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Building Virtual Reality Hajj Journey Learning Media as a Simulation Tool for Teaching Hajj and Umrah Topics

Mochammad Rizal Ramadhan[1*], Samudra Mutiara Hasanah[2], Tsania Khoirunnisa[3], Tri Anggara Medhi Sampurno[4], Nur Faizin[5], Achmad Sultoni[6], Reno Nurdiyanto[7], Abd Aziz bin Rekan[8]

[1,2,3,4,5,6] Universitas Negeri Malang, Indonesia
[7] Universitas Islam Negeri Raden Mas Said Surakarta, Indonesia
[6] Universiti Malaysia Sabah, Malaysia

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ABSTRACT

The need for more engaging Hajj and Umrah education highlights the limitations of conventional methods, such as lectures and printed manuals, which often lack experiential and spiritual depth. While Virtual Reality (VR) has become increasingly common in education, its use in religious ritual training, particularly for Hajj and Umrah, remains largely underexplored. This study aims to develop immersive learning media that allow users to practice Hajj and Umrah rituals interactively. The development of the VR-Hajj application followed the Research and Development (R&D) model by Lee and Owens, which includes five stages: analysis, design, development, implementation, and evaluation. The validation process involved experts who assessed the media's content, usability, and instructional design. Data were analyzed using inter-rater agreement to determine consistency among expert evaluations, with results showing a high level of agreement. The Content Validity Index (CVI) was also used to assess overall validity, yielding a strong score of 0.83. Experts gave the VR-Hajj media an average rating of 91.54%, confirming its effectiveness and instructional relevance. These findings support VR-Hajj as a promising tool for improving Hajj and Umrah preparation through immersive Islamic learning. The study also proposes a future framework integrating VR and metaverse technologies to enhance accessibility and engagement. To expand its impact, further research should explore strategic partnerships with Islamic boarding schools (pesantren) to help deliver VR-based religious education more widely and inclusively.

KEYWORDS

Hajj simulation; Islamic learning tool; Research and Development; Spiritual experience, Virtual reality

[*]**Corresponding author**: Mochammad Rizal Ramadhan ✉(mochammad.ramadhan.fs@um.ac.id), Universitas Negeri Malang, Indonesia

Introduction

The data from the Saudi Arabian Ministry of Hajj and Umrah indicates that the average number of pilgrims performing Hajj in Mecca each year reaches approximately 2.5 million people (BPKH 2022). These prospective pilgrims require comprehensive information to complete their spiritual journey, including the rituals they must perform, the locations they need to visit, and the distances between these sites (Fahham 2016; Melebari and Khan 2022). Hajj and Umrah Guidance Groups (Kelompok Bimbingan Ibadah Haji dan Umrah, or KBIHU) help facilitate this process by providing access to information and organising pre-departure simulations. However, most KBIHU in Indonesia still rely on conventional, non-interactive training methods (Ramadhan et al., 2024). This is unfortunate given the rapid advancement of modern technology, particularly immersive media, which holds great potential to improve both the effectiveness and efficiency of Hajj and Umrah preparation programs (Setiawan et al. 2024; Kholiq et al., 2023). Therefore, innovative, technology-based learning solutions are needed to optimise the training experiences of Indonesian pilgrims.

Several studies have introduced digital tools designed to support Hajj learning, such as the E-Hajj application, which provides travel routes, key site information, and activity schedules (Syahril et al., 2016); the Manasikana app, offering practical guidance on Hajj and Umrah rituals (Santoso 2019); and the Smart Hajj application, which integrates real-time location tracking and QR code technology to enhance monitoring and security (Kusuma and Hadinata 2022). While useful, these tools mainly rely on static or video-based content and lack immersive interaction, leaving many pilgrims feeling unprepared or overwhelmed during the actual pilgrimage (Jamaludin et al. 2022; Muna, Amaluddin, and Rn 2022). These limitations reveal a gap between available technology and the pedagogical depth required for adequate spiritual and procedural readiness. This is especially true in local contexts such as KBIHU Al-Falah Malang, where the need for engaging, contextually relevant, and interactive learning tools is increasingly evident.

Virtual Reality (VR) presents a promising solution for bridging this gap. VR enables prospective pilgrims to experience Hajj and Umrah rituals as if they were physically present in Mecca, even before departure (Melo 2020; Abich et al. 2021). Previous research, including Fahri (Fahri 2023), has explored VR-based simulations for Hajj. Still, the existing platforms were limited—often using basic devices like Google Cardboard—and lacked comprehensive instructional content, particularly regarding the religious rules, procedures, and prohibitions. Furthermore, cultural awareness remains a critical issue. For example, many Indonesian pilgrims are unfamiliar with specific customs in sacred places such as Raudhah, where improper behaviour—such as failing to queue or

using loud chants—can disrupt fellow worshippers (Taibah et al. 2020; Bustamam-Ahmad and Zakaria 2018). These challenges underscore the urgent need for a more holistic and culturally responsive simulation tool that fosters both procedural accuracy and spiritual sensitivity.

Despite growing interest in digital tools for Hajj and Umrah education, few initiatives offer a fully integrated solution that combines immersive experience, pedagogical structure, and cultural insight. Most current applications provide fragmented or superficial learning that does not sufficiently support pilgrims with limited prior religious knowledge. Thus, there is a strong demand for the development of VR-based instructional media that allows users to cognitively and emotionally engage with the pilgrimage experience in a safe and controlled environment.

This study aims to develop the *VR Hajj Journey* learning media as an immersive and interactive simulation tool for teaching the rituals of Hajj and Umrah. *VR Hajj Journey* offers the advantage of experience-based learning, providing a depth of engagement that previous educational tools for Hajj and Umrah have yet to achieve. This media contributes to the body of constructive pedagogy literature, which highlights experience as a key factor influencing the depth and breadth of knowledge acquisition (Suryadi 2022). In addition, the *VR Hajj Journey* has the potential to be both scalable and inclusive, making it accessible to people of various ages and backgrounds. This is especially relevant since the majority of prospective pilgrims are elderly individuals who often face physical limitations when performing the successive steps of Hajj and Umrah (Syarifuddin et al., 2022). Therefore, this media is expected to promote more equitable access to Islamic education.

Using the Research and Development (R&D) model by Lee and Owens, the study evaluates the media's content validity, usability, and instructional effectiveness. Specifically, it addresses the research question: *How valid and instructionally appropriate is the developed Virtual Reality Hajj Journey learning media as a simulation tool for teaching the rituals of Hajj and Umrah?* By integrating technological innovation into Islamic education, this research presents a novel framework for immersive religious learning—one that helps Indonesian pilgrims build spiritual readiness and gain ritual competence.

Literature Review

Virtual Reality-Based Islamic Learning Media

VR has become an innovative force in education, offering immersive and interactive learning experiences that increase student engagement and comprehension. In the context of Islamic learning, VR provides a unique opportunity to simulate environments and rituals that are otherwise difficult to experience firsthand (Bailenson 2018; Bushell 2024). By virtually placing learners within sacred spaces, such as mosques or pilgrimage sites, VR can foster a stronger emotional and cognitive connection to religious practices (Tham et al. 2018).

This immersive approach supports modern educational theories that emphasise experiential and student-centred learning. Instead of simply reading about religious rituals or viewing instructional videos, learners can actively participate in them through guided VR experiences. These simulations allow users to visualize spatial layouts, rehearse physical movements, and navigate religious protocols with greater confidence and understanding (Asril et al. 2023). As a result, learners are more likely to internalize and apply what they have practised in virtual settings.

Designing VR media for Islamic education requires careful attention to both pedagogical value and religious authenticity (Sumardani et al. 2021). The content must remain respectful and accurate while being engaging and accessible for diverse learners. Educators and developers must collaborate to ensure that virtual tools reflect core Islamic teachings while also meeting the learning needs of modern users (Junaedi et al., 2024). With the right design strategies, VR-based Islamic learning can offer a dynamic and respectful alternative to traditional approaches.

Furthermore, the integration of VR into Islamic learning presents a powerful solution for overcoming geographical and financial limitations. Students and prospective pilgrims who may not have access to physical instruction or training centres can still benefit from virtual simulations. This expands the reach of religious education and supports equitable access to spiritual preparation across regions. Ultimately, the use of VR in Islamic education not only enriches the learning experience but also aligns with broader goals of educational inclusivity, technological integration, and spiritual growth (Moslimany et al., 2024; Nasucha et al., 2023).

A critical dimension that further enhances the application of VR in Islamic education is the concept of embodiment, which refers to the sensation of being present in, owning, and controlling a body within the virtual environment (Arjmand 2022; Tham et al. 2018). In VR-based pilgrimage simulations, users are not merely passive observers of religious rituals; they actively experience them through a virtual body or avatar that

replicates physical gestures and spatial interactions. This embodied experience strengthens procedural memory and deepens spiritual engagement, allowing learners to internalize practices like Tawaf and Sa'i both cognitively and physically. Research indicates that variations in avatar design can influence users' perceptions and behaviours, shaping how they connect with virtual religious spaces (Aljaroodi et al. 2023; Freeman and Maloney 2021). Therefore, integrating embodiment theory into VR-based Islamic learning tools contributes to a more immersive, emotionally resonant, and pedagogically impactful learning experience. Establishing reliable metrics to evaluate users' sense of embodiment is essential to optimize this immersive effect and ensure the instructional design remains both meaningful and measurable.

As the digital landscape continues to evolve, embracing VR as a complementary tool can help bridge the gap between tradition and innovation. It allows Islamic teachings to be preserved and experienced in ways that resonate with contemporary learners, fostering both reverence and relevance. With continued research, collaboration, and ethical design, VR has the potential to transform the way Islamic knowledge is conveyed (Mustapa et al. 2023). This ensures that the learning experience remains impactful, accessible, and deeply meaningful in the modern era.

Hajj and Umrah Simulation in Educational Contexts

Hajj and Umrah involve a series of complex, time-bound rituals performed in specific locations under specific conditions. Preparing pilgrims to perform these rituals correctly is a key responsibility of religious educators and guidance groups. Traditional methods such as printed booklets, verbal instruction, or short video clips often fall short in helping learners fully grasp the sequence and significance of each ritual (Shalihin and Widodo 2019; Bender 2023). Simulation-based learning provides an effective solution for improving both cognitive understanding and physical readiness (Ridda et al. 2021). Through simulated environments, prospective pilgrims can practice the steps of the Hajj and Umrah rituals in a safe and structured setting (Shah 2024). This hands-on preparation builds confidence, reduces anxiety, and ensures that participants can perform their duties with proper intention and procedural accuracy when the time comes.

Incorporating simulation into Hajj and Umrah education also enhances emotional and spiritual engagement. By allowing learners to virtually walk through the rituals—such as Tawaf around the Kaaba or Sa'i between Safa and Marwah—they can develop a deeper connection to the pilgrimage even before arriving in Mecca (Owaidah et al. 2019). This kind of immersive experience fosters reflection and familiarity, making the

actual journey more meaningful and less overwhelming. Moreover, simulation tools can be adapted to accommodate different learning needs and physical abilities. Elderly pilgrims, individuals with disabilities, and those living in remote areas can all benefit from virtual or digital training media (Alwakid, 2025). As such, Hajj and Umrah simulation programs have the potential not only to enhance learning outcomes but also to support inclusivity and accessibility within religious education.

To get the most out of simulation-based learning, Hajj and Umrah VR experiences must be designed with both educational effectiveness and Islamic values in mind. Developers should work closely with religious scholars to ensure that every ritual is represented accurately and respectfully, while instructional designers should focus on creating interactive, easy-to-use, and flexible learning environments (Campbell 2016). This kind of collaboration helps ensure that the technology complements traditional religious instruction rather than replacing it.

In the bigger picture of Islamic education, using VR simulations to prepare for pilgrimage shows how technology can support lifelong spiritual growth (Sudiro and Munjin 2024; Papakostas 2024). As digital tools become more widely available, they open up new ways for Muslims around the world to strengthen their religious understanding and feel more confident and prepared for their sacred journey. In the end, this approach highlights how educational technology can be both powerful and meaningful when it's grounded in cultural respect and spiritual purpose.

Method

This study employed a Research and Development (R&D) method to produce and validate the Virtual Reality Hajj Journey learning media as a simulation tool for teaching Hajj and Umrah rituals. The research was conducted in Malang City, East Java, Indonesia, targeting members of the local community, particularly prospective Hajj pilgrims affiliated with the Hajj and Umrah Guidance Group (Kelompok Bimbingan Ibadah Haji dan Umroh or KBIHU) Al-Falah Malang. This setting was chosen due to the high demand for practical, immersive preparation tools among prospective pilgrims.

The development process followed the Multimedia-Based Instructional Design ADDIE model proposed by (Lee and Owens 2004). This model was selected for its focus on integrating technology into instructional design, especially for creating interactive multimedia tools. The model consists of five systematic phases: (a) Analysis, including needs assessment and front-end analysis; (b) Design; (c) Development; (d) Implementation; and (e) Evaluation (Figure 1).

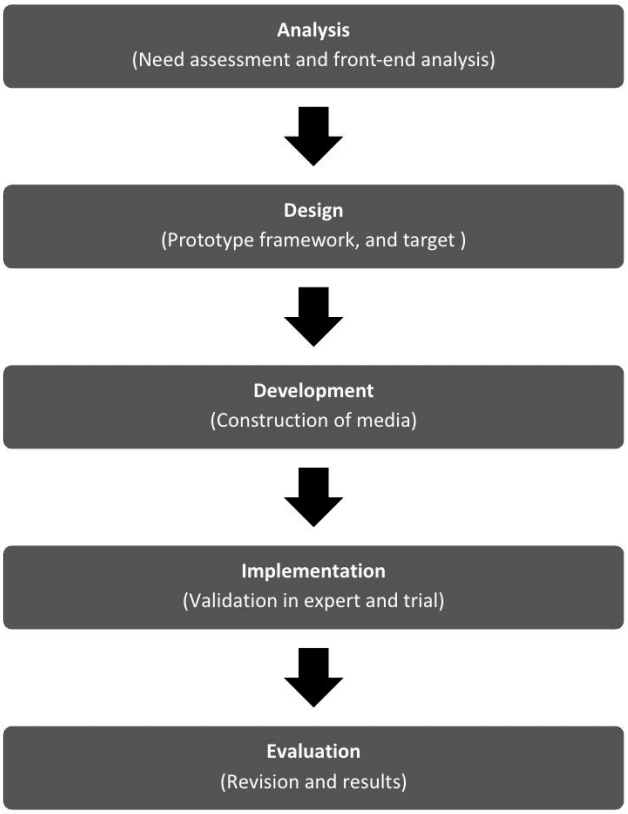

Figure 1. Lee and Owens R&D Model Phases

The primary focus of the research was to examine the validity and feasibility of the developed VR Hajj Journey media. The research variables included media validity, usability, ease of use, accuracy, and visual appeal. Data sources consisted of expert validators in instructional media and Islamic content, as well as end users from the community. Expert validation instruments were designed using Likert-scale items that assessed the aforementioned variables.

Quantitative data analysis was carried out using the inter-rater agreement method to measure consistency among expert judgments (Table 1). The overall validity of the media was then evaluated using the Content Validity Index (CVI), with an acceptable threshold of S-CVI ≥ 0.80. In addition to numerical ratings, experts provided qualitative feedback and improvement suggestions through comment sections in the validation forms.

Tabel 1. Inter-rater-agreement model

	Expert Validation 2	
Expert Validation 1	Low relevance (item rated 1-2)	High relevance (item rated 3-4)

Low relevance (item rated 1-2)	A	B
High relevance (item rated 3-4)	C	D

The basis for decision-making employs the expert test index, using an inter-rater agreement model and the following data interpretation scale.

$$Expert\ Test\ Index = \frac{D}{A + B + C + D}$$

Explanation:

A: Low relevance from both Expert 1 and Expert 2
B: Low relevance from Expert 1 and high relevance from Expert 2
C: High relevance from Expert 1 and low relevance from Expert 2
D: High relevance from both Expert 1 and Expert 2

After the expert validation results were analyzed, a second phase of data collection was conducted involving feedback from prospective users. This step was essential to understand user perceptions of the media's usability and effectiveness in a real-world context. Respondents were asked to use the VR Hajj Journey media and complete a structured feedback form. Their responses, both quantitative and qualitative, were used to refine and improve the product further.

Tabel 2. Validity Classification

Score Range	Criteria	Validity Classification
0,76 – 1,00	Very Accurate/Very Useful/Very Interesting/Very Easy	Very High
0,51 – 0,75	Accurate/Useful/Interesting/Easy	High
0,26 – 0,50	Less Accurate/Less Useful/Less Interesting/Less Easy	Medium
0,00 – 0,25	Inaccurate/Not Useful/Not Interesting/Not Easy	Low

Source: (Gregory, 2021)

This two-stage validation process—first from experts and then from end users—ensured that the VR media was not only theoretically valid but also practically appropriate for use in community-based Hajj education. The integration of both expert and user perspectives contributed to the development of a learning tool that is pedagogically sound, technologically feasible, and contextually relevant to the needs of Indonesian pilgrims.

Results

The Virtual Reality Hajj Journey (VR-Hajj) was developed as an innovative tool to simulate the pilgrimage experience for prospective Hajj and Umrah pilgrims, aiming to enhance their understanding and spiritual preparation. The VR-Hajj program provides an immersive, interactive, and educational environment that simulates key rituals of the Hajj, allowing users to experience and familiarise themselves with the rituals in a controlled virtual space.

To ensure the simulation is both accurate and instructionally sound, VR-Hajj was vetted by a panel of subject-matter experts, including Islamic-law scholars and instructional-technology specialists. Their reviews, covering content fidelity, user experience, and alignment with authentic Hajj procedures, confirmed that VR-Hajj is a valid and effective platform for strengthening pilgrims' understanding of each ritual and their overall preparedness for the journey.

Development of VR-Hajj Journey

The VR Hajj explores how advanced virtual reality (VR) technologies can be used to simulate the sacred pilgrimage of Hajj and Umrah. By harnessing the power of VR, the project aims to bridge the gap between real-world limitations, such as physical, financial, or logistical barriers, and the deeply spiritual nature of the pilgrimage. This innovation makes the experience more accessible to a wider audience while honouring the sanctity and emotional depth of the actual journey.

This section also dives into the design of the VR Hajj Journey, detailing how each element was crafted to create an immersive and meaningful simulation. From the visual reconstruction of sacred sites to the sequencing of rituals and interactive components, the design prioritizes both educational value and spiritual authenticity.

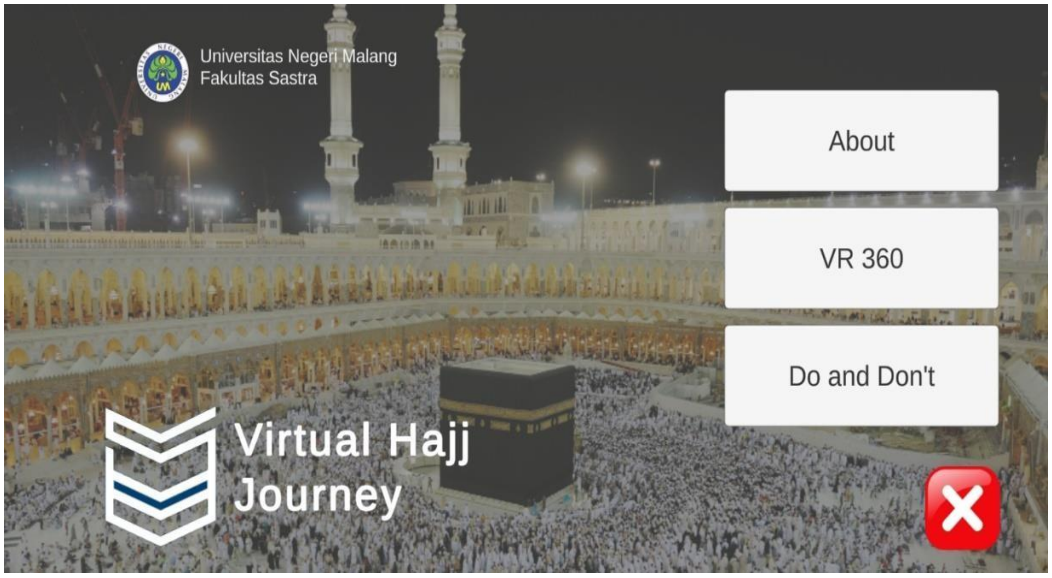

Figure 2. Menu Features of VR-Hajj

The VR-Hajj application features three core components, VR 360 and Do and Don't, each thoughtfully designed to support users in both the technical and spiritual preparation for the Hajj pilgrimage. Together, these features offer a comprehensive virtual experience that enhances understanding and readiness for the sacred journey.

Tabel 3. VR-Hajj Menu Features

Feature	Description
About	Provides an overview of the application's purpose along with usage instructions.
VR 360	Offers an immersive simulation of key Hajj rituals, enhancing familiarity with each stage.
Do and Don't	Lists essential guidelines on recommended and prohibited actions during Hajj.

The About section serves as an introductory guide, helping users understand the purpose of the application and how to operate it. By offering clear and accessible instructions, this feature ensures that users can confidently navigate the virtual experience from the very beginning.

The VR 360 feature provides an immersive, interactive simulation of the Hajj journey. Users can virtually engage in essential rituals, including Tawaf (circumambulating the Ka'bah seven times), Sa'i (walking between the hills of Safa and Marwah), spending the night during the Day of Arafah, and completing Tawaf al-Wada. These virtual rituals are accompanied by the appropriate prayers and recitations,

allowing users to develop a deeper spiritual connection while learning the correct procedures and sequence of worship during the pilgrimage (Tagliacozzo and Toorawa 2016).

The Do and Don't features complement the immersive experience by offering practical guidance on the behaviours expected during Hajj. It outlines recommended actions and actions to avoid, ensuring that users understand the proper etiquette and religious boundaries of the pilgrimage. Together, these three features make the VR-Hajj application not only a powerful educational tool but also a meaningful platform for spiritual growth and preparation.

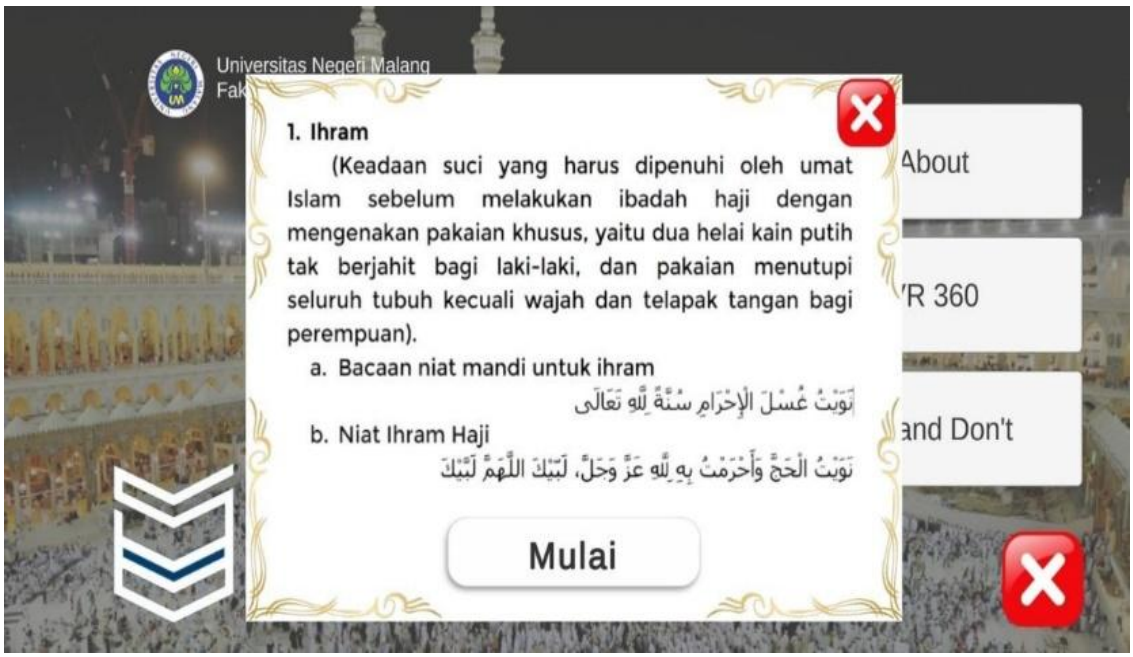

Figure 3. About Feature

The About feature in the VR-Hajj application includes important introductory content to help users build foundational knowledge before beginning the virtual pilgrimage. One of its key elements is an explanation of the different types of Hajj—Tamattu, Ifrad, and Qiran, which allows users to understand the distinctions and requirements of each form. This provides essential context for anyone new to the pilgrimage or seeking a deeper understanding of its variations.

In addition, the About section offers initial readings and prayers that are typically recited at the start of the Hajj journey, similar to those performed during Umrah. These guided readings help users become familiar with the appropriate spiritual practices, ensuring they are mentally and spiritually prepared before engaging with the more immersive aspects of the VR experience.

Figure 4. The Tawaf Activity and The Prayer Feature

The Tawaf activity and its integrated prayer feature offer users an immersive experience. With specific prayers included in each ritual feature—like during Tawaf—users no longer have to search for the appropriate supplications themselves. This seamless integration allows users to stay focused on the spiritual journey without the distraction of looking up the right prayers for each part of the pilgrimage (Hassan et al., 2022).

In addition, the clear guidance and intuitive design of the feature make it especially helpful for first-time pilgrims or those less familiar with the rituals. By combining accessibility with authenticity, the experience supports correct practice and deepens users' connection to the spiritual meaning behind each act of worship.

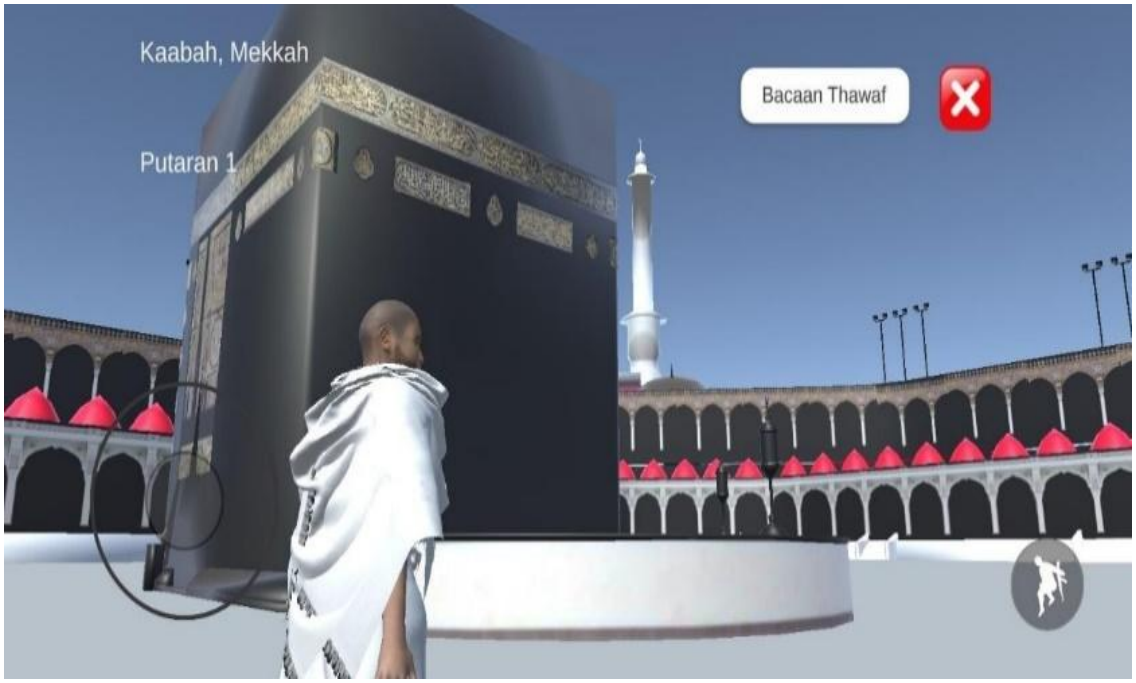

Figure 5. The First Circuit of the Seven Circuits of Tawaf

VR-Hajj offers a realistic and interactive experience, allowing users to feel as though they are physically in Mecca or Medina (Niu 2023). This immersive feature enhances the sense of closeness to the rituals of Hajj and Umrah, making the experience feel more authentic and spiritually engaging. The application is designed with flexibility in mind, helping users especially first-time pilgrims, better understand the steps and significance of each part of the pilgrimage. With intuitive navigation and guided content, it removes barriers that might otherwise make the rituals feel overwhelming or confusing.

Additionally, the app is not limited by time or location, allowing users to access it anytime and anywhere. Whether preparing months in advance or reviewing rituals on-site, users can learn and reflect at their own pace. This level of convenience empowers individuals to build a deeper connection to the pilgrimage experience, regardless of where they are, fostering both confidence and spiritual readiness.

Validation Results of VR-Hajj Journey

Validation is a critical step in ensuring the accuracy and reliability of the VR experience for users. It involves a comprehensive evaluation of the application's ability to authentically represent the rituals of Hajj and Umrah while meeting the spiritual, educational, and cultural objectives of the pilgrimage. Through this process, developers

can identify areas for improvement and ensure the content remains faithful to Islamic teachings and practices.

The validation process includes collecting feedback from religious scholars, instructional designers, and technology experts to assess the application's content accuracy, user interface design, and overall usability. By applying rigorous criteria and structured evaluation methods, this process ensures that the VR Hajj Journey offers a meaningful, respectful, and immersive experience. This section outlines the validation strategies employed and underscores their significance in delivering a virtual pilgrimage that is both educational and spiritually enriching.

In addition to expert evaluations, user testing plays a vital role in the validation process. Engaging a diverse group of users, including those with varying levels of familiarity with the Hajj and Umrah rituals, helps uncover practical insights related to usability, engagement, and emotional resonance (Alharbi et al. 2025). This user-centered approach strengthens the application's overall effectiveness but also ensures that the virtual experience is accessible and impactful for a broad audience, from prospective pilgrims to educators and learners exploring Islamic practices.

Tabel 4. Item Validation Results

No	Indicator	Percentage (%)	Criteria
1	Material and construction aspects of VR-Hajj	91.67	Valid
2	Display the user interface on the VR-Hajj application	93.83	Valid
3	Display of pictures and illustrations on the VR-Hajj and applications	90.33	Valid
4	Display of 3D objects in the application	90.33	Valid
	Average	**91.54**	**Valid**

The results of the validation from the experts yielded an average score of 91.54, which falls within the valid range. The material and construction were assessed based on their alignment with the core concepts and steps of the Hajj rituals, ensuring that the sequence and content adhered to Islamic teachings. The user interface was found to be intuitive and user-friendly, making navigation accessible even for users unfamiliar with VR technology. Experts also highlighted the clarity and relevance of images and illustrations, which play a vital role in supporting visual learning. Furthermore, the 3D objects used in the application, such as the Kaaba, Masjid al-Haram, and ritual sites were praised for their detail and realism, enhancing the immersive quality of the experience.

Several revisions suggested by the experts included the need for further development, particularly in enabling the application to incorporate metaverse technologies, such as the use of meta-helmet devices. This feedback on metaverse technologies highlights opportunities to increase interactivity and realism, allowing users to feel even more present within the virtual environment (Dwivedi et al. 2022). By adopting advanced technological integrations, the VR Hajj Journey could become a more comprehensive and engaging tool for simulating the pilgrimage. These revisions are aimed at improving the functional quality of the media and ensuring its alignment with religious authenticity and user expectations.

Additionally, the results of the Scale-Content Validity Index (S-CVI) revealed an inter-rater agreement score of 0.83, which meets the acceptable standard established by (Polit and Beck 2006). This score indicates a high level of consistency among the experts in their assessments of the VR Hajj media, affirming the instrument's validity. The strong inter-rater agreement suggests that the evaluators shared a common understanding of the application's strengths and limitations, reinforcing confidence in the validation results. As a result, the application is deemed to be a reliable, accurate, and contextually appropriate tool for supporting users in understanding and engaging with the rituals of Hajj and Umrah.

In conclusion, the expert validation process confirms that the VR Hajj Journey meets essential standards for educational, spiritual, and technological effectiveness. By combining realistic visuals, intuitive design, and authentic religious content, the application presents a strong foundation for virtual pilgrimage experiences. Ongoing improvements, guided by expert feedback and user testing, will further enhance the platform's capabilities. Ultimately, this initiative contributes meaningfully to Islamic education, offering an accessible and immersive way to prepare for and reflect upon the Hajj and Umrah pilgrimages.

Discussions

The expert validation results indicate that the VR Hajj Journey application meets a high standard of quality in representing the rituals of Hajj and Umrah. The evaluation covered essential components, including the material and construction of the content, the design of the user interface, visual illustrations, and the accuracy of 3D object representations. These components collectively contribute to the authenticity and educational value of the application. Previous research has emphasized that immersive learning environments must integrate both content accuracy and visual engagement to maximize learning outcomes, especially in spiritually significant contexts (Astatke, Weng, and Yohannes 2025). The application's attention to realistic and detailed

renderings of ritual spaces, such as the Kaaba, Masjid al-Haram, and Mount Arafat, significantly enhances user immersion and reinforces both cognitive and affective engagement with the material.

Expert recommendations also included the potential for further development, particularly through integration with metaverse technologies such as meta-helmet devices. These technologies would increase the interactivity and sensory realism of the experience, supporting a stronger sense of presence and embodiment (Gülen et al., 2022). This aligns with emerging trends in immersive learning research that highlight how advanced virtual reality and mixed reality tools can deepen user engagement and foster emotional connections to content (Bailenson 2018; Chang et al., 2023; Seabrook et al. 2020). The incorporation of such features would not only elevate the technological quality of the application but also provide a richer, more holistic simulation of Hajj rituals, potentially transforming how Islamic religious education is delivered in the future.

The further analysis used S-CVI scale confirms the reliability of expert judgments. This value meets the standards, indicating a high level of inter-rater agreement. Strong agreement across multiple evaluators suggests the application possesses content that is both accurate and pedagogically sound. Studies in similar contexts, such as cultural heritage simulations and language immersion programs, have also shown that expert consensus is crucial for maintaining the credibility and effectiveness of virtual learning platforms (Lin et al. 2025). Thus, the strong validation metrics achieved in this study provide a solid foundation for broader implementation and future iterations of the application.

In addition to expert evaluations, the VR Hajj Journey media has demonstrated potential to address key challenges in preparing for the pilgrimage. Many prospective pilgrims experience anxiety or uncertainty due to a lack of exposure to the complex rituals involved in Hajj and Umrah. Traditional training methods often rely on static materials or limited physical simulations, which may not sufficiently prepare individuals for the dynamic nature of the pilgrimage (Rani and Ramli 2022). The VR Hajj Journey overcomes these limitations by providing an interactive, repeatable experience that users can access anytime and anywhere. This flexibility allows learners to move at their own pace, revisit ritual steps as needed, and build familiarity through experiential learning, which research has shown to be more effective in knowledge retention and skill development (Childs et al. 2024).

Moreover, the application has the potential to serve a diverse audience beyond prospective pilgrims. For instance, it could be used as a learning tool in religious

education curricula, both in formal classroom settings and informal learning environments such as community centers and mosques (Latuapo 2021). It also holds value for Muslim children, new converts, and individuals with physical or financial limitations that prevent them from performing the actual pilgrimage. These broader applications reflect the adaptability of immersive technology in democratizing access to religious experiences, as also observed in VR simulations used for spiritual empathy training (Estrada Villalba, San Martín Azócar, and Jacques-García 2021). By fostering familiarity and spiritual reflection, the VR Hajj Journey supports a wider mission of inclusive, accessible, and transformative religious education.

The use of VR technology to simulate the Hajj pilgrimage represents a groundbreaking development in immersive learning for religious education. Traditionally, prospective pilgrims have relied on textbooks, lectures, or limited on-site training to prepare for the physical and spiritual demands of Hajj. However, VR technology offers a dynamic, interactive experience that allows users to actively engage with the rituals of Hajj in a simulated, yet realistic environment (Coburn et al., 2015). This innovation enables users to practice key rituals such as Tawaf, Sa'i, and standing at Arafat, giving them the opportunity to familiarize themselves with these sacred practices before embarking on the actual pilgrimage. Through VR, prospective pilgrims can overcome the anxiety of unfamiliarity with the rites and procedures, enhancing both their preparedness and confidence. Figure 6 illustrates a proposed future framework for immersive religious simulation integrated with advanced technologies, outlining key components and pathways for enhancing spiritual education through virtual environments.

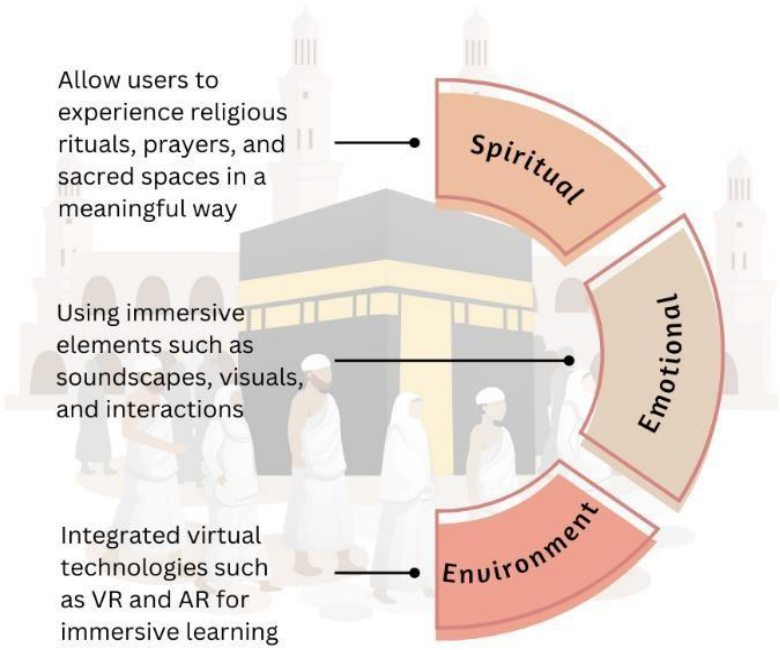

Figure 6. Future framework for immersive religious simulation integrated technology

The integration of VR technology into religious education marks a significant advancement in how cultural and spiritual practices are taught, experienced, and preserved. Traditional methods of teaching religious rituals often rely on lectures, printed materials, or verbal guidance, which can be abstract and passive for learners. In contrast, virtual reality provides an active and immersive learning environment that enables users to engage directly with the sacred rituals of Hajj. This immersive experience fosters a deeper emotional and spiritual connection, as users can visualize, hear, and interact with the environment in ways that closely mimic the actual pilgrimage (Semwal and Tyagi 2025). As a result, learners not only gain procedural knowledge but also internalize the emotional and spiritual aspects of the experience.

Moreover, VR offers the ability to simulate real-life challenges that pilgrims may face, such as navigating large crowds during Tawaf or experiencing the collective atmosphere of worship at key sites like Arafat. These scenarios are often impossible to replicate in conventional learning environments, especially for individuals who have never been to Mecca. By bridging this gap, VR enhances users' preparedness, confidence, and sense of connection to the rituals. This blending of modern technology with centuries-old religious traditions revitalizes faith-based education and provides new opportunities for intergenerational learning.

Beyond confirming the application's high level of content validity and technical quality, the findings also highlight the importance of ensuring inclusivity and accessibility

in the implementation of VR Hajj Journey for diverse user groups. The application's potential impact extends beyond prospective pilgrims with optimal access to technology, encompassing individuals with physical disabilities or economic limitations who may otherwise be excluded from such immersive learning experiences. This underscores the necessity of expanding the reach of VR-based religious education through mobile-compatible versions and collaborative partnerships with Islamic educational institutions such as madrasahs, pesantren, and zakat organizations. These strategies reflect a broader commitment to equitable technological integration, where innovation is not solely defined by sophistication, but also by its capacity to align with religious values, support underserved communities, and promote universal access to spiritual learning.

The study's results also resonate strongly with the future-oriented framework depicted in Figure 6, particularly concerning the integration of emerging technologies such as metaverse-based devices. The alignment between expert validation outcomes and the proposed immersive framework demonstrates how the incorporation of advanced sensory tools, like meta-helmet technology, can meaningfully enhance the embodiment and interactivity of the virtual pilgrimage. These features contribute to a more realistic and emotionally resonant experience, reinforcing not only cognitive understanding but also affective and spiritual engagement. As such, VR Hajj Journey exemplifies a comprehensive pedagogical model that situates virtual reality as a transformative medium within Islamic religious education, bridging technological advancement with spiritual depth and cultural authenticity.

Conclusion

The development of the VR-Hajj application has successfully produced an immersive and pedagogically sound simulation of Hajj and Umrah rituals, providing meaningful support for prospective pilgrims in preparing for their spiritual journey. By enabling users to virtually perform essential rituals such as Tawaf and Sa'i while simultaneously learning the associated prayers, the application deepens both procedural and spiritual understanding. The validation process yielded an impressive average score of 91.54%, with a strong inter-rater agreement and an S-CVI score of 0.83, indicating a high level of expert consensus regarding the application's quality and instructional value. These findings confirm the VR-Hajj application as a valid and reliable tool for use in Islamic religious education.

Beyond its technical merits, this study contributes to the broader discourse on immersive learning in faith-based education by demonstrating how virtual

environments can preserve religious authenticity while enhancing accessibility and engagement. In this way, the VR-Hajj application aligns with the pedagogical objectives of spiritual formation, experiential learning, and equitable access to religious knowledge, particularly for learners who face physical, financial, or geographic constraints. Nevertheless, the study is not without limitations, including the reliance on expert validation without empirical user testing and the potential technological dependencies that may limit access for underserved populations.

Future research should consider empirical trials involving diverse learner populations to assess cognitive and affective learning outcomes, as well as longitudinal studies to evaluate long-term spiritual impacts. Comparative investigations with other immersive religious learning tools may also provide insight into best practices for integrating emerging technologies in Islamic education. With continued refinement, including the integration of metaverse-compatible devices and self-assessment modules, the VR-Hajj application holds strong potential to serve as both an innovative and spiritually resonant medium for immersive Islamic pedagogy.

Author Contribution Statement

Contributions of the authors in this article: Mochammad Rizal Ramadhan, Samudra Mutiara Hasanah, and Tsania Khoirunnisa contributed as the preparation of research proposals, the concept developer and drafters; Tri Anggara Medhi Sampurno, Nur Faizin, and Achmad Sultoni contributed as the preparation of the research plan and data collection assistance, data analyst and interpreter, Reno Nurdiyanto and Abd Aziz bin Rekan contributed to collecting data and critically revising the article. All authors agree to take responsibility for all aspects of this work.

Disclosure Interest

We have no conflict of interest to declare.

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