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R.QAULI: EXPLORING RUKUN QAULI IN AUGMENTED REALITY FOR PRAYER

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Abstract

This project addresses two primary issues in Islamic education: the lack of interactive and visual representations of Rukun Qauli within existing educational tools and the absence of applications specifically designed to emphasize this fundamental aspect of prayer. Utilizing the SAMR (Substitution, Augmentation, Modification, Redefinition) model, the project aims to enhance traditional teaching methods by integrating Augmented Reality (AR) technology. The study adopts the systematic instructional design approach of the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model to develop a marker-based AR application. This application allows users to visualize and interact with the components of Rukun Qauli in real-time during prayer, thereby fostering deeper understanding and engagement. Evaluation of the AR application's effectiveness and usability will be conducted using the System Usability Scale (SUS), measuring user satisfaction and the practicality of AR technology in enhancing the learning and practice of Rukun Qauli. This research aims to contribute valuable insights into the feasibility and impact of AR-enhanced educational tools, particularly within Islamic education contexts and potentially across broader educational domains.

Keywords: Augmented Reality; Marker-Based; Rukun Qauli of Prayer; ADDIE Methodology; System Usability Scale (SUS)

INTRODUCTION

Many Islamic religious applications have been developed by mobile developers in recent years, fusing faith with technology to improve religious practice and education. Augmented Reality (AR), which immerses users in the learning process, is transforming traditional religious studies, which are frequently restricted to text and 2D visuals (Mohamed Ali et al., 2022).

The second pillar of Islam, prayer, demands perfection in Rukun, especially Rukun Qauli, which are necessary recitations that the reciter must be able to hear. Many Muslims ignore Rukun Qauli despite its significance, and conventional teaching approaches might not adequately close this knowledge gap (Ebrifayaning Tias et al., 2021; Ghazali & Sulaiman, 2021).

The goal of this project is to create an augmented reality application that will improve Rukun Qauli education by providing a fun and interactive means of practicing and visualizing prayer recitations. This creative method seeks to improve the accessibility and interest level of religious education by addressing the dearth of dedicated, interactive platforms for Rukun Qauli.

LITERATURE REVIEW

In Salah (prayers), there are 13 requisites that are obligated for all Muslims to do. Otherwise, the prayers will not be considered. Among those 13 practices, they are divided into 3 parts, namely Rukun Qalbi, Rukun Fi'li and Rukun Qauli. Rukun Qauli is one of the three requisites of the prayers that most Muslims take very lightly. According to Dr. Zulkifli Mohamad, Minister in the Prime Minister Department (Religious Affair) (2022), it is named as Rukun Qauli because these requisites are obligatory to be recited or verbalized that they are heard at least to the reciter himself. These components are primary elements that must be done correctly for the prayers to be valid. There are five key elements in Rukun Qauli.

First and foremost, Takbir which will be the beginning of the prayers with declaration of "Allahu Akbar"', signaling the start of the prayer. Next, recitations of Surah Al-Fatihah. Surah Al-Fatihah is required to be recited in every Rak'ah. It is considered a crucial part of prayers. Also, the recitation of the final tasyahhud and praise and salutations for the Prophet Muhammad in the final tasyahhud. Lastly, salam. According to Imam al-Nawawi, the minimum recitation for Qauli requisites is in a low voice that can be heard by oneself if he can hear. Figure 2.1 shows the definition of Rukun Qauli.

Traditional learning methods for prayer practices often relied on oral transmission and guidebooks. Oral transmission involved the master-apprentice model, where experienced practitioners like sheiks, imams, and ustaz guided younger learners through observation and

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direct feedback. Family also played a significant role, with parents teaching children prayer rituals through daily practice. However, these methods can be challenging in today's fast-paced world, as busy young adults may struggle to find time for regular sessions with knowledgeable teachers. Additionally, oral transmission without written guidelines can lead to inaccuracies and variations in prayer practices. Guidebooks are another traditional medium, offering detailed instructions on gestures, postures, and recitations. However, they often use two-dimensional images that can be difficult to understand and unattractive to some learners, requiring imagination to visualize the practices accurately.

In contrast, Augmented Reality (AR) offers a modern solution for learning Rukun Qauli in prayers. AR technology overlays virtual information onto real-world environments in real-time, enhancing the user's understanding of reality. This innovative approach uses mediums like smartphones or webcams to add new information to natural settings, making learning more interactive and engaging. AR has various applications, including home design, product visualization, education, and gaming. It provides a more realistic experience compared to virtual reality by combining the real world with computer-generated visual elements, making it an effective tool for teaching complex prayer practices and improving the accuracy and consistency of religious education.

Type of Augmented Reality

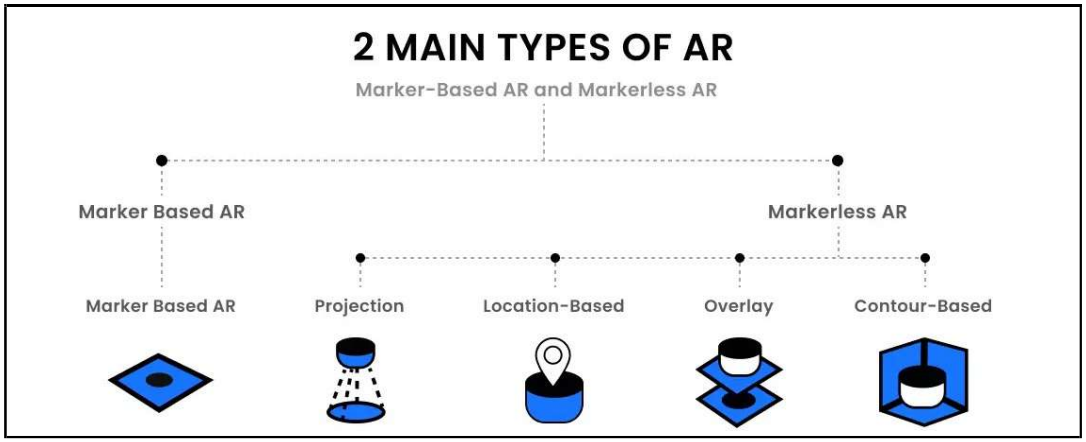

Figure 1: 2 Main Types of AR

Figure 1 shows two main types of augmented reality: marker-based AR and markerless AR. Marker-based AR uses physical markers, such as 2D images or natural objects, to overlay virtual 3D objects, text, or animations in the real world. According to Disha Sinha (2021), this type of AR requires a specific image pattern and can only be accessed via mobile devices

through a downloaded app or software. Despite its limitations, marker-based AR is increasingly used in education, particularly in classrooms and laboratories (Sirakaya & Sirakaya, 2020). Figure 2 provides an example of marker-based AR in use.

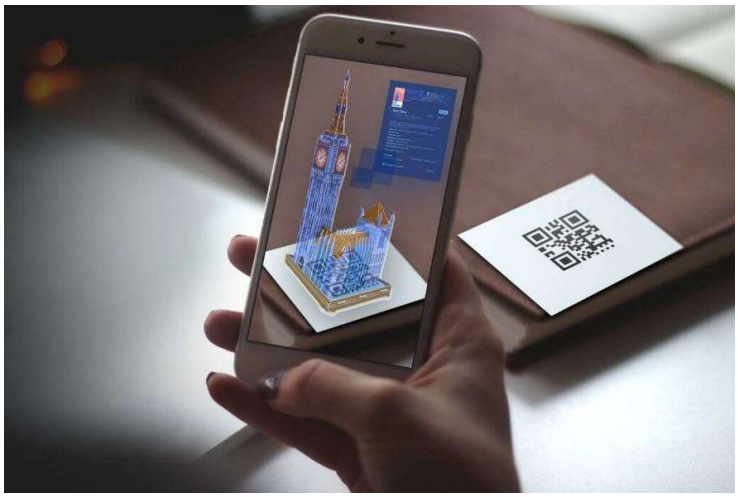

Figure 2: Marker-based AR

On the other hand, markerless AR does not require 2D image recognition. Instead, it uses location software, the device's camera, and accelerometer to detect objects and their spatial orientation. Disha Sinha (2021) notes that advances in cameras, sensors, and AI algorithms have eliminated the need for object tracking systems. Markerless AR enhances user experience and is applied in fields like manufacturing, marketing, advertising, and education. Studies have shown high test results using markerless AR as a learning tool, with validation tests of AR-based learning media on cell organelles achieving a high average qualification (Ihsan et al., 2021).

Benefits of using Augmented Reality in Learning Rukun Qauli

Having access to technology helps connect students to learning in a more authentic and meaningful way, especially with multiple possibilities for students to engage with content through the use of AR (Augmented Reality) and VR (Virtual Reality) tools (Fitria T. N., 2023). Furthermore, various studies have found that AR has a great potential in improving learning, especially self-learning, so the AR approach can be used to improve the skills and practice of prayer-related Muslims in everyday life (Khairuldin et al., 2019). The user of the

application might find themselves remembering the practices of the prayers faster than by other methods. The use of AR can stimulate creative thinking, improve understanding and change the paradigm of students' learning arcs in a subject (Yusof et al., 2022).

METHODOLOGY

The ADDIE model was chosen for this project due to its several benefits. It is a widely used learning model, suitable for designing clear and effective training programs, making it ideal for teaching Rukun Qauli in prayers (DeBell, 2020). The phases of the ADDIE model—Analysis, Design, Development, Implementation, and Evaluation—allow for thorough analysis of learning needs and objectives, making application development more straightforward. Additionally, it provides a systematic approach, ensuring the effectiveness of the development process.

The first step in this research was to analyse and compile data on problem statements, augmented reality (AR), and pertinent publications about Rukun Qauli and AR. A preliminary investigation was carried out to determine the problems associated with learning Rukun Qauli. The R.Qauli app was developed in multiple stages: storyboarding, which involved visualizing the application's flow; character and environment development, which involved creating and animating a 3D character in Blender and designing the user interface with Canva; gameplay and audio development, which involved importing assets into Unity, editing recitation audio with Adobe Audition, and implementing functions with C# in Microsoft Visual Studio 2022. Finally, in order to optimize the program, unnecessary assets were removed, and an Android-specific .apk file was created and stored. The following figure 3 is the flowchart illustrates the flow of the application in this project.

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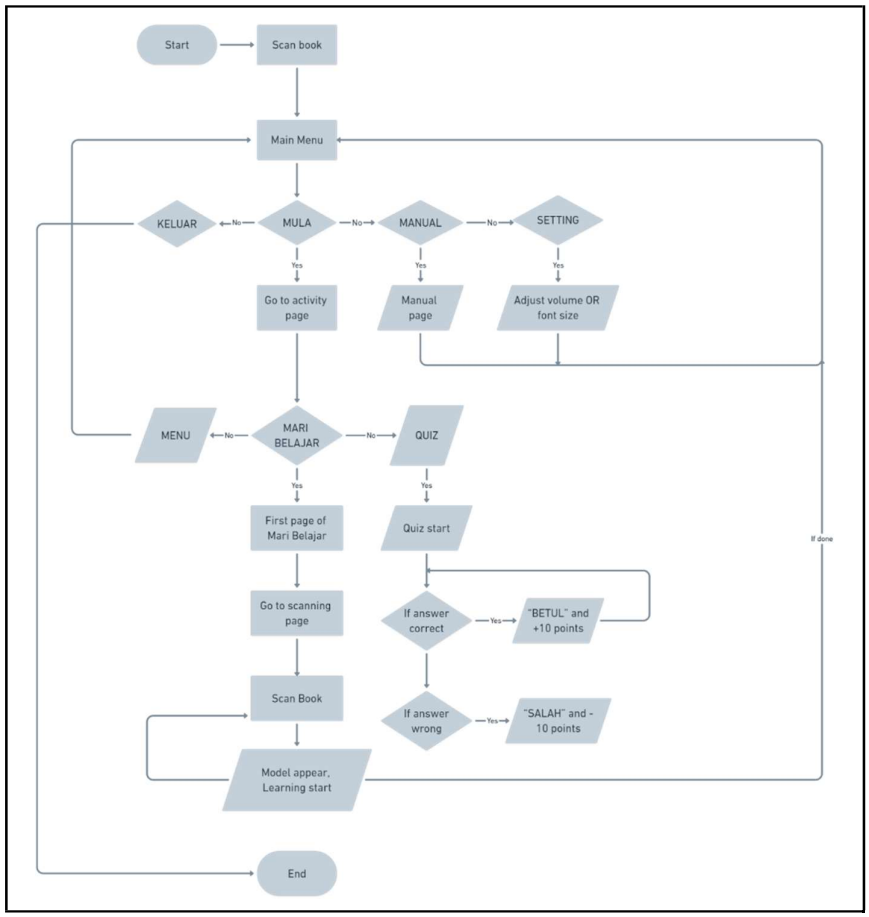

Figure 3: Flowchart

RESULT AND DISCUSSION

The testing of R.Qauli application is by using System Usability Scale (SUS). The purpose of the evaluation is to analyze the application's usability for users, which is the third objective of this project. This testing technique is beneficial in ensuring that the finished product is clear and user-friendly.

Overall, participants were satisfied with the application, indicating they would use it regularly and found it provided fresh experiences. Most disagreed that the application was overly complicated and agreed it was simple to use. During testing, 21 participants disagreed that the application required assistance to use, showing it is user-friendly. Participants found the application's functionality well-integrated and could use it quickly with the help of manuals. All participants felt confident using the application and disagreed that it was cumbersome. The

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survey responses indicate positive feedback on the R.Qauli application. Table 1 shows the collected data.

Table 1: Summary of The Data Collected

	Scale				
Question	**1**	**2**	**3**	**4**	**5**
I think that I would like to use this system frequently rather than other ways.			1	11	18
I found the system unnecessarily complex.	8	16	3	2	1
I thought the system was easy to use and interactive.			1	11	18
I think that I need the support of a technical person to be able to use the system.	11	10	4	4	1
I found the various functions in this system were well integrated				14	16
I thought there was too much inconsistency in the system	13	11	3	2	1
I would imagine that most people would learn to use this system very quickly.			1	9	20
I found the system very cumbersome to use.	13	13	2	1	1
I felt very confident using the system.			1	12	17
I needed to learn a lot of things before I could get going with this system.	11	10	3	3	3

The System Usability Scale (SUS) has its own formula to calculate the answers provided by the testers. Several steps must be followed to obtain the most accurate result. Figure 4 shows the formula to calculate SUS result.

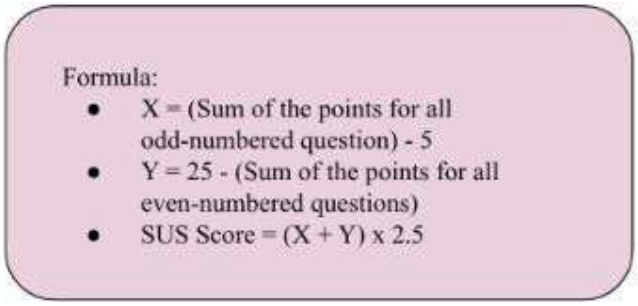

Figure 4: SUS Formula

X and Y will be the term for each calculation. X was used to calculate the expression for all the numbers from the odd-numbered questions. Meanwhile, Y was used to calculate the expression for all the numbers from the even-numbered questions. The sum of the points for odd-questions need to be subtracted with five to get X. Meanwhile, twenty-five need to be substituted with the sum of the points for all the even-numbered questions to get Y. Lastly, X and Y need to be added so that the total can be multiplied by 2.5. Hence, the SUS result is successfully calculated.

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Calculations:

X = (5+5+5+5+5)-5 = 20

Y= 25 - (1+2+1+2+4) = 15

SUS Score for the first participants = (20 + 15) x 2.5 = 87.5

Number of Participants	1	2	3	4	5	6	7	8	9	10	Score	raw
1	5	1	5	2	5	1	5	2	5	4	87.5	35
2	5	2	5	1	5	1	5	1	5	2	95	38
3	5	1	5	1	5	1	5	1	5	1	100	40
4	5	2	4	1	5	1	5	2	5	2	90	36
5	4	2	4	1	5	1	5	2	5	1	90	36
6	4	2	4	3	4	3	4	3	4	2	67.5	27
7	5	2	5	1	5	1	5	1	5	1	97.5	39
8	5	2	4	1	4	1	5	1	5	1	92.5	37
9	4	4	5	4	4	4	4	2	4	4	57.5	23
10	4	2	5	3	4	1	4	1	4	3	77.5	31
11	5	1	5	1	5	2	5	1	5	2	95	38
12	3	1	4	1	4	3	5	1	5	1	85	34
13	4	2	4	3	4	2	4	2	4	3	70	28
14	5	3	4	4	4	2	3	3	3	3	60	24
15	5	5	5	5	5	5	5	5	5	5	50	20
16	5	2	5	2	5	2	5	1	5	1	92.5	37
17	4	1	4	2	4	1	5	2	4	2	95	38
18	5	2	5	1	5	1	5	1	5	1	97.5	39
19	5	1	5	2	4	2	4	2	4	2	82.5	33
20	5	2	5	2	5	2	5	2	5	2	87.5	35
21	4	3	3	2	4	3	4	2	4	5	60	24
22	5	2	4	2	5	1	5	2	4	2	85	34
23	5	3	4	4	4	2	4	2	4	4	65	26
24	4	4	5	4	5	4	5	4	5	5	57.5	23
25	5	2	5	3	5	2	5	2	5	2	87.5	35
26	4	2	5	2	4	2	4	2	5	1	82.5	33
27	5	2	5	2	5	2	5	1	5	1	92.5	37
28	5	1	5	1	4	2	4	1	4	2	87.5	35
29	4	1	5	1	4	1	5	1	4	1	92.5	37
30	4	2	4	2	5	1	5	1	4	1	87.5	35
TOTAL											2467.5	987

Figure 4: Calculation of SUS Score

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Total SUS Score = (2467.5 /3000) * 100

= 82.25

The R.Qauli application has been evaluated using the System Usability Scale (SUS) and has achieved a total score of 82.25. The total SUS score is calculated by summing all the scores from participants, dividing by the full score of 30000, and then multiplying by 100 to get the final score. From the results, the application has achieved an excellent grade. This can be seen in Figure 5 that shows the SUS Scoring Range.

Figure 5: SUS Scoring Range

CONCLUSION

This project has complete and satisfy all the objectives which is to design an application for Rukun Qauli in Solat using AR, to develop an application for Rukun Qauli in Solat using AR, and to evaluate the usability of an application for Rukun Qauli using AR. Moreover, the application has effectively addressed several issues faced by the target user. The high usability score and positive user feedback underscore the success of the project in achieving its goals. All things considered, the R.Qauli application is proof of the potential of augmented reality to change learning environments and make learning more dynamic and interesting.

REFERENCES (APA 7TH EDITION)

DeBell, A. (2020, January 6). *What is the ADDIE Model of Instructional Design?* Water Bear Learning. Retrieved December 23, 2023, from https://waterbearlearning.com/addie-model-instructional-design/

Ebrifyaning Tias, R., Hidayat, M. M., Prasetyo, E., Widagda, A. T., & Suryaningrum, A. (2021, December). Application of Obligatory Prayer Learning Based on Augmented Reality. *Journal of Electrical Engineering and Computer Sciences*, *6*(2), 1117-1124. https://doi.org/10.54732/jeecs.v6i2.205

ELM Learning. (2023, - -). *What is ADDIE? Your Complete Guide to the ADDIE Model*. ELM Learning. Retrieved December 23, 2023, from https://elmlearning.com/hub/instructional-design/addie-model/

Faisal, D. M. (2020, October 5). *Solat: Kawal suara, elak ganggu orang lain*. Harakahdaily. Retrieved December 3, 2023, from https://harakahdaily.net/index.php/2020/10/05/solat-kawal-suara-elak-ganggu-orang-lain/

Fitria, T. N. (2023, February). Augmented Reality (AR) and Virtual Reality (VR) Technology in Education: Media of Teaching and Learning: A Review. *International Journal of Computer and Information System (IJCIS)*, *4*(1), 14-25. https://www.researchgate.net/publication/368655016_Augmented_Reality_AR_and_Virtual_Reality_VR_Technology_in_Education_Media_of_Teaching_and_Learning_A_Review

Ghazali, N. S., & Sulaiman, S. (2021, June 30). e-Bantu Solat 2D Animation Mobile Application A Mobile Application as a Guidance to Perform Wudhu and Prayers During Illness. *Journal of Computing Technologies and Creative Content*, *6*(1), 18-26. https://jtec.org.my/index.php/JTeC/article/view/480

Hamzah, M. L., Ambiyar, Rizal, F., Simatupang, W., Irfan, D., & Refdinal. (2021). Development of Augmented Reality Application for Learning Computer Network Device. *International Journal of Interactive Mobile Technologies (iJIM)*, *15*(12), 47 - 64. https://doi.org/10.3991/ijim.v15i12.21993

Hayes, A. (2023, May 15). *Augmented Reality (AR) Defined, With Examples and Uses*. Investopedia. Retrieved November 29, 2023, from https://www.investopedia.com/terms/a/augmented-reality.asp

Haywood, K. (2023, December). *Adobe Audition | INFORMATION TECHNOLOGY*. University of Denver. Retrieved December 29, 2023, from https://www.du.edu/it/services/software/software-catalog/d763f12c1bdaa850689210e58d4bcb7d

Hidayat, W. N., Damayanti, H., Pratiwi, L. S., Sutikno, T. A., & Patmanthara, S. (2020, December 4). Fun Learning with Flashcard using Augmented Reality for Learning Daily Prayers of Kindergarten Students. *2020 3rd International Conference on Computer and Informatics Engineering (IC2IE)*, -(-), 349-354. IEEE Xplore. 10.1109/IC2IE50715.2020.9274671

Ihsan, M., Sa'adah, S., & Maspupah, M. (2021, July 28). The validity of markerless augmented reality-based learning media on the concept of cell organelle. *THE 3RD INTERNATIONAL CONFERENCE ON SCIENCE, MATHEMATICS, ENVIRONMENT, AND EDUCATION: Flexibility in Research and Innovation on Science, Mathematics, Environment, and education for sustainable development*, *2540*(1), -. https://doi.org/10.1063/5.0105748

Mohamed Ali, M. H., Hafidzi, A., Mohd Herrow, M. F., Yahya, M., Ismail, A., & Abdul Samad, N. (2022, July 24). The Development of Mobile Learning (M-Learning) Apps Adik-Adik Solat to Enhance Learning Experience in Solat. *JOURNAL OF QURANIC SCIENCES AND RESEARCH*, *3*(1), 35-41. https://doi.org/10.30880/jqsr.2022.03.01.006

Sinha, D. (2021, June 9). *An Overview: Understanding Different Types of Augmented Reality*. Analytics Insight. Retrieved December 2, 2023, from https://www.analyticsinsight.net/an-overview-understanding-different-types-of-augmented-reality/

Sirakaya, M., & Sirakaya, D. A. (2020, February 5). Augmented reality in STEM education: a systematic review. *Interactive Learning Environments*, *30*(8), 1556-1569. https://doi.org/10.1080/10494820.2020.1722713

Yusof, A. S., Ajmain, M. T., Ab. Rahim, S., & Abuhassna, H. (2022, September 27). Implementation of Augmented Reality (AR) in Malaysian Education System. *Implementation of Augmented Reality (AR) in Malaysian Education System. International Journal of Academic Research in Progressive Education and Development*, *11*(3), 1207-1216. 10.6007/IJARPED/v11-i3/14660