

Development of the VIRAH Website Based on 3D Augmented Reality for Asmaul Husna Learning in Grade 6 Elementary School

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Abstract: The Teaching of Asmaul Husna in elementary schools remains dominated by memorization. This approach struggles to translate abstract religious concepts into concrete representations suitable for students' concrete operational stage of cognitive development. This study aims to develop and evaluate a website-based technology named VIRAH (Visualization Interactive Asmaul Husna 3D AR), as an interactive learning technology for sixth-grade students in Islamic Education. The research employed the Design and Development (D&D) method following the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The resulting product is the VIRAH website, which integrates Augmented Reality (AR) technology using the Assemblr Edu platform and is published via Netlify. The website was validated by subject matter and media experts, then implemented with 27 sixth-grade students at SDN Sukaraja II, Sumedang. Data collection utilized validation sheets, student response questionnaires, and pretest-posttest instruments. Data analysis was conducted using percentage calculations, the N-Gain Score, a paired t-test, and effect size calculations. The validation results showed that the media received a score of 93.75% from subject matter experts and 98.13% from media experts, both of which fell into the "highly acceptable" category. The average N-Gain Score of 0.64 falls into the "moderately effective" category. The paired t-test confirmed a statistically significant increase ($t = 7.97$; $df = 26$; $p < 0.05$), with an effect size of $d = 1.766$, classified as "very large". The student response questionnaire yielded a positive percentage of 77.04%, categorized as "good". In conclusion, the development of the VIRAH website, based on 3D AR technology, is proven feasible and sufficiently effective in enhancing elementary students' understanding of Asmaul Husna. It successfully transforms abstract concepts into concrete, interactive, and meaningful learning experiences.

Keywords: 3D augmented reality, VIRAH website, interactive learning technology, asmaul husna, elementary school.

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■ INTRODUCTION

Technological advancements have brought significant changes to the world of education. In the era of the Fourth Industrial Revolution, learning is required to be more innovative, interactive, and aligned with the characteristics of 21st-century learners (Aeni et al., 2022). Rather than assuming that today's students automatically possess digital literacy simply because they belong to a certain generation an

assumption that is increasingly being questioned in the educational literature the pedagogical rationale for integrating technology into the classroom is based on how students learn, not on which generation they belong to. Interactive and multisensory learning, which allows students to engage directly with and manipulate the material, has been linked to deeper conceptual understanding compared to passive, one-way instruction especially for elementary school

students, who benefit from concrete and practical representations of abstract concepts. This requires educators to adapt technology-based learning strategies to create relevant and meaningful learning experiences. In Islamic Education, this challenge becomes even more complex because, in addition to keeping pace with technological advancements, learning must also uphold Islamic values. The integration of technologies such as Augmented Reality (AR) is crucial, particularly for elementary school students who are in the concrete operational stage and require hands-on learning (Syahrir et al., 2025). Therefore, AR-based learning media can serve as a solution to visualize abstract concepts like the Asmaul Husna, making them easier to understand while simultaneously enhancing the quality of Islamic Education in elementary schools. Hendajani et al. (2018) have demonstrated that integrating three-dimensional (3D) animation with Augmented Reality provides more concrete and engaging learning experiences for elementary school students, thereby facilitating the understanding of abstract concepts through interactive visualization. Tian & Ironsi (2025) found that Augmented Reality (AR) enhances the learning experience by overlaying digital information onto the real world, creating an immersive environment that engages students in ways traditional approaches may not achieve.

Augmented Reality (AR) is a technology capable of integrating 3D virtual elements into the real environment, creating an immersive and interactive learning experience for students, thereby enabling a more realistic and profound learning experience. In line with constructivist theory, learning that involves direct experience and interaction helps students build a more meaningful understanding. Karimah et al. (2026) indicate that the use of AR based on Assemblr Edu can enhance students' literacy skills and serve as an innovative learning medium, with effectiveness test results showing significant

improvement and very positive student responses. Recent studies have also shown that Augmented Reality learning media developed using the Assemblr Edu platform can significantly improve sixth-grade students' learning motivation and learning outcomes, further supporting the effectiveness of this platform for interactive learning in elementary schools (Krismapera et al., 2025). The VIRAH (Visualization Interactive Asmaul Husna 3D AR) learning tool was developed as an innovative web-based solution utilizing 3DAR technology. This tool is designed to visualize the Asmaul Husna engagingly and interactively and can be easily accessed via various devices without installation. These advantages make the web-based platform more flexible and capable of reaching a broader user base compared to mobile apps (Indra Pastika I Komang et al., 2025). The Asmaul Husna curriculum holds a strategic position within the Islamic Education curriculum because it serves as the foundation for the development of students' religious character. Through a proper understanding of the names of Allah, students are expected to emulate these attributes in their daily lives. However, the complexity of this subject lies in its abstract and transcendental nature. Names such as Al-Ghaffar (The Most Forgiving), Al-Afuww (The Most Pardoning), Al-Wahid (The One and Only), and Al-Samad (The Self-Sufficient) require visual aids and concrete examples to be understood by elementary school-aged children.

Unfortunately, various challenges still arise in the learning process. First, there is a limited availability of interactive learning materials in schools. Most teachers rely solely on lecture-based and rote-learning methods due to a lack of training in developing technology-based learning materials. Alkhatabi (2017) similarly reported that insufficient teacher training in technology integration remains a major barrier to the implementation of technology-based learning.

Second, the lack of variety in teaching approaches leads to student boredom and a decline in motivation. Third, the demands of a dense curriculum often lead teachers to choose the quickest method without considering students' conceptual understanding (Ismawati et al., 2023). Previous studies have developed various learning materials on the Asmaul Husna using different approaches. For example, Selviani et al. (2023) developed the MARBAH (Mari Belajar Asmaul-Husna) application, which was found to be suitable for use in the elementary school learning process. Subsequently, Hartandi et al. (2024) developed the Android-based application NURKIDS for teaching Asmaul Husna in fourth-grade Islamic Education classes. Another study was conducted by Sugianti and Amaliyah (2026), who developed an animated video-based learning medium for the Asmaul Husna curriculum. The findings indicated that animated videos were effective in increasing students' interest in learning; however, they still had limitations in terms of interactivity and immersive learning experiences. Al-Ansi et al. (2023) further stated that the use of Augmented Reality (AR) through Assemblr Edu can enhance students' literacy skills and serve as an innovative learning medium that receives highly positive responses from students.

Although many Asmaul Husna learning resources such as animated videos, apps, and educational games have been developed, the integration of 3D web-based AR technology remains relatively limited. One of the primary considerations in designing learning resources for elementary school students is accessibility, not only in terms of content but also in terms of how easily students can access that content. Web-based platforms have demonstrated advantages in this regard. Petra et al. (2016) found that when students are given access to learning through a web-based environment, they tend to take more active control of their own learning process by revisiting learning materials and studying at their

own pace, without being constrained by specific software requirements on a particular device. This flexibility of access, as noted by these researchers, inherently serves as a driver of sustained engagement. This is the rationale behind the decision to develop VIRAH as a website rather than a standalone mobile app, a choice made not merely for convenience, but with the understanding that broader access creates greater opportunities for meaningful learning for sixth-grade students, given the wide variety of devices available. Web-based learning media offer the advantage of flexible access without the need for installation, making it accessible via various devices with an internet connection (Usman & Lesmana, 2020). Additionally, the use of AR technology combined with 3D visualization allows students to see visual representations of the names of Allah and their meanings in a more concrete and engaging way. Zulfiqar et al. (2023) emphasized in their systematic review that "while there are potential advantages, some authors noted that implementing augmented reality (AR) in education is not without difficulties," including challenges related to technology accessibility and the need for educator training.

Additionally, the use of AR technology combined with 3D visualization allows students to see visual representations of the names of Allah and their meanings in a more concrete and engaging way. It is important to clarify that the concreteness offered by VIRAH does not stem from the three-dimensional format itself, since the visualized objects consist of Arabic text and audio rather than tangible physical referents. Rather, the concreteness lies in the interactive experience this technology enables: students can rotate, zoom, and manipulate the 3D representation of each name of Allah from multiple angles while simultaneously listening to its correct pronunciation, thereby engaging more than one sensory channel at once. This interactivity converts a static, one-dimensional reading of

Arabic script, as commonly found in textbooks, into an embodied, manipulable encounter that anchors the transcendental attributes of Allah to an object students can actively explore within their immediate perceptual field. In this way, 3D AR visualization functions as a cognitive bridge between abstract, transcendental concepts and the concrete operational thinking that characterizes sixth-grade students, rather than merely repackaging textbook content into a three-dimensional shape.

In Southeast Asia, the relationship between digital technology and student learning has received increasing scientific attention, revealing a complex and nuanced picture. Anshari et al. (2016) demonstrated that students' interactions with digital tools are influenced by various personal and contextual factors, including gender, personal habits, and generational familiarity with technology. These findings suggest that the mere presence of technology in the classroom does not automatically lead to better understanding. Huda et al. (2016) further emphasized that the key issue is whether technology is implemented in ways that actively support higher-order thinking and meaningful engagement with the subject matter, rather than merely serving as a passive display medium.

Similarly, Elmqaddem (2019) cautioned that although Augmented Reality (AR) and Virtual Reality (VR) have attracted considerable attention in education, empirical evidence regarding their effectiveness remains mixed. Their educational value depends largely on how thoughtfully they are integrated into pedagogy rather than on the novelty of the technology itself. These findings must be considered when situating VIRAH within the existing literature. The goal is not to introduce Augmented Reality merely for the sake of novelty, but to design a learning experience that responds to the learning characteristics of sixth-grade students and provides a concrete form for concepts (in this

case, the Asmaul Husna) that might otherwise remain abstract and difficult to internalize. This nuanced understanding of technology integration in Southeast Asian classrooms reinforces the importance of developing media such as VIRAH that prioritizes active and meaningful engagement over passive consumption. Based on this background, the following research questions are proposed:

1. RQ1: How feasible is the VIRAH website, a learning medium built on 3D Augmented Reality (AR) technology, for teaching Asmaul Husna to sixth-grade elementary school students, as measured through subject matter and media expert validation?
2. RQ2: Does the implementation of the VIRAH website significantly improve sixth-grade students' learning outcomes in understanding the Asmaul Husna material, and how do students respond to its use as a learning medium?

This study first develops VIRAH, a 3D AR-based learning medium using the Assemblr Edu platform for sixth-grade elementary school Asmaul Husna material, which includes 3D visualizations, meanings, and their application in daily life with an interactive and user-friendly interface. Building on this product, the study then aims to: (1) test the media's feasibility through validation by subject matter experts and media experts, covering aspects of content appropriateness, clarity of visualization, ease of use, and appeal to students, thereby answering RQ1; and (2) evaluate the media's effectiveness in improving student understanding through a comparison of pretest and posttest results as well as student responses to the learning experience, thereby answering RQ2.

The urgency of this research is based on the importance of Asmaul Husna material as the foundation for religious character development which is still taught conventionally, as well as the

need for media capable of visualizing abstract concepts into concrete forms suited to the characteristics of elementary school students (Pahmi & Syafei, 2022). Additionally, the use of the user-friendly, web-based Assemblr Edu platform enables broader access. It has the potential to serve as a practical solution in developing innovative and effective educational media (Agustin et al., 2024). Thus, this study is expected to contribute to the development of innovative and interactive Islamic Education learning media that meet the learning needs of the digital age, while also supporting the improvement of elementary school students' understanding of religious values. The practical contribution of this study is the availability of learning media that can be used by Islamic education teachers in various schools, while its theoretical contribution is to enrich the body of research on the integration of AR technology in Islamic Education at the elementary level.

■ **METHOD**

Research Design

This study employs the Design and Development (D&D) method, which translates to "Desain dan Pengembangan" in Indonesian. This method is typically used to develop and produce a product, such as a learning application (Aeni et al., 2023). The development model employed is the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation (Aeni et al., 2022). Zulmi et al. (2026) used an approach similar to the ADDIE model to develop Assemblr Edu-based AR media, which has proven to be a systematic method for producing high-quality learning experiences. The research was conducted on March 13, 2026, at SDN Sukaraja II, Jl. Empang No. 04, Regol Wetan Village, South Sumedang District, Sumedang Regency, West Java. The selection of the research location was

based on observations indicating that Islamic Education instruction, specifically the Asmaul Husna curriculum, remains dominated by rote memorization, thus necessitating the development of interactive learning media. Prior to the implementation of the study, permission was obtained from the school administration to conduct the research and to implement the learning media trial with the students. All data collected were used solely for research purposes and were reported anonymously to ensure the confidentiality of the participants.

The experimental design used was a one-group pretest-posttest design. In this design, students took a pretest before the intervention, then received instruction using the VIRAH media, and subsequently took a posttest. The pretest and posttest results were compared to determine the improvement in students' understanding after using the developed media. This research procedure was conducted based on the five stages of the ADDIE model. In the first stage analysis the researcher conducted a needs analysis by identifying learning issues and student characteristics, as well as analyzing the relevant curriculum. The design stage involved developing the VIRAH learning medium, its user flow, interface design, and the Asmaul Husna content to be presented in the form of 3D Augmented Reality (AR). Next, in the development stage, the researcher developed the VIRAH website based on 3D Augmented Reality (AR) using Assemblr Edu, then integrated it into a website created using the Visual Studio (VS Code) application and published it via Netlify. To ensure the product's suitability, the design's validity was tested by subject matter experts and media experts. During the implementation phase, a pilot test of the VIRAH learning platform was conducted with students during instructional activities to assess the effectiveness of the developed media. The subsequent evaluation phase assessed the entire development process

based on the results of student response surveys following the use of the media.

Participants

This study involved 27 sixth-grade students from SDN Sukaraja II, Sumedang Regency, Indonesia, consisting of 11 male students and 16 female students. The participants were selected using purposive sampling, as the study focused on students who met specific criteria relevant to the objectives of the research and the initial implementation of the VIRAH website. The inclusion criteria were: (1) sixth-grade students enrolled at SDN Sukaraja II, (2) students who had studied the Asmaul Husna material in Islamic Religious Education, and (3) students who completed the entire research procedure, including the pretest, learning activities using the VIRAH website, and posttest. The exclusion criteria were: (1) students who were absent during the implementation of the study and (2) students who did not complete either the pretest or posttest. The use of purposive sampling was considered appropriate because this Design and Development (D&D) study aimed to evaluate the feasibility and initial effectiveness of the developed learning media rather than to generalize the findings to a broader population.

Data Collection Instruments

The instruments used in this study consisted of expert validation sheets, pretest and posttest achievement tests, and a student response questionnaire. The expert validation sheets were used to evaluate the feasibility of the VIRAH website in terms of material and media aspects. The expert validation process involved four validators, consisting of two subject matter experts and two media experts. The subject matter experts included an Islamic Religious Education teacher from SDN Sukaraja II and an Islamic Religious Education teacher from SD IT Darul Qolam, Bandung. The media experts

consisted of a classroom teacher from SDN Sukaraja II, and a lecturer from Universitas Pendidikan Indonesia Cibiru Campus. The involvement of external experts from outside the research institution was intended to enhance the objectivity of the evaluation and minimize potential bias during the validation process. The validation instruments consisted of a rating-scale questionnaire and a suggestion sheet adapted from Elangovan and Sundaravel (2021), which served as objective instruments for evaluating the quality and feasibility of the developed educational product (Wafudu et al., 2022).

The achievement test was initially developed in the form of 10 multiple-choice questions based on the Learning Outcomes (CP), Learning Objectives (TP), and learning indicators of the Asmaul Husna material in the *Merdeka* Curriculum. Before implementation, all items were subjected to an empirical validity test using Pearson Product-Moment correlation. The validity analysis indicated that six items (Items 1, 3, 7, 8, 9, and 10) met the validity criterion ($r\text{-count} > r\text{-table} = 0.381$), whereas four items (Items 2, 4, 5, and 6) did not. The invalid items were excluded from the final instrument and were not used in the pretest and posttest. Consequently, only the six validated items were retained for the subsequent reliability analysis and effectiveness evaluation. The validity test results are presented in Table 1.

Table 1. Results of instrument validity testing

items	<i>r</i> -count	<i>r</i> -table	decision
1	0.473	0.381	Valid
2	0.245	0.381	Invalid
3	0.433	0.381	Valid
4	0.235	0.381	Invalid
5	0.154	0.381	Invalid
6	0.318	0.381	Invalid
7	0.624	0.381	Valid
8	0.474	0.381	Valid
9	0.574	0.381	Valid
10	0.385	0.381	Valid

Following the item validity analysis, the reliability of the final instrument was assessed using Cronbach's Alpha to determine its internal consistency. The reliability analysis was conducted using the six valid items retained after the validity testing. The analysis yielded a Cronbach's Alpha coefficient of 0.511. Therefore, only the six validated items were used to calculate students' pretest and posttest scores in the subsequent analyses. The reliability coefficient increased after four invalid items were excluded from the achievement test. Therefore, only the six validated items were retained and used for all subsequent analyses of students' learning outcomes.

Data Analysis Techniques

All data collected in this study, including student learning outcomes and evaluations by media and subject matter experts, were processed and converted into percentages. This conversion process was carried out by comparing the maximum score of each instrument with the scores obtained by the students, ensuring a standardized approach to data interpretation. This method allows for direct comparison of findings across different assessment instruments with varying maximum scores, providing consistency in data analysis and interpretation regardless of the original scoring scales used.

N-Gain Score Test of Pretest and Posttest Results

The N-gain score test measured the effectiveness of instructional media in improving learning outcomes (Molin et al., 2021). This approach provides a normalized measure of learning improvement by considering both the initial achievement and the maximum attainable score. Unlike a direct comparison of pretest and posttest results, the N-gain score expresses learning gains relative to the amount of improvement available for each student.

Consequently, it enables a more accurate assessment of learning progress across students with different levels of prior knowledge. By normalizing individual learning gains, the N-gain score reduces bias associated with differences in baseline performance and offers a more equitable evaluation of instructional effectiveness. In this study, the N-gain score was used to evaluate the effectiveness of the VIRAH instructional media in improving students' learning outcomes. The normalized gain scores were subsequently converted into percentages and interpreted according to the following effectiveness categories:

Table 2. N-Gain effectiveness categories

N-Gain	Category
< 0.4	Ineffective
0.4-0.55	Less Effective
0.56-0.75	Moderately Effective
>0.76	Effective

Paired Sample Test

A paired-sample t-test was conducted to determine whether there was a statistically significant difference between students' pretest and posttest scores following instruction with the VIRAH website. Statistical significance was determined at $\alpha = 0.05$. This statistical test allows the researcher to determine whether the observed improvement in student scores represents a genuine effect of the instructional intervention or whether such an improvement might have occurred by random chance. A result is considered statistically significant when the probability of obtaining that result by chance is less than 5 percent ($p < 0.05$), providing strong evidence that the VIRAH media had a real impact on student learning.

Effect Size

Effect size (Cohen's d) was calculated to determine the practical magnitude of the

improvement in students' learning outcomes after using the VIRAH website. While the paired-sample t-test tells us whether improvement occurred, the effect size tells us how large that improvement actually was. A large effect size indicates that the VIRAH instructional media had a substantial and meaningful impact on student learning that would be important for educational practice. In contrast, a small effect size might indicate improvement that is statistically detectable but not practically significant for classroom use.

Interpretation of Percentage Scores from Expert Validation and Student Response Questionnaires

The percentage scores obtained from expert validation questionnaires completed by subject matter experts and media experts, as well as the student response questionnaire administered after implementation of the VIRAH media, were interpreted using predetermined assessment criteria. These standardized criteria ensure consistent and objective evaluation of the product across all assessment instruments. Validation percentage scores help determine the feasibility and appropriateness of the developed media for classroom use. In contrast, student response percentages provide direct feedback regarding students' experiences with and acceptance of the learning medium.

■ RESULT AND DISCUSSION

Characteristics and Validity of the Developed Media

The Asmaul Husna material taught in sixth grade of elementary school in this study includes Al-Gaffār (The Most Forgiving), Al-Wâ'id (The One and Only), Al-'Afuw (The Most Pardoning), and Al-bamad (The Self-Sufficient). These four beautiful names of Allah hold significant meanings that elementary school students must understand as a foundation for shaping their attitudes and character in daily life (Hafiza & Amaliyah, 2026).

The Qur'an recommends understanding and practicing the Asmaul Husna, including *Surah Al-A'raf*, verse 180, which encourages people to pray using the beautiful names of Allah and not to deviate in their understanding of them. Observations conducted at SDN Sukaraja II in Sumedang indicate that Asmaul Husna instruction is still dominated by memorization activities, so students' understanding of the meanings and their application in daily life has not yet developed optimally. Furthermore, students showed limited engagement with the learning materials prior to the implementation of the VIRAH learning media. After completing the analysis phase, the researcher began developing an educational medium in the form of a website named VIRAH (Visualization Interactive Asmaul Husna 3D AR). This medium is designed to assist teachers in presenting material in an engaging, visual, and interactive manner through 3D AR technology, allowing students to view 3D representations of objects along with explanations of each Asmaul Husna concept. It is hoped that this will enable students to understand and apply these concepts in their daily lives.

Practicality and Student Responses

The results of the pilot study indicate that students were able to use the VIRAH website effectively after receiving instructions on how to use it. The 3D visual features and interactive quizzes successfully engaged students throughout the learning process. The results of the student feedback survey indicate that the VIRAH website is easy to use, engaging, a helpful in understanding the Asmaul Husna material. Teachers also gave positive feedback regarding the platform's ease of use in supporting the learning process in the classroom. Çetin (2022), in their systematic review, found that augmented reality-based applications increase motivation in reading environments, support collaborative learning, and create enjoyable learning environments.

Effectiveness on Learning Outcomes

The effectiveness of the VIRAH medium was analyzed by comparing students’ pretest and posttest scores. The analysis revealed an increase in scores following the use of the VIRAH medium in teaching the Asmaul Husna. These findings were supported by the results of a paired-sample t-test, which showed a significant difference between scores before and after instruction. The development of this medium was carried out using the D&D (Design and Development) method with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation), which proved effective in developing the 3DAR-based VIRAH website. This model was used to guide each stage of the process, from the design to the development of the VIRAH website. Through systematic steps, the resulting visuals and materials align with the learning needs of sixth-grade elementary school students while achieving the predetermined Learning Objectives. Furthermore, the development process in this study will be described in greater depth.

Analysis Stage (Problem and Needs Analysis)

The analysis phase is the initial stage of the research, aimed at examining learning needs and issues encountered in the field. In this phase, the

researcher reviewed the document titled “Decision of the Head of BSKAP No. 046/H/KR/2025 on Learning Outcomes (CP),” which served as a reference for the problem analysis. The researcher selected the Islamic education subject for Phase C, which includes the Akidah component, for sixth-grade elementary school students, focusing on the Asmaul Husna material. The researcher then translated the Learning Outcomes (CP) into Learning Objectives (TP). Subsequently, the researcher observed the Islamic education process in the sixth-grade class at SDN Sukaraja II Sumedang, focusing on the Asmaul Husna learning material. The observation was conducted using a triangulation technique involving observational data collection, RPP Documentation, and interviews with the sixth-grade Islamic education teacher. The data obtained by the researcher was subsequently analyzed using the Miles and Huberman model, which includes data reduction, data presentation, concluding (Anisa et al., 2024). Data reduction focused on findings from observations, interviews, and RPP Documentation, specifically the teaching methods used by teachers, the use of instructional media, student engagement during the learning process, students’ understanding of the Asmaul Husna learning material, and curriculum alignment, as shown in Table 3.

Table 3. Triangulation matrix of data

Aspect	Observation Data	RPP Documentation	Interview Data
Learning Method	Teachers use lecture methods, memorization, and question-and-answer sessions that are monotonous in nature.	The RPP used does not include innovative or interactive learning approaches.	Teachers confirm that the methods used still focus on memorization.
Learning Media	During observation, teachers use only textbooks as learning media.	The RPP does not include plans for using digital or visual media.	Teachers confirm that they have not yet used digital or visual media in Asmaul Husna learning.
Student Engagement	Out of 27 students, only about 10 are actively answering teacher questions, 13 listen without	The RPP does not include learning activities that are active and participatory in nature.	Students are acknowledged to easily get bored, lack focus, and are not encouraged

	participating, and 4 are not paying attention.		to explore the material further.
Student Understanding	Students can memorize the names of Asmaul Husna, but their understanding of the meanings and applications in daily life is still very low.	Competency achievement indicators in the RPP emphasize C1-C3 levels, so they do not fully promote meaningful understanding.	"When asked about the meanings and their applications, they are still confused."
Curriculum Alignment	Learning implementation is not yet fully aligned with the <i>Merdeka</i> Curriculum demands that emphasize conceptual understanding.	The CP and TP in the RPP do not yet reflect holistic competency achievement as required by the <i>Merdeka</i> Curriculum.	Teachers emphasized conceptual understanding, but limited media remained the main obstacle.

Based on the results of non-participant observation conducted by the researcher, it was found that teachers still use lecture, memorization, and question-and-answer methods when teaching Asmaul Husna. The use of these methods also affects the level of student attention and engagement during learning activities. Students easily become bored, lose focus, and are not motivated to explore the material further (Lingo & Chen, 2023). The observation results also showed that students' attention tended to wane after about 15 minutes of instruction. Of the 27 students who participated in the lesson, only about 10 actively answered the teacher's questions, 13 listened to the explanation but did not participate, while 4 were not paying attention. These observation results indicate that student participation levels are still not optimal. These observational findings are supported by the RPP Documentation. The existing lesson plans do not include learning activities that are active, innovative, or digital media-based. The core activities in the lesson plans are still dominated by a one-way rote learning approach, lacking methodological variety that could foster meaningful understanding. Furthermore, the competency achievement indicators listed in the lesson plans place greater emphasis on recall (C1) than on conceptual understanding (C2) and application (C3). The listed learning resources also refer only to the Islamic Education (PAI)

textbook, with no plans for the use of digital or visual media that could help students understand the abstract concepts in the Asmaul Husna material. This situation also indicates that the CP and TP listed in the lesson plans have not yet been operationalized into learning activities capable of achieving competencies holistically, as required by the *Merdeka* Curriculum.

Interviews with the sixth-grade PAI teacher further corroborated these findings. The teacher confirmed that the teaching methods used still focus on rote memorization, and there have been no efforts to develop technology-based media due to limited training. The teacher also noted that students often become bored and lack motivation to explore the material further. Specifically, the teacher noted that although most students have been able to memorize the names and meanings of the Asmaul Husna, "when asked about their meanings and applications, they are still confused." This statement explicitly confirms the existence of a gap between memorization skills and meaningful understanding which is the primary objective of the *Merdeka* Curriculum. Instruction should not only be oriented toward mastery of content but also emphasize conceptual understanding and students' ability to connect the material to their daily lives (Trisna et al., 2024). However, current conditions indicate that students still tend to memorize material without truly understanding its meaning. Furthermore, sixth-

grade elementary school students are in the concrete operational stage of cognitive development. At this stage, learning is more effective when concepts are presented through concrete and visual representations that support students' understanding of abstract material (Alyusfitri et al., 2024).

Based on the results of the analysis, there is a need for innovative learning media that can enhance the appeal and interactivity of the learning process. One solution that can be implemented is the use of Augmented Reality (AR) technology, which can provide 3D visualizations that help students transform their understanding of abstract concepts into more concrete ones, making them easier to grasp (Y. Zang et al., 2025). To address this need, researchers developed the VIRAH (Visualization Interactive Asmaul Husna 3DAR) website as a learning tool, even though AR does not fully replicate the concrete experience of direct interaction with real objects. However, AR can provide 3D visual representations that serve as a bridge, helping students connect concepts and bringing them closer to concrete experiences than presenting material through text or lectures. Additionally, the integration of AR into the VIRAH website is designed to present content aligned with Learning Outcomes (CP) and Learning Objectives (TP), utilizing the curriculum used at SDN Sukaraja II Sumedang, which is displayed visually and interactively through the website, making it easily accessible to students. Moreover, the VIRAH website features pre-tests and post-tests in the form of games, and students are expected to become more interested in understanding the meaning of the Asmaul Husna and be able to apply it in their daily lives. Therefore, the use of the AR-based VIRAH website is considered relevant to support students' learning characteristics at the concrete operational stage. Although the representations provided are virtual, the presence of the teacher as a facilitator is still needed to help students

connect the material with a more meaningful understanding.

Design Phase (Product Design)

The product designed by the researchers in this study is a website named VIRAH that presents 3D AR-based learning materials, with content aligned to the Learning Objectives derived from the Learning Outcomes in the *Merdeka* Curriculum. Based on the Head of BSKAP Decision No. 046/H/KR/2025, the Learning Outcomes for Phase C of 6th-grade elementary school in the Akidah element, which were reviewed in the analysis phase, include understanding several Asmaul Husna, belief in the Day of Judgment, and qada and qadr. Furthermore, the researchers formulated Learning Objectives (TP) focused on the Asmaul Husna material to ensure that the developed media aligns with the competencies students are expected to achieve. After formulating the learning objectives, the researcher identified the source material from the Islamic Education and Character Education textbook for 6th-grade elementary/Islamic elementary school students in Chapter 2, Allah the Almighty, The All-Encompassing, which discusses the 4 Asmaul Husna (Al-Gaffâr, Al-Wâ'id, Al-'Afuw, and Al-bamad) as the basis for content development to ensure relevance to the *Merdeka* Curriculum. Consideration of student characteristics was also prioritized to ensure the material is easily understood. In the design, the researcher developed the concept by presenting the learning material through visual media based on 3D Augmented Reality (AR) technology. This process was carried out by utilizing the Canva application to create an initial design in the form of 2D images, such as Arabic text, which was then converted into 3D via the website [imagetostl.com](https://www.imagetostl.com).

In the process of designing Augmented Reality (AR) objects, researchers also utilized various 3D object assets already available on the

Assemblr Edu platform. These pre-existing objects were then selected and adapted to the Asmaul Husna curriculum, thereby supporting the achievement of learning objectives through a more concrete presentation, and were incorporated into the Asmaul Husna curriculum section. In addition to the visual design, the researchers also incorporated audio elements to enhance the media's appeal and interactivity by adding background music in the form of Islamic songs selected to create a more comfortable learning environment that supports student concentration. The inclusion of this background music is intended to foster a pleasant learning atmosphere without distracting students from the presented material. Furthermore, several objects displayed in the media were designed with interactive features, such as sounds that play when the object is touched or accessed by the user. The sounds used were created independently by the researchers through a recording process, so that the pronunciation of the Asmaul Husna can be heard more clearly and accurately. In addition to the pronunciation of the Asmaul Husna, the audio recordings also include brief dialogues related to the displayed objects, thereby helping students understand the material more thoroughly. In addition, the researchers designed the website interface, including intuitive navigation buttons and a bright, eye-catching color palette. Aeni et al. (2025) reported that the use of bright colors and engaging visual elements stimulates students' curiosity and increases their interest in the learning material. Meanwhile, the post-test evaluation was packaged as an interactive web-based game called ZEP QUIZ. This game was designed to assess students' level of understanding after using the media, while also increasing engagement and motivation through enjoyable activities.

Development Phase (Product Development)

Once the design phase is complete, the next step is the development phase, which aims to turn

the design into a fully-fledged educational media product. In this phase, the researcher developed an educational media in the form of a website named VIRAH (Visualization Interactive Asmaul Husna 3D AR) based on the previously established design. The development process was carried out in stages, ensuring alignment between the Learning Objectives, content, and the characteristics of the learners. The development of the media began with the creation of Augmented Reality (AR), starting with: (1) designing objects in two-dimensional (2D) form using the Canva application, tailored to the Learning Objectives and source materials, then converting them into three-dimensional (3D) objects via the website [imagetostl.com](https://www.imagetostl.com); (2) the researcher selects 3D objects already available on the Assemblr Edu platform that are relevant to the Asmaul Husna material and the Learning Objectives; (3) these 3D objects are then arranged and integrated within the Assemblr Edu platform to produce a cohesive and structured display; (4) adding explanations to each object to align with the material and the formulated Learning Objectives; (5) The addition of audio elements is based on the Cognitive Theory of Multimedia Learning, which states that learners process information through two primary channels: visual and auditory (Elizabeth E. Park, 2022). Therefore, in addition to 3D visual objects, the researcher also added audio in the form of voice narration recorded independently and integrated into each 3D object that is touched with high intensity, allowing students to obtain explanations without relying entirely on written text. According to the Cognitive Theory of Multimedia Learning, which states that students' working memory capacity is limited, the researcher adjusted the balance of each element by adding audio narration to the 3D objects. According to the Cognitive Theory of Multimedia Learning, presenting information through visual and auditory channels has the potential to aid the

learning process. The addition of Islamic background music was also designed, with an intensity that does not dominate the narration, to maintain a pleasant learning atmosphere without disrupting students' focus; (6) this audio was

integrated into 3D objects through programming on the Assemblr Edu platform so that the objects can play the narration when touched; (7) the resulting AR development is converted into a link ready for use and integration into a website.

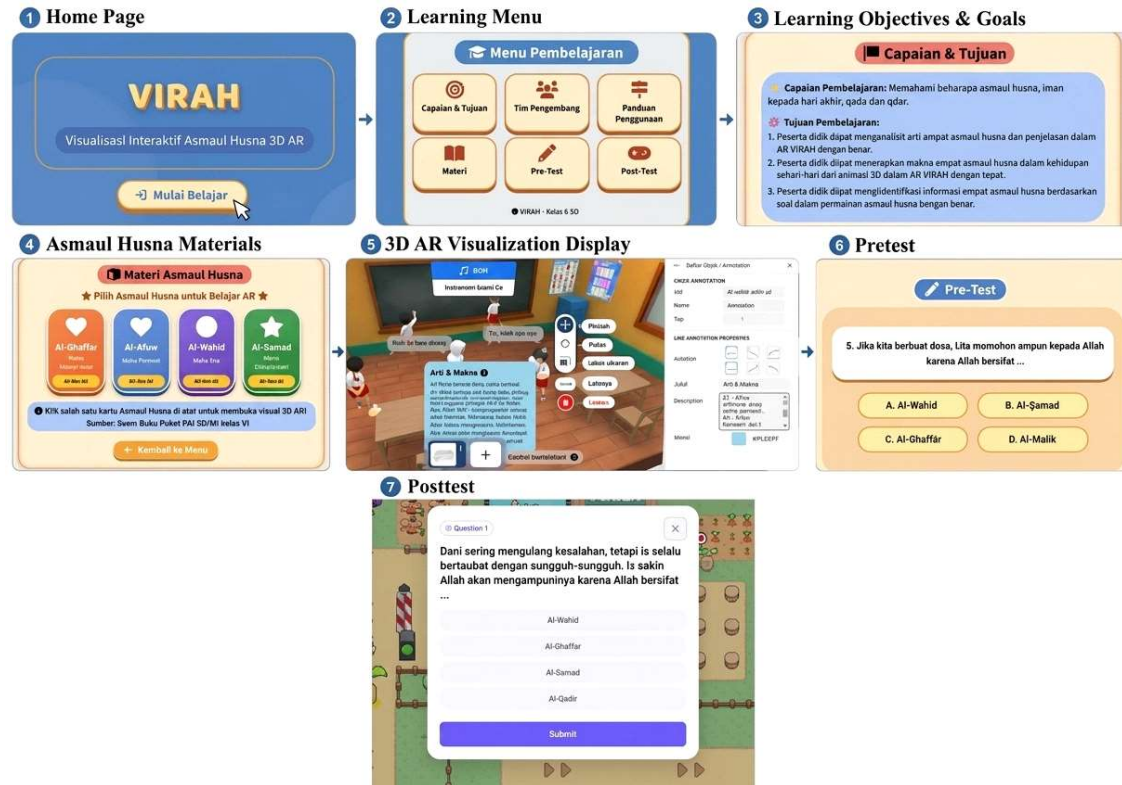


Figure 1. Interface flow of the VIRAH

The next step is to develop the website as the primary medium. This phase includes: (1) designing the website layout using HTML, edited through the Visual Studio Code (VS Code) application; (2) adding text and images as content, as well as button elements to the website, and structuring them using HTML code; (3) inserting the AR links created on the Assemblr Edu platform; (4) compiling and uploading pretest questions tailored to the material and Learning Objectives; (5) creating posttest questions in the form of an interactive game using the ZEP QUIZ platform and integrating them into the website; (6) uploading the HTML output by hosting the website via Netlify. This website features a Learning Menu page containing several supporting

features, namely: (1) Learning Outcomes & Objectives, which includes Learning Outcomes sourced from BSKAP Head Decision No. 046/H/KR/2025, subsequently broken down into more operational Learning Objectives; (2) Development Team, which contains information on the product developers' identities along with a contact person; (3) User Guide, which provides technical instructions to help users understand the steps for using the website; (4) Materials packaged in the form of Augmented Reality (AR) along with references, thereby enhancing student engagement; (5) A pretest as an initial assessment; (6) A posttest designed as a final assessment using an interactive online quiz game based on the ZEP QUIZ website.

RQ1: How Feasible is the VIRAH Website, a Learning Medium Built on 3D Augmented Reality (AR) Technology, for Teaching Asmaul Husna to Sixth-Grade Elementary School Students, as Measured Through Subject Matter and Media Expert Validation?

Furthermore, validity testing was conducted by subject matter experts and media experts. The instrument used in the validity test was a questionnaire. The assessment conducted by subject matter experts and media experts on their respective products was carried out across four aspects, with a maximum total score of 20 for each aspect. The results of the subject matter experts' evaluation indicate that the VIRAH website is considered highly appropriate in terms of educational content. This high level of suitability is primarily driven by the presentation of the Asmaul Husna concept in a hierarchically structured manner, making it well-suited to the cognitive development of sixth-grade elementary

school students, who still rely on concrete visual aids.

The material is not only presented textually but also visualized through 3D AR objects, beginning with an explanation of the meaning and followed by examples of application in daily life. This sequence aligns with Gagne's cognitive taxonomy, where understanding is built progressively from recognition to application. Furthermore, the writing of the material, which adheres to Arabic language conventions and learning outcome indicators, further strengthens the content's validity (Zain et al., 2025). Thus, the high validation score reflects the alignment between the structure of the material presentation and students' cognitive needs, rather than merely an accumulation of numbers. More specifically, the results of the subject matter expert evaluation are presented in Table 4 below.

In addition to providing quantitative ratings, the subject matter experts also provided qualitative feedback to improve the VIRAH

Table 4. Results of the subject matter expert product evaluation

No	Evaluation Aspect	Validator 1	Validator 2	Average Score	Ideal Score	Percentage (%)	Criteria
1	Content Relevance	18	19	18.50	20	92.50	Highly Acceptable
2	Material Presentation	19	18	18.50	20	92.50	Highly Acceptable
3	Writing/Orthography	20	18	19.00	20	95.00	Highly Acceptable
4	Positive Impact	18	20	19.00	20	95.00	Highly Acceptable
TOTAL		75	75	75.00	80	93.75	Highly Acceptable

website. Both experts agreed that the website was appropriate for use in Islamic Religious Education learning and could enhance students' understanding of the Asmaul Husna material. One expert noted that the website effectively increased students' interest and enthusiasm during learning, while the other highlighted that the product could facilitate students' understanding of the learning material. These findings indicate that the VIRAH website is appropriate for supporting Islamic

Religious Education learning and facilitating students' understanding of the Asmaul Husna material. The qualitative feedback also confirmed that the website has practical value for classroom implementation.

Meanwhile, media expert validation indicated that the VIRAH website was highly suitable for use, particularly in terms of usability, interface design, and accessibility. These findings are consistent with previous research showing that

website-based learning media provides flexible access without requiring software installation, making it easier to integrate into classroom learning (Puspita Dewi et al., 2023). In addition to providing quantitative ratings, the media experts also offered qualitative feedback. The classroom teacher noted that the website could increase students' motivation and facilitate their understanding of the learning material. However, the implementation might be constrained because not all students have access to smartphones or

sufficient internet quotas. Furthermore, the external media expert from Universitas Pendidikan Indonesia (UPI) Cibiru Campus recommended improving the website by incorporating more diverse and intensive interactive features to create a more engaging and meaningful learning experience. Based on these suggestions, several revisions were made to improve the website interface and optimize its usability before the field implementation. The detailed results of the media expert validation are presented in Table 5 below.

Table 5. Results of the media expert product evaluation

No	Evaluation Aspect	Validator 1	Validator 2	Average Score	Ideal Score	Percentage (%)	Criteria
1	Product Suitability	20	20	20.00	20	100.00	Highly Acceptable
2	Product Appearance	20	19	19.50	20	97.50	Highly Acceptable
3	Ease of Access	20	19	19.50	20	97.50	Highly Acceptable
4	Positive Impact	20	19	19.50	20	97.50	Highly Acceptable
	TOTAL	80	77	78.50	80	98.13	Highly Acceptable

Overall, the qualitative feedback complements the quantitative validation results by demonstrating that the VIRAH website was evaluated not only through numerical ratings but also through constructive suggestions for further improvement. Based on the results of the content and media validity tests presented above, the developed learning media falls into the category of highly suitable for implementation in the learning process. However, there are several suggestions and recommendations from experts as input for improving the product.

RQ2: Does the Implementation of the VIRAH Website Significantly Improve Sixth-Grade Students' Learning Outcomes in Understanding the Asmaul Husna Material, and How Do Students Respond to its use as a Learning Medium?

Implementation phase (product trial)

In the Implementation phase of the ADDIE model, the developed product is applied in a real-

world learning situation to assess its usability. This phase was conducted on March 13, 2026, with 27 sixth-grade students at SDN Sukaraja II, consisting of 11 boys and 16 girls. The researcher guided the students to access the learning media through their own devices, such as cell phones, by scanning a barcode linked to the VIRAH website so that students could directly access the materials prepared by the researcher. In addition, the learning media was also displayed on a smartboard provided by SDN Sukaraja II so that the teacher could provide usage instructions simultaneously and all students could have the same learning experience. The learning process was structured into three stages: the introductory stage (apperception and orientation), the core stage (interactive learning), and the evaluation stage (assessment of learning outcomes), utilizing the VIRAH learning media as a tool to support these learning strategies.

Next, the learning activity began with the recitation of the Basmallah. In the introductory

stage of the lesson, the teacher introduced the features available on the VIRAH website and provided a brief demonstration of how to use each menu. After understanding the instructions, the students independently used their own cell phones to access the Learning Outcomes and Learning Objectives menus. Next, the teacher directed students to independently complete the pretest available on the VIRAH website to assess their initial proficiency regarding the Asmaul Husna learning material. During the pretest, the teacher acts as a facilitator, providing technical guidance if students encounter difficulties using the platform, while students actively answer the questions available in the system. In the core stage, the implementation of VIRAH is carried out through a combination of traditional classroom instruction and independent exploration. The teacher first introduced the students to the material to be studied, after which the students independently explored the 3D Augmented Reality (AR) visualizations featuring four of the Asmaul Husna: Al-Gaffâr, Al-Wâ'id, Al-'Afuw, and Al-bamad. Each student observes the 3DAR visualizations, reads the material explanations integrated into the

objects, and listens to the provided pronunciations and dialogues. At certain points, the teacher pauses the exploration activity to reinforce concepts and invites students discuss the meaning of the Asmaul Husna currently being studied.

After the core learning activities were completed, students were instructed to take a post-test as a final evaluation to assess their level of understanding after using the VIRAH website as a learning resource. This post-test is presented in the form of an interactive, game-based online quiz via ZEP QUIZ, which has been integrated into the website, allowing students to complete it directly on their own devices. The questions are designed based on the Asmaul Husna material previously studied and aligned with the pre-established Learning Objectives. The implementation of the VIRAH learning media showed improvements in student learning outcomes after participating in the learning process. To obtain a more detailed picture of these changes, data visualization was performed using a scatter plot showing the distribution of students' pre-test and post-test scores, as shown in Figure 2.

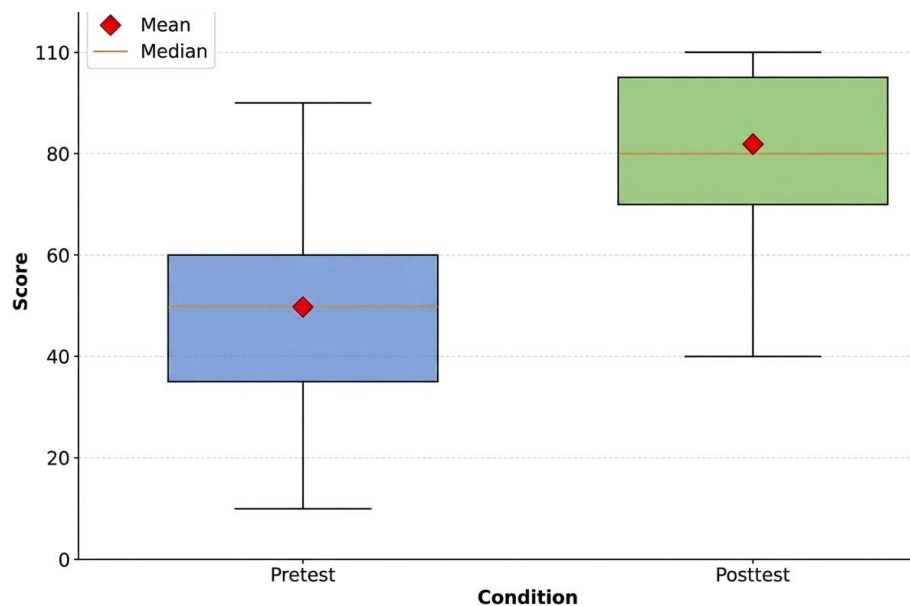


Figure 2. Paired boxplot of the development of student learning outcomes before and after using VIRAH media

Analysis of the paired boxplot shows a significant increase in the distribution of student learning outcomes between the pretest and posttest. The median increased from 60.0 to 80.0, indicating a 20-point increase in the midpoint of the score distribution. More importantly, the interquartile range (IQR) decreased from 40 to 30 points (Q1: 50'!70, Q3: 90'!100), indicating greater homogeneity in student performance at higher score levels. This pattern suggests that the VIRAH medium not only improved students' average achievement but also reduced variability across the student population. The minimum score increased from 10 to 40, showing that all students made progress following the intervention. The maximum score reached the ideal value of 100, and there were no extreme outliers on the posttest, indicating that the VIRAH media is

effective for students of varying ability levels without creating drastic learning gaps. Descriptive statistics reinforce these findings. The average score increased from 49.63 to 81.85 (an increase of 32.22 points or 64.9%), while the standard deviation decreased from 20.47 to 15.70. This dual effect a rise in central tendency accompanied by a decrease in dispersion provides strong evidence that the VIRAH medium improves not only average achievement but also the consistency of student performance. Additionally, the results from the pretest and posttest activities indicate an improvement in students' understanding following the use of this platform. A comparison of learning outcomes before the implementation of the platform (using the pretest) and after the implementation (using the posttest) is presented in the following table 6 below.

Table 6. Descriptive statistics of pretest, posttest, and n-gain scores

Statistics	Pretest	Posttest	N-gain Score (%)
Minimum Score	10	40	0.2
Maximum Score	90	100	1
Mean	49.63	81.85	0.64
Standard Deviation	20.47	15.70	0.28

Based on the descriptive statistics table of the pretest, posttest, and N-Gain scores for the implementation of the VIRAH website, there are indications of improved student learning outcomes following the use of the VIRAH website, as evidenced by the difference in scores between the pretest and posttest. Based on the N-Gain

score test results, a mean score of 0.64 was obtained, which falls into the “moderately effective” category. This indicates that the implementation of the VIRAH website was able to provide a fairly significant improvement in understanding. This is also demonstrated by the results of the paired t-test (Table 7).

Table 7. Summary of paired-sample t-test results

Conditions	Descriptive Statistics				t-Test Results		
	Mean	N	SD	SE	t	df	Sig.
Pretest	49.63	27	20.47	3.94	-	-	-
Posttest	81.85	27	15.70	3.02	-	-	-
Differences (Pre-Post)	-32.22	-	21.00	4.04	7.97	26	0.000

Table 7 shows an increase in average learning outcomes: the pre-test results indicated a mean score of 49.63 (SD = 20.47), and after instruction using the VIRAH medium, the post-

test mean score increased to 81.85 (SD = 15.70). This average increase of 32.22 points indicates that implementing the VIRAH medium has a significant positive effect on improving student

learning outcomes. The decrease in the standard error of the mean from 3.94 to 3.02 also indicates that the post-test mean has a higher level of precision compared to the pre-test mean. Table 8 shows that the calculated t-value = 7.97 is greater than the critical t-value = 2.056 (df = 26; $\alpha = 0.05$), so H_0 is rejected, and H_a is accepted. Additionally, the obtained significance value of 0.000 is less than 0.05 ($0.000 < 0.05$). Thus, to confirm that there is a significant difference in scores between students' learning outcomes before and after using the VIRAH learning medium, the final step is to calculate the effect size. The calculated effect size is 1.766, which is classified as a very large effect. These findings indicate that the VIRAH learning medium

has a significant influence on improving student learning outcomes. Thus, the use of the VIRAH website can be interpreted as having a positive impact on the smoothness of the learning process.

Evaluation stage (product evaluation)

In the final stage, the researcher evaluated the VIRAH website, which had been implemented as a learning medium. The evaluation was carried out to assess and determine the suitability and quality of the learning medium that had been designed and implemented. The evaluation included a student response questionnaire regarding the VIRAH website. Based on the data from students who completed the questionnaire, the researcher obtained the following results.

Table 8. Student response questionnaire

No	Question	Yes	No	Percentage (Yes)	Percentage (No)	Category
1	Is the VIRAH website interesting?	23	4	85.19%	14.81%	Good
2	Is the Asmaul Husna material on the VIRAH website easy to understand?	20	7	74.07%	25.93%	Fair
3	Do you enjoy learning using the VIRAH website?	19	8	70.37%	29.63%	Fair
4	The 3D Augmented Reality (AR) feature on the VIRAH website helps me understand the Asmaul Husna material.	20	7	74.07%	25.93%	Fair
5	The post-test questions in the ZIP game align with the material taught	22	5	81.48%	18.52%	Good
Total		104	31	77.04%	22.96%	Good

To provide a clearer picture of the distribution of students' responses, the percentage data from Table 9 is further visualized in the scatter bar chart below, with the zero point placed at the center of the horizontal axis. "Yes" responses are depicted as bars extending to the right from the zero point. In contrast, "No" responses are depicted as bars extending to the left, since this questionnaire is bipolar (each item offers only two

opposing answer choices). This scatter plot format allows positive and negative sentiments for each questionnaire item to be compared directly at a glance, making it easier to identify which items received the most and least positive feedback from students.

Based on the results of the student response survey, the VIRAH website received a 77.04% "yes" response rate and a 22.96% "no" response

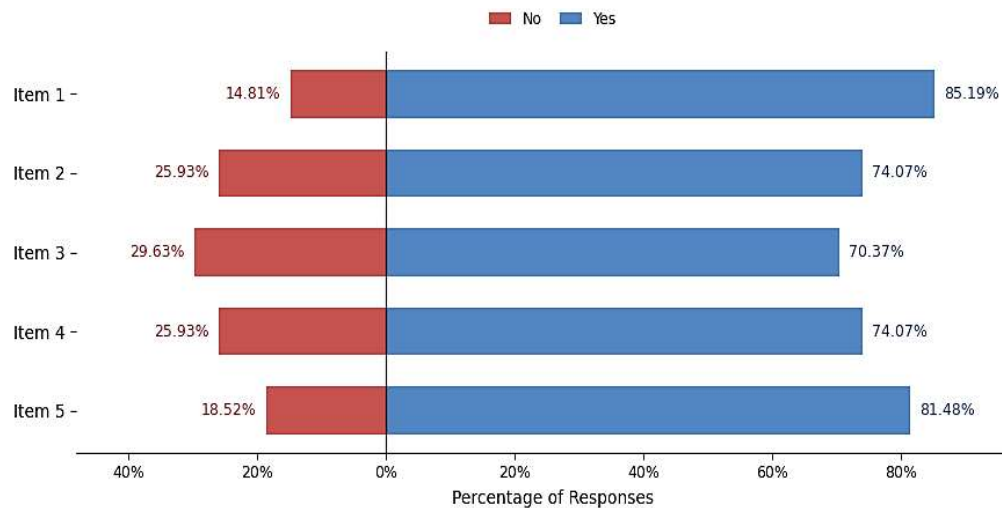


Figure 3. Distribution of student response percentages per questionnaire aspect

rate. These results indicate that students responded positively to the use of the VIRAH website we developed. The implications of these research findings suggest that the use of Augmented Reality (AR)-based learning media via a website can support the understanding of abstract concepts by making them more concrete, in line with the characteristics of elementary school students, as well as enhance engagement and learning comprehension. In the context of Islamic Education, the presentation of interactive and contextual material has proven to have the potential to help students connect the meanings of the Asmaul Husna with their daily lives. Furthermore, applying the ADDIE model in media development demonstrates its effectiveness as a systematic approach to producing learning products that are appropriate and aligned with curriculum needs.

The improvement in students' conceptual understanding of the Asmaul Husna material, as evidenced by an N-Gain score of 64.12%, which falls into the "moderately effective" category, did not occur by chance. However, this study did not isolate the individual contribution of each component through a controlled comparison, such as an AR-only group versus a gamification-only group. Accordingly, this improvement is best

understood as an outcome of the VIRAH system as a whole, in which 3D Augmented Reality (AR) visualization and the gamification-based ZIP game operate jointly rather than as two separately verified causes. Within this integrated system, the AR feature allows students to interact with abstract Islamic concepts in a concrete, three-dimensional form making intangible material easier to understand. This finding is consistent with the study by Muhammad et al. (2021), who reported improvements in students' learning achievement and engagement when AR was integrated into a broader instructional design rather than implemented as an isolated instructional tool. Similarly, Mustafa et al. (2025) and Rosita et al. (2025) reported that integrating AR into Islamic Education enhances students' learning motivation and facilitates the visualization of abstract concepts in a more concrete and meaningful way. Concurrently, gamification elements through the ZIP game are part of this same integrated system rather than a separately verified contributor. Research on gamification more broadly indicates that it can enhance students' motivation, cognitive understanding, affective traits, and psychomotor skills, particularly in the context of Islamic Education. Furthermore, Zeng et al. (2024) conducted a meta-analysis of 22 studies published

between 2008 and 2023, confirming that gamification generally has a positive impact on students' academic achievement across various educational levels. Taken together, these findings suggest that the ZIP game likely contributed to the observed post-test gains as one part of an integrated system rather than as an independently isolated factor. As this study did not include a design capable of separating the unique effect of 3DAR from that of gamification, the improvement in learning outcomes is attributed to the VIRAH system as a whole rather than to either feature individually.

Compared to previous international studies, this research expands upon existing findings by integrating AR and gamification into a single web-based platform specifically designed for Islamic Education in elementary schools. This combination has not been extensively explored in the literature. Most AR studies in Islamic Education to date have focused on a single feature, such as AR for the Hijaiyah alphabet or the procedures for prayer. The VIRAH website demonstrates that combining immersive 3DAR with game-based assessment within a single platform can yield meaningful improvements in learning, even within a single instructional cycle. Thus, these findings not only confirm the effectiveness of AR in Islamic Education in line with the findings of Mustafa et al. (2025), but also add empirical evidence that the holistic integration of technology has a greater impact than the use of a single feature. The improvement in student learning outcomes documented in this study does not stand in isolation. It reflects a growing body of work that has examined how carefully designed digital media can shift learners from passive recipients to active participants in their own education. Petra et al. (2016) observed this shift in the context of web-based learning more broadly, finding that students who engaged with flexible, self-navigable digital environments developed stronger habits of

autonomous learning over time. What VIRAH appears to have done, at least within the scope of this implementation, is to create conditions where that kind of active engagement was possible even for students at the elementary level. At the same time, Muhammad et al. (2021) cautioned that learners' responses to technology are not uniform, as individual characteristics and contextual factors mediate their learning experiences. The variation in N-Gain scores across students in this study reflects precisely that reality, and it suggests that future iterations of VIRAH would benefit from further attention to how the platform can be adapted to serve a wider range of learner profiles and needs.

■ CONCLUSION

This study aimed to (1) develop the VIRAH (Visualization Interactive Asmaul Husna 3DAR) website as an Augmented Reality based-learning medium using the ADDIE model, and (2) examine the effectiveness of VIRAH in improving sixth-grade elementary school students' conceptual understanding of Asmaul Husna. The findings indicate that the VIRAH website was successfully developed through the five stages of the ADDIE model and media experts, obtaining highly acceptable validation scores. The paired-sample t-test showed a statistically significant improvement in students' learning outcomes ($t = 7.97$; $df = 26$; $p < 0.05$), while the effect size ($d = 1.766$) indicated a very large practical effect. In addition, the student response questionnaire yielded a positive response rate of 77.04%, indicating that the developed learning media was well accepted by students. These findings suggest that the VIRAH website is a feasible and moderately effective learning medium for supporting elementary school students' understanding of abstract concepts in Asmaul Husna. However, because this study only examined short-term implementation, future research is recommended to investigate long-term

learning retention, expand the content to include additional Asmaul Husna attributes, and evaluate the applicability of the media across different grade levels and educational contexts.

■ DECLARATION OF GENERATIVE AI USAGE IN THE WRITING PROCESS

During the drafting of this manuscript, the authors utilized DeepL for language refinement, grammar correction, and translation assistance. In the process of drafting this manuscript, the author used DeepL for language refinement, grammar correction, and translation assistance. Each translation has been critically reviewed and substantially revised by the author to ensure accuracy, academic integrity, and consistency with the research findings. The author assumes full responsibility for the accuracy and integrity of the content of this article.

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