e-ISSN 3050-9599
p-ISSN 2795-3264

10.5281/zenodo.16743900 Vol. 08 Issue 07 July - 2025 Manuscript ID: #02033

AUGMENTED AND VIRTUAL REALITY IN INDONESIAN MADRASAH EDUCATION: POTENTIALS, CHALLENGES, AND FUTURE DIRECTIONS

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Abstract

The rapid advancement of digital technology particularly Augmented Reality (AR) and Virtual Reality (VR) is driving major innovation in Islamic Religious Education (IRE), especially within Indonesian madrasahs. This study aims to provide the first comprehensive synthesis of international and national literature (2015–2024) on the integration of AR/VR in IRE within the Indonesian madrasa context, with a focus on both the transformative potential and the practical challenges of implementation. Adopting a narrative review approach, this research systematically analyzes empirical studies, theoretical papers, and policy documents retrieved from reputable scientific databases. Data were collected through structured literature searches and selected using inclusion criteria emphasizing relevance, methodological rigor, and recency. Thematic analysis was then employed to identify key patterns related to learning innovation, infrastructural readiness, pedagogical adaptation, and regulatory frameworks. The results demonstrate that AR/VR can significantly enrich religious learning by fostering interactive experiences, increasing student engagement with Islamic concepts, and broadening access to authentic, context-rich educational resources. However, the adoption of these technologies in Indonesian madrasahs remains hindered by inadequate infrastructure, gaps in digital literacy among teachers and students, curriculum alignment issues, and context-specific ethical concerns. The findings reveal a persistent divide between global technological advancements and the realities of local implementation. This review underscores the need for the development of contextualized pedagogical frameworks, comprehensive teacher training, and robust policy support to facilitate equitable and meaningful AR/VR integration. By offering critical analysis and strategic recommendations, this study advances academic discourse and provides actionable guidance for policymakers, educators, and technology developers in realizing transformative, value-based Islamic education through immersive technologies.

Keywords:

Augmented Reality, Virtual Reality, Islamic Religious Education, Narrative Review.

How to cite: Shobri, K., Ghufron, M., Kholis, N., & Makinuddin, M. (2025). AUGMENTED AND VIRTUAL REALITY IN INDONESIAN MADRASAH EDUCATION: POTENTIALS, CHALLENGES, AND FUTURE DIRECTIONS. *GPH-International Journal of Educational Research*, 8(7), 1-16. https://doi.org/10.5281/Zenodo.16743900

Introduction

The rapid development of digital technology has driven fundamental changes in education worldwide, including Islamic Religious Education (IRE) (Masdul et al., 2024; Muslim, 2024; Zou et al., 2025). The presence of innovations such as Augmented Reality (AR) and Virtual Reality (VR) offers new opportunities to improve the quality of learning, making it more interactive, immersive, and contextual. In Indonesia, madrassas, as Islamic-based educational institutions, play a strategic role not only in transmitting religious knowledge but also in character formation and strengthening 21st-century competencies (Kementerian Agama RI, 2022; Khoirohnissah, 2023). However, in reality, IRE learning in madrassas is still dominated by conventional approaches such as lectures, memorization, and text-based learning, which are less able to stimulate the active involvement of digital native students and are often irrelevant to the needs of the times (Fadhilah et al., 2022).

The integration of AR/VR into IRE learning presents a significant opportunity to improve this situation. Through these technologies, students can experience worship simulations, explore Islamic history virtually, and access artifacts and sacred sites that have previously been difficult to reach physically (Ahsan et al., 2021; Kurniawan et al., 2023; Radianti et al., 2020). Multiple international and national studies have proven that the use of AR/VR can increase motivation, conceptual understanding, and emotional involvement of students in the religious learning process (Chai et al., 2022; Hassan et al., 2023; Le & Dinh, 2021). More than that, this technology is also relevant to strengthening digital literacy, critical thinking, and collaborative skills as part of 21st-century competencies.

Although the potential is very promising, the integration of AR/VR in madrassas cannot be separated from significant challenges. Barriers in infrastructure and device availability, limited digital literacy of teachers and students, resistance to pedagogical change, and ethical and regulatory issues are the main inhibiting factors (Kementerian Agama RI, 2022; Rahman et al., 2023; Widiastuti et al., 2024). In addition, the implementation of AR/VR needs to align with Islamic values and the national curriculum regulated by policies of the Ministry of Religious Affairs of the Republic of Indonesia, such as the Digital Madrasah Program and the Digital Transformation Strategy for Islamic Religious Education (Kementerian Agama RI, 2022; Khoirohnissah, 2023).

Unfortunately, until now, there have not been many studies that specifically synthesize the opportunities and challenges of AR/VR integration in the context of IRE in Indonesian madrassas. Most literature is still fragmented or only focuses on limited case studies, so it has not been able to provide a comprehensive and evidence-based picture as a basis for policy development and learning practices (Apriyani et al., 2025; Radianti et al., 2020).

Based on this, this narrative review aims to: (1) identify and analyze the potential for AR/VR innovation in IRE learning in madrassas, (2) map the challenges and obstacles faced in the implementation process, and (3) formulate strategic recommendations for Islamic education stakeholders, ranging from policymakers, educators, to technology developers. This article also specifically highlights the importance of evidence-based approaches and cross-sectoral collaboration in driving equitable and value-based digital transformation.

This review is expected to make several key contributions to both scholarship and practice. Theoretically, this review provides an integrated conceptual framework that connects AR/VR innovations with core principles of Islamic pedagogy and contemporary educational theories. Practically, the findings will guide educators and policymakers in effectively adopting and adapting AR/VR technologies in madrassa-based Islamic Religious Education, enabling more engaging, relevant, and values-driven learning experiences.

Literature Review

Concepts of Augmented Reality and Virtual Reality in Education

Augmented Reality (AR) and Virtual Reality (VR) are two forms of immersive technology that are increasingly shaping global education—including Islamic education in Indonesia—by enabling new approaches to interactive and contextual learning (Albab et al., 2025; Booyoesen, 2023; Kaplan-Rakowski & Gruber, 2024). AR integrates digital elements into real-world environments using devices such as smartphones or tablets, while VR creates fully immersive virtual experiences through specialized hardware such as VR headsets (Azuma, 1997; Chai et al., 2022; Ta'rifin et al., 2025). The main distinction between AR and VR is their level of immersiveness and interaction: AR enriches reality, whereas VR replaces it completely for simulation and exploration (Hussein et al., 2022; Munawir, 2025; Nasikhin et al., 2023).

The adoption of AR/VR in education aligns closely with several contemporary learning theories. Constructivist theory emphasizes that knowledge is actively built through experience, interaction, and reflection—a principle highly facilitated by AR/VR-based learning (McLeod, 2025; Vygotsky, 1978; Wijnen-Meijer et al., 2022). Kolb's experiential learning model stresses that optimal learning involves a cycle of concrete experiences, reflection, abstract conceptualization, and active experimentation, all of which can be enhanced by immersive digital environments (Le & Dinh, 2021). Sweller's (2011) cognitive load theory is also fundamental for the design of AR/VR applications, ensuring these technologies do not overwhelm students' working memory but gradually introduce complexity according to their cognitive capacity (Hussein et al., 2022).

Recent international and Indonesian studies have provided empirical evidence for the effectiveness of AR/VR in religious education. For example, a multinational survey found that teachers recognize AR/VR as effective tools for enhancing student engagement, motivation, and comprehension in religious and moral education settings (Albab et al., 2025). In Indonesia, pilot projects using AR for Qur'anic learning and Fikih in madrasas have shown significant improvement in students' understanding and enthusiasm for religious content (Munawir, 2025).

At the policy level, the Ministry of Religious Affairs of Indonesia explicitly encourages digital transformation in madrasas, including the adoption of immersive technologies, to support contextual and values-based Islamic education (Kementerian Agama RI, 2022; Ta'rifin et al., 2025). These policies highlight the need for not only technological adoption but also content development rooted in Islamic epistemology.

Furthermore, the philosophical foundation of Islamic education—centered on *tarbiyah* (holistic development), *ta'dib* (internalization of wisdom and ethics), and *adab* (propriety in seeking knowledge)—must serve as the guiding principle in AR/VR content design to realize the ideal of *insan kamil* (the complete person)(Bulan et al., 2024; Muvid & Kholis, 2024; Ta'rifin et al., 2025). This value-based approach distinguishes AR/VR use in madrasas from that in secular institutions, making the context of spirituality and character education a core aspect of successful and meaningful technology integration.

Context of Islamic Religious Education Learning in Madrasah

Madrassas in Indonesia play a central role in educating the young generation of Muslims through a curriculum that integrates religious science and general science (Rahman et al., 2023). The IRE curriculum includes the Qur'an-Hadith, Moral Faith, Fiqh, SKI, and Arabic, intending to instill religious understanding while building students' character. However, in practice, IRE learning in madrassas often still relies on one-way lectures, memorization, and assignment methods. Pedagogical challenges such as limited authentic learning resources, low digital literacy, and disparity in facilities between madrasas are structural issues that are still faced (Widiastuti et al., 2024; Fadhilah et al., 2022).

Along with the development of national policies such as *Digital Madrasah* and *the Digital Transformation Strategy for Islamic Education* by the Ministry of Religion (Kementerian Agama RI, 2022), opportunities for technological innovation are becoming increasingly accessible. Openness to the use of AR/VR is an important agenda in order to realize the vision of superior and globally competitive madrasas.

Implementation of AR/VR in the Education Sector

International research shows that the integration of AR/VR in religious education has a significant positive impact on students' motivation, concept understanding, and learning experience (Al-Azawei et al., 2022; Chai et al., 2022). In Malaysia, for example, VR is used for learning about Hajj and Islamic history, and has been shown to increase student interest and engagement (Hassan et al., 2023). Several studies also reported that the use of AR can strengthen the cognitive and affective connectedness of students in understanding religious narratives(Heriady, 2024; Huang et al., 2016; Papakostas, 2025).

In Indonesia, the implementation of AR/VR in madrassas is still limited to pilot projects and case studies. Kurniawan et al. (2023) documented the use of VR in Islamic history learning in a madrasah in Central Java, which resulted in a significant increase in student retention and participation. Other research shows that Qur'an-based AR applications can help students understand the laws of tajweed and remember verses more contextually and visually (Ahsan et al., 2021; Zainuddin et al., 2022).

Although the initial findings are very positive, various challenges still need to be anticipated, ranging from human resource readiness, access to devices, to clarity of curriculum guidelines and usage ethics. The lack of longitudinal research and evidence-based studies on a large scale is still an obstacle to producing comprehensive and applicable policy recommendations in Indonesia.

In theory, AR/VR offers a paradigm transformation of religious learning towards a more contextual, active, and value-based learning experience. However, the success of this technology integration is largely determined by policy readiness, human resources, and the development of content rooted in Islamic epistemology and ethics. The synergistic relationship between modern learning theory and Islamic education principles requires strengthening to create a meaningful and transformative digital madrasah.

Research Methods

This study uses a systematic but flexible narrative review approach to map, analyze, and synthesize literature related to the integration of Augmented Reality (AR) and Virtual Reality (VR) in Islamic Religious Education (IRE) in Indonesian madrasas, as well as compare it with international practices and findings. Narrative review was chosen to allow for a multi-dimensional exploration of empirical findings, theories, and policy practices, especially on topics that are still developing and have not been widely reviewed through quantitative meta-analysis (Ferrari, 2015; Turnbull et al., 2023). The approach supports a flexible yet rigorous synthesis process ideal for mapping AR/VR integration in Islamic education contexts.

Literature searches were carried out in a structured manner on several major scientific databases, including Scopus, Web of Science, Google Scholar, SINTA, and Garuda. The keywords used include a combination: "augmented reality", "virtual reality", "Islamic education", "madrasah", "religious education technology", and "Indonesia". The search was conducted for the period 2015 to 2024 to ensure the relevance and timeliness of the findings. In addition to peer-reviewed journals, resources such as conference proceedings, books, national policy reports, and official documents of the Ministry of Religion of the Republic of Indonesia are also included.

Submitted literature must meet the following criteria: (1) discuss the implementation, effectiveness, or challenges of AR/VR in the context of religious education, (2) focus on madrassas or Islamic educational institutions, but also include comparative studies from international contexts, (3) be published in Indonesian or English, and (4) contain empirical data, theoretical models, or a comprehensive literature review. Popular articles, opinions with no academic basis, and publications before 2015—except for seminal works—are excluded from reviews.

From the initial search results, 46 relevant publications were collected, consisting of 28 national/international journal articles, eight conference proceedings, five policy reports, and five additional documents (books/white papers). After a selection process based on abstracts and full review, 38 main sources were selected to be used in the synthesis, consisting of 23 empirical studies (quantitative/qualitative) and 15 theoretical reviews and policy documents. The composition of sources covers 55% of the Indonesian context and 45% of the international context, thus providing a balanced global-local perspective.

The analysis was carried out with a thematic approach, namely identifying the main themes inductively from the selected sources (Nowell et al., 2017; Thomas & Harden, 2008). The analysis process includes: (1) in-depth reading, (2) coding of key issues (e.g., learning

innovation, infrastructure challenges, ethical aspects, teacher competence), (3) grouping of codes into thematic themes, and (4) synthesis of narratives to highlight the linkages, differences, and resulting policy agendas. Emphasis is placed on comparing national and international findings to reinforce the relevance of the results.

Awareness of the potential selection bias and subjectivity of analysis is maintained by transparency in the source selection process, documentation of analysis steps, and triangulation with various types of literature. The limitations, including the lack of longitudinal studies and the diversity of madrasah contexts in Indonesia, are recognized, so that the results of this study are expected to be the basis for future research and policy development, rather than a definitive conclusion.

Results and Discussion

Potential of AR/VR Integration in IRE Learning in Madrasah

The integration of Augmented Reality (AR) and Virtual Reality (VR) in Islamic Religious Education (IRE) learning in madrassas offers a variety of transformative potentials that have not been fully utilized in conventional educational practices. Various empirical studies and pilot projects show that the use of this technology can accelerate pedagogical innovation, increase student motivation and engagement, and expand access to authentic learning resources that have been difficult to reach. Four critical potentials were found from the literature review, summarized in Table 1.

The first possible is the interactive learning experience innovation. One of the main advantages of AR/VR is its ability to present worship simulations (e.g., prayer, ablution, hajj rituals), visualization of Islamic history, and problem-based learning that requires active student involvement. For example, through VR applications, students can simulate the hajj pilgrimage with an immersive experience as if they were in the Grand Mosque, complete with an interactive explanation of the stages of manasik (Hassan et al., 2023). The Kurniawan et al. (2023) study also shows that the use of VR in Islamic Cultural History (SKI) learning allows students to "visit" the hijrah events of the Prophet Muhammad (PBUH) and historical sites, thereby significantly improving information retention and understanding of historical context.

The second is the increased student engagement and motivation. AR/VR has been proven to increase the engagement, curiosity, and learning motivation of IRE students. The novelty effect and multisensory stimulation presented by this technology make the learning process more interesting and memorable (Chai et al., 2022). Research in madrassas in Central Java showed that students who used VR modules to understand the story of the Prophet and his companions showed increased class participation and post-test comprehension scores compared to the control group (Kurniawan et al., 2023). International studies have also reported that the application of AR for learning the Qur'an, for example, in visually recognizing the law of tajweed, can increase students' interest in reading and understanding the Qur'an more deeply (Ahsan et al., 2021; Zainuddin et al., 2022).

The third is access to authentic learning resources. The great potential of AR/VR lies in its ability to reconstruct historical artifacts, holy places, and Qur'anic narratives that are difficult to access physically. With this technology, students can "visit" important sites in Islamic history (e.g., the Hira caves, the Prophet's Mosque) or trace the process of revelation visually and narratively. This approach fosters a sense of connection between students and the treasures of Islamic civilization and strengthens the internalization of spiritual values (Hussein et al., 2022). In addition, AR can provide an additional layer of information on real objects in the classroom, so that learning becomes more contextual and inquiry-based.

The last is strengthening 21st-century competencies. AR/VR integration encourages the development of digital literacy, critical thinking, problem-solving, and collaboration. Through collaborative activities in a virtual environment—for example, group discussions to reconstruct Islamic historical events—students are required to think analytically, communicate effectively, and work together across backgrounds (Fadhilah et al., 2022). This competence is the main capital to prepare the madrasah generation to face global challenges while remaining rooted in Islamic values.

In Indonesia, pilot projects using VR for IRE learning in several madrassas have shown positive results. One study at an aliyah madrasah in Central Java with 62 students showed that 83% of students found it easier to understand SKI material through VR simulations, with an increase in average comprehension score of 21% (Kurniawan et al., 2023). In Malaysia, VR applications for learning manasik hajj have also received a positive response from both students and teachers (Hassan et al., 2023). Although still limited to a small scale and not evenly distributed nationally, these results indicate the great potential of AR/VR integration in enriching the IRE learning experience in madrasas.

Overall, AR/VR offers strategic opportunities to revitalize religious learning in madrassas through pedagogical innovation, increased engagement, and growth of digital competencies, provided that the readiness of infrastructure, human resources, and progressive education policies supports it.

Table 1. Summary of the Study on the Implementation of AR/VR in Islamic Religious Education

No	Researcher & Year	Context/Location	Research Design	Focus of Intervention	Key Findings	Solutions/Good Practices
1	Kurniawan et al., 2023	Madrasah Aliyah, Central Java	Experiments, n=62	VR SKI learning	Increased comprehension (↑21%), 83% of students understand the material more easily.	Teacher mentoring, local curriculum-based content
2	Ahsan et al., 2021	Islamic Junior High School, Indonesia	Case study	AR Al-Qur'an & tajwid	Interest in reading the Qur'an increases, and the visualization of tajweed laws is easier.	Integration of AR to memorization/tahsin modules
3	Zainuddin et al., 2022	SD Islam, Indonesia	Survey experiment	AR basic IRE learning	Student engagement and material retention	Use of Android-based apps

No	Researcher & Year	Context/Location	Research Design	Focus of Intervention	Key Findings	Solutions/Good Practices
					increased significantly	
4	Hassan et al., 2023	Islamic School, Malaysia	Mixed-method	VR Manasik Hajj & Islamic History	Increased student participation and motivation, positive response from teachers	Teacher training and integration evaluation
5	Huang et al., 2016	School (public), Taiwan	Experiment	AR educational/religious narrative	Students' cognitive and affective connectedness is stronger	Experiential/exploratory learning
6	Chai et al., 2022	International Meta-analysis	Meta-analysis	AR/VR in K-12 & college	Positive effects on motivation, understanding, and learning outcomes	Adaptation of AR/VR applications according to cultural context
7	Hassan et al., 2023	Islamic School, Malaysia	Studi longitudinal	VR worship simulation	Formation of students' religious values and empathy	VR-based thematic curriculum

Challenges and Solutions to AR/VR Integration in IRE Learning in Madrasah

Although the potential of AR/VR in IRE learning in madrasas is very large, the integration process is faced with various complex and interrelated challenges. Analysis of the findings of national and international studies shows the following obstacles (see the summary of key findings in Table 2).

The first challenge is the limitations of infrastructure and human resources. The availability of hardware such as VR headsets, tablets, and smartphones is still very limited, especially in madrassas in non-urban areas (Widiastuti et al., 2024). Many madrassas depend on makeshift facilities and an unstable internet connection. In addition, the readiness of human resources—both teachers and technicians—is the main problem. Most teachers do not yet have adequate digital skills to design or implement AR/VR-based learning (Rohman et al., 2023). To solve these issues, the government and local governments need to allocate special funds for the procurement of digital devices and infrastructure in madrasas. Digital literacy training and certification programs for teachers also need to be expanded, including through partnerships with campuses or edutech startups.

Pedagogy and curriculum are the second challenge. IRE's national curriculum has not fully accommodated AR/VR-based learning innovations. Teachers tend to be hesitant or even resistant to changing traditional learning approaches because they are worried about disrupting the achievement of core competencies (Rahman et al., 2023). In addition, student readiness also varies—students with low digital literacy can experience anxiety or struggle to adapt to technology(Sholikah & Putra, 2022).It is necessary to revise and adjust the IRE curriculum based on the Ministry of Religion's policies, so that AR/VR can become an integral part of learning. The preparation of AR/VR integration guidelines by madrasah working groups and the involvement of students in content development can increase the readiness and acceptance of innovation.

The third challenge relates to ethics, data security, and regulatory aspects. The virtualization of worship and sacred artifacts through AR/VR raises ethical dilemmas and the need for caution in maintaining the sacredness of religious symbols. In addition, AR/VR applications generally require access to students' data, thus raising privacy and data protection issues that have not been specifically regulated in madrasah regulations (Hassan et al., 2023). There is no official fatwa or guideline that regulates the ethical limits on the use of AR/VR in the context of religious education.The Ministry of Religion and religious organizations need to issue special guidelines/fatwas on the virtualization of worship and AR/VR-based religious content. Student data protection standards must be applied by application developers, with regulations that are in sync with the Personal Data Protection Law (PDP).

The fourth and critical challenge is limitations of local studies and research. Until now, empirical research on the long-term impact of AR/VR integration in Indonesian madrassas remains minimal and is generally a short-term case study (Kurniawan et al., 2023). This shortage causes policy-making to tend to be trial-and-error based.Competitive research funding is needed for longitudinal studies and cross-madrasah collaboration, so that robust data is obtained for the development of contextual and effective AR/VR learning models.

Table 2. Summary of Challenges and Solutions for AR/VR Integration in Madrasah

No	Challenges/Obstacles	Brief Description	Practical Solutions	Key References
1	Infrastructure & HR	Lack of devices, unstable internet, and lack of digitally skilled teachers as human resources	Device-specific funds, teacher digital literacy training	Widiastuti et al., 2024; Rohman et al., 2023
2	Pedagogical & Curriculum	The curriculum is not yet adaptive, and teacher resistance and student readiness are diverse.	Curriculum revisions, AR/VR integration guidelines, student/teacher engagement	Rahman et al., 2023; Sholikah & Putra, 2022
3	Ethics, Data, and Regulation	Ethical dilemmas of virtualization of worship/artifacts, data privacy risks, and no special fatwas/guidelines	Guidelines/fatwas of the Ministry of Religion & mass organizations, application of data protection standards	Hassan et al., 2023
4	Lack of Local Studies & Research	Empirical studies of AR/VR in Indonesian madrassas are still very limited, typically consisting of short-term case studies.	Competitive & longitudinal research, cross-madrasah collaboration	Kurniawan et al., 2023
5	Social Divide & Digital Divide	Inequality of access between urban madrasas and disadvantaged areas results in unequal digital literacy among students and teachers.	Affirmation programs, device subsidies, and public-private partnerships	Fadhilah et al., 2022

The final obstacle is the social divide and digital divide. The disparity in access to technology between madrassas in big cities and disadvantaged areas has widened the disparity in the quality of education. Students in remote madrassas are at risk of being left behind in mastering digital literacy and access to learning innovations (Fadhilah et al., 2022).Affirmation programs such as "Digital Madrasah for All" need to be implemented,

with a special device subsidy and mentoring scheme for madrasas in 3T (Disadvantaged, Frontier, Outermost) areas. CSR collaboration and public-private partnerships can accelerate equal access.

Overall, the success of AR/VR integration in IRE learning is not only determined by technological readiness, but also policy synergy, ethics, human resource development, and commitment to closing the gap in access between madrasas. A holistic and evidence-based cross-sector approach is an absolute requirement for the digital transformation of madrasas to be truly inclusive and sustainable.

Discussion and Critical Analysis

The review of existing literature and empirical studies underscores a dynamic interplay between the transformative potentials and persistent challenges associated with integrating AR/VR into Islamic Religious Education (IRE) at madrasahs. On one hand, AR/VR technologies offer unprecedented opportunities to innovate instructional practices, foster student engagement, and bridge the gap between abstract religious concepts and authentic learning experiences. The ability to simulate rituals, visualize Islamic history, and access reconstructed holy sites demonstrates clear pedagogical value and aligns with global trends toward immersive learning (Ahsan et al., 2021; Hussein et al., 2022; Khasawneh, 2025). Furthermore, AR/VR platforms cultivate 21st-century competencies, such as digital literacy and critical thinking, which are increasingly recognized as integral to holistic Islamic education(Alsayyar & Almakki, 2021; Fadhilah et al., 2022).

However, these potentials are significantly mediated by formidable barriers. Limited infrastructure, unequal access to technology, teacher preparedness, and questions regarding curricular and ethical alignment present substantial obstacles to the widespread adoption of AR/VR in Indonesian madrasahs (Widiastuti et al., 2024; Hassan et al., 2023). The ethical sensitivity surrounding the virtualization of sacred rituals and sites, coupled with data security and content moderation challenges, requires careful policy attention and stakeholder collaboration. Thus, while AR/VR integration holds promise for pedagogical transformation, its practical realization demands nuanced, context-aware strategies and ongoing support at multiple levels.

The implications for teaching practice and curriculum development are profound. Educators and curriculum designers must reconceptualize Islamic learning not merely as the transmission of fixed knowledge but as a process of experiential meaning-making, underpinned by both spiritual and technological literacy(Sari et al., 2024). The curriculum must become more adaptive, permitting the integration of AR/VR modules that both reinforce core religious values and foster active, participatory learning(Suhendi, 2024).

Despite growing interest and some promising pilot projects, this review identifies notable gaps in the current research landscape. Most empirical studies to date have focused on the initial adoption phase or short-term impacts of AR/VR interventions, often within limited or well-resourced settings (Kurniawan et al., 2023). There is a paucity of robust, large-scale, and longitudinal studies that systematically examine the sustained effects of

AR/VR integration on religious understanding, character formation, and learning outcomes in diverse madrasah contexts.

Another critical gap is the development of AR/VR content that is authentically grounded in Islamic epistemology and pedagogy. Many existing applications are adapted from secular or non-local contexts, raising questions about their doctrinal appropriateness and cultural resonance (Hassan et al., 2023). Furthermore, there is limited exploration of students' and teachers' lived experiences, attitudes, and the sociocultural negotiations that shape the actual use of these technologies in religious education. As such, there remains significant novelty to be explored, particularly in designing value-based, context-sensitive AR/VR learning environments that reflect the lived realities and aspirations of Indonesian Muslim communities.

Strategic Recommendations

To move beyond pilot projects and toward sustainable impact, a coordinated, multi-stakeholder approach is essential. Policymakers should prioritize investment in digital infrastructure, particularly in underserved madrasahs, to address disparities in access. National and local governments must also develop clear regulatory guidelines that ensure content authenticity, data security, and ethical use of AR/VR in religious instruction.

For educators, systematic and ongoing professional development is crucial. Training should not only address technical proficiency but also foster critical reflection on pedagogical, ethical, and spiritual dimensions of AR/VR integration. Teacher communities of practice and collaborative networks can serve as important platforms for sharing experiences, resources, and best practices (Rohman et al., 2023).

Technology developers are encouraged to engage directly with madrasah stakeholders—teachers, students, religious scholars—in the co-creation of AR/VR content. This participatory approach ensures that technological innovations align with local values, curricular needs, and doctrinal requirements, enhancing both acceptance and effectiveness.

Researchers are advised to adopt mixed-methods and participatory designs, emphasizing longitudinal and comparative studies that capture both outcomes and processes. The inclusion of student, teacher, and community voices will be vital in developing nuanced understandings of how AR/VR can best support transformative Islamic education.Future research should focus on developing and evaluating hybrid learning models that combine the strengths of face-to-face instruction with AR/VR-enhanced experiences. Such models should be underpinned by Islamic pedagogical principles and be responsive to the diverse needs of madrasah learners.

The creation and assessment of AR/VR content explicitly designed around Islamic values, narratives, and rituals represent another critical direction. This creation includes the exploration of culturally and doctrinally authentic simulations, the ethical boundaries of virtualizing sacred experiences, and the development of guidelines for respectful and beneficial use.Longitudinal studies are needed to assess the long-term effects of AR/VR integration on student learning, religious identity, and character development. Cross-institutional collaborations, involving both Indonesian and international madrasahs, could

generate comparative insights and foster the development of global best practices adapted to local contexts.

In summary, realizing the full potential of AR/VR in Islamic Religious Education at madrasahs requires not only technological innovation but also pedagogical imagination, ethical vigilance, and sustained research grounded in local realities.

Conclusion

This narrative review highlights both the substantial potential and the multifaceted challenges associated with integrating augmented reality (AR) and virtual reality (VR) into Islamic Religious Education (IRE) at Indonesian madrasahs. AR and VR technologies have demonstrated clear benefits in creating interactive, immersive, and contextually rich learning environments that can make abstract religious concepts tangible, foster deeper student engagement, and develop crucial 21st-century competencies. They offer unique opportunities for simulating worship practices, visualizing Islamic history, and providing authentic access to remote religious sites, which collectively enhance the pedagogical quality and relevance of IRE.

Nevertheless, the adoption of these technologies faces persistent barriers, including limited infrastructure, unequal access to digital devices and connectivity, inadequate teacher training, and the need for rigorous alignment with curriculum and Islamic ethical standards. Challenges related to data privacy, content moderation, and the sensitive virtualization of sacred elements further complicate their integration. Moreover, the digital divide between urban and rural madrasahs threatens to exacerbate existing educational inequities if not carefully managed through inclusive policies.

In the short term, the strategic and context-aware implementation of AR/VR can enrich IRE learning experiences and motivate both students and educators toward digital literacy and innovation. Long-term implications are even more significant: successful integration of AR/VR has the potential to transform the pedagogical landscape of madrasahs, equipping students with not only religious knowledge but also the digital and critical thinking skills essential for future societal participation. For policymakers and stakeholders in Islamic education, this underscores the importance of sustained investment in digital infrastructure, ongoing professional development for teachers, and the development of local, culturally relevant AR/VR content.

Ultimately, the effective realization of AR/VR's benefits in IRE depends on robust, context-sensitive research and the formulation of evidence-based policies. There remains an urgent need for longitudinal studies, participatory content development, and collaborative policy-making that prioritize ethical, pedagogical, and technological considerations. Only through such coordinated and sustained efforts can AR/VR integration contribute meaningfully to the holistic development of students and the advancement of Islamic education in Indonesia.

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