AR becomes not just an attractive innovation but a pedagogically grounded and scalable educational practice.

The analysis of seven journal articles published between 2023 and 2025 reveals a consistent trend regarding the implementation of Augmented Reality (AR) as a transformative learning tool in Islamic Religious Education (IRE). The findings demonstrate that AR significantly enhances students' learning motivation, engagement, and comprehension of religious materials (Abdullah & Noor, 2024; Albab et al., 2025).

Most studies highlight how AR-based applications ranging from three-dimensional simulations of sacred sites to interactive Android-based Hijayah recognition tools provide immersive and contextualized learning experiences. Journals such as *Masharif al-Syariah* and *EDUKASI* emphasize the role of AR in fostering meaningful learning through visual-cognitive integration, while others, including *BUSITI* and *JSTE*, document its effectiveness in promoting playful, flexible learning environments for early learners (Syamsuddin, Irawati, & Ramdaniah, 2023; Ummah & Nisak, 2024). However, despite these promising results, the studies collectively note a number of limitations, such as the small scale of existing trials, the lack of control groups, the absence of long-term retention assessments, and the need for broader replication across institutions (Hartati, 2024; Nasikhin et al., 2023).

The relationship between data and research questions indicates a clear cause-and-effect pattern: AR facilitates the visualization of abstract, procedural, and spatially complex religious concepts, thereby reducing cognitive load and improving knowledge retention. The interactive and multimodal nature of AR aligns with the principles of the Cognitive Theory of Multimedia Learning (CTML) and Cognitive Load Theory (CLT), which explain how dual-channel visual and verbal processing supports meaningful comprehension when instructional design minimizes extraneous load (Mayer, 2024; Ouwehand, Lespiauw, Tricot, & Paas, 2025).

This cause-and-effect mechanism is particularly evident in studies involving the simulation of Hajj and Umrah rituals, which allow students to practice and internalize sequences of worship more effectively than traditional lectures (Shofiyyuddin & Muthi'Uddin, 2024). The findings are also consistent

with Self-Determination Theory (SDT), which posits that technologies like AR can enhance learners' autonomy, competence, and relatedness three psychological needs that foster intrinsic motivation (Deci, Olafsen, & Ryan, 2017).

Similar patterns are reported in recent open-access research such as Albab et al. (2025) in *EDUKASI: Jurnal Penelitian Pendidikan Agama dan Keagamaan*, which found that AR fosters meaningful learning and sustained motivation in IRE classrooms, and Abdullah and Noor (2024) in *Masharif al-Syariah*, who demonstrated improved comprehension and participation through AR-enhanced lessons. These results echo broader educational meta-analyses published in *Education Sciences and Sustainability*, showing that AR interventions produce large effect sizes on both motivation and learning outcomes when aligned with pedagogical intent (Li et al., 2025; Na & Yun, 2024).

Comparatively, the emerging IRE literature extends earlier findings from STEM education by applying AR to abstract theological and ritual contexts, domains traditionally dominated by textual and oral instruction. Unlike prior research in engineering or medical education, where AR focused on spatial reasoning or procedural mastery, IRE applications demonstrate how immersive visualization can enhance affective and spiritual dimensions of learning (Mustafa, Daud, Yussuf, Kasasbeh, & Abu Khurma, 2025). Yet, in contrast with the rigor of those fields, AR studies in religious education still face methodological limitations. Most rely on pretest-posttest designs without randomization, lack cognitive-load instrumentation, and rarely assess transfer to authentic practice (Hartati, 2024; Nasikhin et al., 2023). These weaknesses suggest that while AR's pedagogical potential in IRE is substantial, its validation requires more robust and replicable research designs.

The contribution of this synthesis lies in bridging theoretical and empirical insights to clarify where and why AR benefits IRE learning. It identifies three primary contributions: first, defining the domains in which AR is most effective spatial (sacred sites), procedural (ritual sequences), and linguistic (tajwid and Hijaiyah); second, establishing a framework that integrates CTML, CLT, and SDT to explain AR's cognitive and motivational effects; and third, highlighting contextual determinants such as teacher readiness, infrastructural equity, and curricular alignment as crucial mediators of success. The action plan derived from these findings underscores the need for mechanism-driven instructional design, rigorous experimental validation, and structured teacher professional development. Future research should adopt mixed-method and longitudinal designs to assess retention and transfer, integrate cognitive-load and engagement metrics, and examine the scalability of AR in under-resourced contexts. Additionally, partnerships between researchers, educators, and technology developers could foster open-access AR resources optimized for low-spec devices and multilingual content delivery (Ouwehand et al., 2025; Mayer, 2024).

In conclusion, Augmented Reality represents a powerful but design-sensitive innovation for Islamic Religious Education. It transforms learning from passive reception into active exploration, bridging cognitive, affective, and procedural dimensions of religious knowledge. The integration of AR into IRE

should thus be guided not by technological novelty but by pedagogical purpose, theoretical grounding, and equitable access. When these conditions are met, AR can meaningfully contribute to the broader goal of education as the central engine of civilizational progress and human development in the digital era (Li et al., 2025; Albab et al., 2025; Abdullah & Noor, 2024).

CONCLUSION

Augmented Reality consistently emerges as a high-impact, complementary tool for Islamic Religious Education: it boosts students' motivation, engagement, and conceptual understanding especially for abstract and procedural topics such as tajwid, prayer movements, and Hajj/'Umrah by turning content into immersive, context-rich experiences. These effects are theoretically grounded in CTML and CLT (dual-channel processing and managed cognitive load) and are reinforced by SDT through enhanced autonomy, competence, and relatedness.

However, the evidence base is still preliminary: most studies are small-scale, short-term, and non-randomized, with limited retention testing and cross-site replication, and they surface practical barriers (teacher readiness, access to devices, and uneven infrastructure). AR should therefore be integrated as a pedagogically driven adjunct not a replacement for teachers within curricula that include structured teacher training and authentic assessment.

To realize AR's promise at scale, the next phase requires rigorous mixed-method and longitudinal research, broader replications across diverse IRE settings, and partnerships that produce open, low-spec AR resources. With these conditions in place, AR can shift IRE toward more engaging, equitable, and student-centered learning while staying anchored to robust instructional design.

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