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CONVEYING ASMAUL HUSNA'S KNOWLEDGE VIA MOBILE APP FOR UNDERGRADS: HYBRIDIZING SIGNALING PRINCIPLE AND NIELSEN'S DESIGN GUIDELINES

Arifah Fasha Rosmani[1*], Ariffin Abdul Mutalib[2], Siti Mahfuzah Sarif[3]

[1] Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Cawangan Perlis, Malaysia
Email: arifah840@uitm.edu.my
[2] Multimedia Innovation and Digital Humanities Research Unit, Universiti Utara Malaysia (UUM), Malaysia
Email: am.ariffin@uum.edu.my
[3] Multimedia Innovation and Digital Humanities Research Unit, Universiti Utara Malaysia (UUM), Malaysia
Email: ctmahfuzah@uum.edu.my
[*] Corresponding Author

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Abstract:

With the evolution of mobile innovation, teaching asmaul husna to be engaging and exciting is possible. Therefore, this study aims to plan and develop a mobile app to effectively and competently prepare undergraduate students to learn asmaul husna. Signaling principles are chosen for this mobile application, as it is a very persuasive idea in digital learning in the same manner as Nielsen's design guidelines in the field of interaction design. (i) Asmaul Husna; (ii) Huraian Makna; (iii) Solusi Kehidupan and (iv) Kuiz Kefahaman, four separate parts of AHMA-SP (Asmaul Husna Mobile Application). This research presents an elective way to encourage students to learn asmaul husna and enhance their ability to memorize the definition of asmaul husna and their everyday life applications. It is evident from the test results provided on the level of knowledge through pre-test and post-test that there is a substantial improvement in this aspect. It is also proof that students have been able to understand the meaning and recall the names of Allah by implementing and incorporating the Signaling Principle and Nielsen's Design Guidelines.

Keywords:

Asmaul Husna, Islamic Mobile Application, Multimedia Learning, Signaling Principle, Nielsen's Design Guidelines.

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Introduction

Multimedia learning involves learning from texts and pictures. It includes learning from textbooks containing passages and illustrations, computer-based lessons that contain animations and narratives, and slide shows containing graphics and presentations accompanied by sound (Mayer, 2009). Multimedia learning theories tend to focus on the cognitive processes involved in learning, such as choosing relevant information, administering the material into a coherent organization, and integrating it with previous knowledge and long-term memory, as suggested in the Cognitive Theory of Multimedia Learning (CTML) (Mayer, 2014). CTML guides the multimedia content structure and instructions to fully utilize how the brain processes visual and auditory information to produce quality multimedia teaching materials for students. Teachers and instructional designers are taught using principles as they could use multimedia tools that utilize brain cognitive abilities with visual and auditory capabilities provided by texts, images, graphics, animations, videos, and narratives (Mayer, 2014). The empirical research proposes some prescriptive principles to aid multimedia designers to make educational materials more suited to human cognitive architecture that can eliminate or reduce cognitive burden, confusing variables, and information incompetence (Rapp, 2013; Mohamed, 2011).

Principles of Multimedia Learning

This principle is introduced by Mayer (2001) that manages in delivering courseware without the conventional up close and personal strategy. It is centered principally around courseware plans and organizations. There is a wide assortment of multimedia learning guidelines examined by Mayer (2014), which is upheld by looking into recognizing learning circumstances to decide on, which brings an entirely superior learning process. It includes twelve rules that shape the structure and organization of interactive multimedia presentations which include Principles for Fostering Generative Processing in Multimedia Learning, Principles for Managing Essential Processing in Multimedia Learning, and Principles for Reducing Extraneous Processing in Multimedia Learning (Mayer, 2001).

Signaling Principles

This study decides to apply the Signaling principle because it is very significant in the learning of asmaul husna, especially in e-learning and multimedia presentations. The selected principle has been a success in the previous works on asmaul husna learning and memorization through courseware and game (Rosmani & Zakaria, 2018; Rosmani et al., 2017). Based on the research, decent results were obtained with the use of Signaling Principles such as the students' engagement, excitement, and attractiveness in using the learning materials as well as in learning the content. Signaling principles were established under Principles for Reducing Extraneous Processing, where people could learn better when signals were added to highlight necessary organizational materials.

Cueing can reduce subjective cognitive load, facilitate retention, and transfer performance, and the more mental capacity is reduced by signals, the better retaining and transmission of multimedia learning (Xie et al., 2017; Yang, 2016) regardless of learners' cognitive styles. Figure 1 depicts the previous works that have been achieved using the Signaling principle in their learning methods (Schneider et al., 2018). The signals or cues that have been employed in these studies are the spotlights, use of color in the concept map, arrows, flashing sections, labeled diagrams, graphic organizers, mixed cueing, picture referencing, text highlighting, and mixed text signaling. The signals or cues will assist learners in their study, especially for multimedia presentations such as mobile learning.

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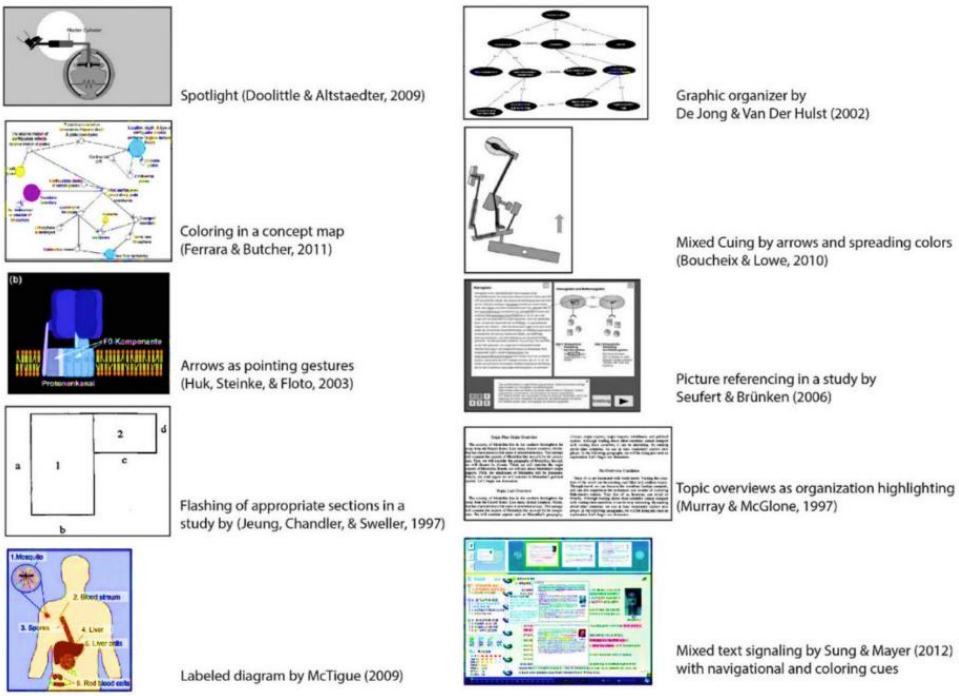

Figure 1: Signal or Cues Applied in Previous Works

Nielsen's Design Guidelines

Nielsen's design guideline has been renowned for its usage and application in human-computer interaction; therefore, numerous types of research have been conducted to create an excellent mobile learning environment based on these guidelines. Nielsen's design guideline is selected for this study as it promises these advantages in the previous works of literature:

i. Suitability for e-learning environments, especially for a mobile learning environment.
ii. Cover the perspectives that are best suited for the development of learning applications.
iii. Customization, according to the learners' category.

Asmaul Husna

Asmaul husna is a respected, incredible name, the title of Allah SWT as per His characteristics; perusing or hearing asmaul husna has many benefits, and each of the names contained in asmaul husna has its advantages (Wulandini et al., 2018). As to motivate college or university students to learn asmaul husna, a useful instrument for driving them is needed. Signaling principles are utilized to push students to learn asmaul husna with the assistance of a mobile app. By using this app, students' enthusiasm to find out about asmaul husna can be improved since the material shows up with shading, sound, content, movement, illustrations, and video. Moreover, the intuitive qualities of the app could connect with the students as they can control their learning according to their necessities and capacities. A few applications were developed to attract Muslims to learn asmaul husna, for example, in Table 1.

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Table 1: Asmaul Husna Mobile Applications

No.	Name of Mobile Applications	Target Audience	Content
1.	99 Names of Allah - Asmaul Husna and Asmaul Nabi	Adult	Ninety-nine names, meanings, and benefits and names of the Prophets.
2.	Asmaul Husna	Children	Ninety-nine names, meanings, and Islamic stories.
3.	Asmaul Husna Audio	Adult	Ninety-nine names, meanings, and benefits in audio.
4.	Asmaul Husna – Let's Sing Together	Children and Adult	Ninety-nine names in the form of *nasyid*.
5.	Belajar Asmaul Husna + Suara	Children	Ninety-nine names and meanings in audio.
6.	Benefits of Asma Ul Husna	Adult	Ninety-nine names, meanings, and benefits.
7.	Cerita Asmaul Husna untuk Anak	Children	Ninety-nine names, meanings, and explanations.
8.	Dzikir 99 Asmaul Husna	Children	Ninety-nine names and meanings and *nasyid*.
9.	Keutamaan Asmaul Husna	Adult	Ninety-nine names and meanings.
10.	Marbel Asmaul Husna + Suara dan Terjemahan	Children	Ninety-nine names and meanings in audio.
11.	Memory Asmaul Husna	Children	Ninety-nine names and meanings.
12.	Names of Allah	Adult	Ninety-nine names and meanings.
13.	Nyanyian Asmaul Husna Bersama Diva	Children	*Nasyid* and asmaul husna meaning.
14.	Remember Asma' Ul Husna	Children	Ninety-nine names and meanings.
15.	Zikir Asmaul Husna	Adult	Ninety-nine names and meanings.

Referring to these asmaul husna mobile applications in Table 1; none incorporates the usage of the 99 names for daily life as envisioned for this study. All these applications are only focusing on the meaning and singing part. Unfortunately, many know very well how to sing but do not fully comprehend each of the definitions and how to apply them in everyday life.

Before starting the class or while studying at home, asmaul husna could be used by mapping each name with the activities to be carried out. As for studying, students could repeat and make a prayer (du'a) using the name of Al-'Alim (The Most Knowledgeable), Al-Hakim (The Wisest), and Ar-Rashid (The Most Intelligent). They could also call upon the name of Al-Khaliq (The Creator), Al-Baari' (The Organizer), and Al-Musowwir (The Most Creative) before preparing for assignments and projects. It is tally with Surah Al-Isra' Verse 110, "Say, Call upon Allah, or call upon the Most Merciful. Whichever [name] you call - to Him belong

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the best names. And do not recite [too] loudly in your prayer or [too] quietly but seek between that a [intermediate] way."

Furthermore, there is no explicit usage of any Multimedia principles in these Islamic mobile applications, especially in the use of Signaling principles. Though the principles might exist, however, it is not highlighted and addressed (Rosmani et al., 2018c). Consequently, this study intends to devise and create a mobile application, named Asmaul Husna Mobile Application (AHMA-SP) as a method to encourage students in learning and memorize the Asmaul Husna meaning, thus applying them in their life.

Therefore, this paper aims to discuss the design part, which is the storyboard and the infused Signaling principles and Nielsen's design guidelines in the prototype.

The Gap

The findings in the preliminary research show that the knowledge and awareness of asmaul husna for Muslims are still in infancy and there is a need for further research to increase the understanding of the subject matter via the use of a mobile app (Rosmani et al., 2018a). Furthermore, most of the existing studies on Islamic mobile applications have little concern about the multimedia principle, particularly the Signaling principle to enhance the user interaction of the app. From the previous works, there is a lacking of the state of the Signaling principle together with Nielsen's design guideline, especially in the study on knowledge, perceived awareness, and perceived motivation in the context of asmaul husna learning (Rosmani et al., 2018c). Therefore, it shows the urgency to explore further the hybridization of both principles to contribute to the user experience via mobile applications.

To fit with mobile learning, the use of multimedia elements will increase user use and interest in using the apps for different purposes, and multimedia learning has become the primary method of learning for formal and informal education. It is undoubtedly necessary to respond to the rapid increase in mobile technology to improve user experience with mobile devices. Mobile learning design is essential to ensure continuity and engagement, and to emphasize the users' interactivity and positive learning experience while using mobile apps (Rosmani et al., 2018b).

Proposed Solution

The changes in the dissemination of Islamic knowledge are proliferating from just preaching, books and radio to the era of Information Communication Technology (ICT) (Ismail et al., 2013). Such innovations are of great help to all ages seeking information in the field of religion.

The findings show that research on Islamic applications, their criteria (including multimedia principles), and users' awareness and usage of mobile Islamic content is still deficient (Khan & Shambour, 2017; Ismail et al., 2016; Ismail et al., 2013). Especially in the learning of asmaul husna, as the knowledge and awareness level of this context is still scarce (Rosmani et al., 2018a; Rosmani & Zakaria, 2018) and it is only memorized temporarily and has not become a practice in life (Julinah, 2014). Hence, a better mobile app is created and developed in this context. Series of asmaul husna mobile apps developed previously, as shown in Table 1, though none have integrated with well-established principles. Consequently, studies on the development of Islamic-based smartphone applications need to be ventured continuously (Ismail et al., 2016, Ahmad & Razak, 2013; Ismail et al., 2013; Nawi & Hamzah, 2013;

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Zuhaidah, Zain, Mahmud, & Hassan, 2013, Kamarudin & Salam, 2012) mainly on the learning of asmaul husna among Muslims.

To bridge this gap, a study on Islamic mobile applications integrated with the Signaling principle and Nielsen's Design Guideline is performed to investigate the knowledge and perceived awareness of the context and perceived motivation of the target users in using the learning material. Islamic mobile apps employed the Signaling principle, although it can still function if the principle is absent. The primary reason is that this principle will assist in guiding attention, organizing, and integrating knowledge (Mautone & Mayer, 2001). Generally, it helps to reduce extraneous load and the unnecessary memory burden which can cause a decrease in learning outcomes (Richter et al., 2016). The signals will ease the demands on the user's working memory and thus, reducing the cognitive load and the information will be easily comprehended conjointly with the incorporation of Nielsen's design guidelines that will assist in determining the usability trends (Loranger et al., 2014). Consequently, this research is inspired to intensify the motivation of the Islamic mobile app user in using the app and uplift their interest and increase their awareness and knowledge in Islamic content, particularly in asmaul husna learning.

Methodology

The three stages involved are planning, design, and development based on Alessi and Trollip (2001) as depicted in Figure 2. Though as stated before, this section will only discuss the design part, which is the storyboard and the infused Signaling principles and Nielsen's in the prototype.

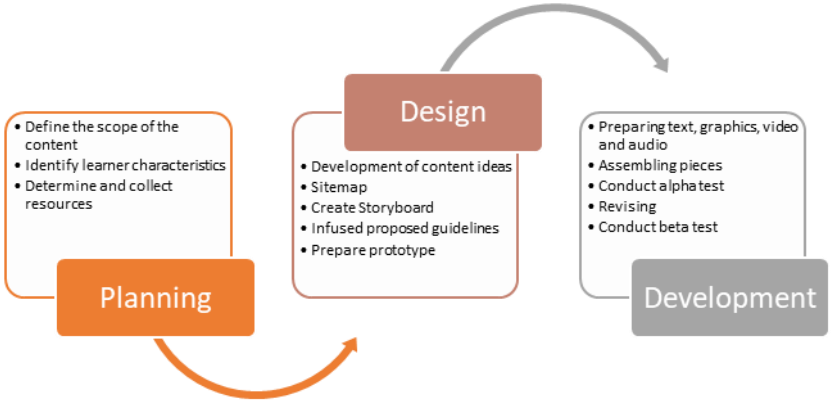

Figure 2: Methodology for AHMA-SP

Design

In the IR4.0 era, the integration of mobile learning into everyday teaching and learning requires an efficient design of a mobile learning environment. It is to ensure that all critical elements for producing effective interactions between students and the mobile learning environment are comprised. Alessi and Trollip's Instructional Design Model (IDM) was incorporated for this study, and three phases involving planning, design, and development were engaged. It is to ensure that the mobile app is more practical, engaging, and meaningful for the users so that this study can be accomplished (Rosmani et al., 2018b).

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Storyboard

A storyboard is a realistic visual planner; a progression of delineations and pictures shown in succession for a film, activity, realistic movement, or intuitive media arrangement. The fundamental motivation behind storyboard configuration is to consider the organization of ideas, to deal with the materials, and to inspect the concepts before the construction process. The upside of utilizing storyboards is that it permits the users to try different things with changes in the storyline to propose a more grounded response or intrigue (Rosmani & Wahab, 2011). The prototype design and development are performed after the completion of the design guidelines and storyboard. The prototype is developed based on the guidelines that have been generated in the design phase. Examples of the storyboard are depicted in Figure 3.

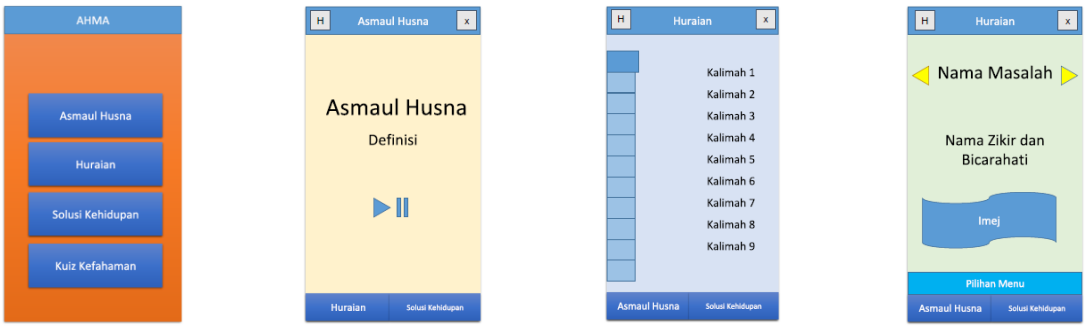
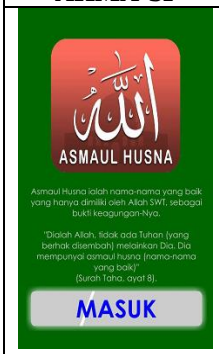


Figure 3: Storyboard Example for AHMA-SP

Infusion of Design Guidelines

The proposed design guidelines have been applied and implemented in the development of AHMA-SP. The guidelines are merged between Signaling principles and Nielsen's design guidelines as well as from results obtained from a survey conducted on target users. The proposed guideline is thoroughly examined by experts and edited accordingly. Table 2 shows some of the principles used in specific interfaces in this mobile app.

Table 2: Infusion of Design Guideline in Prototype

Screenshots of AHMA-SP	Signaling Principles Applied	Screenshots of AHMA-SP	Signaling Principles Applied
	Flashing button, this button uses the Picture-based technique, the use of a button with indications that it is clickable with a flashing signal.		The main title is animated into the apps which depict the text-based concept for titles and headlines.

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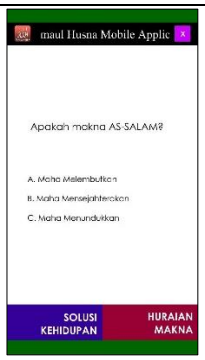
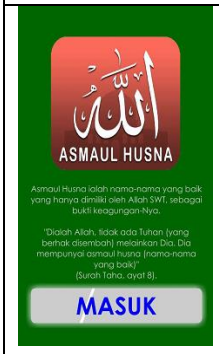
	The main menu buttons are shown using an animated hand icon to depict the picture-based signal to show that the buttons are clickable. The buttons are shadowed to make them stand up.		This is the section for "Huraian Makna" or the meaning for each of the 99 names. The hand icon shows the names individually to show that it can be clicked for more information. The page number is also highlighted to ensure that the user realized that they are on the page 1 list of the 99 names. Each page contains ten names. There are also arrows indicating that the user can click to go to the next page or previous page.
	This is one of the meanings of the 99 names, and the text-based signal is applied to highlight the meaning and essential keywords.		Color-coded is used on this page to signify the sections of the page. The tabs are divided into three different colors to differentiate the parts.
	In this content page for "Solusi Kehidupan", an Audio-based technique is used where voice intonation is accompanied by written text.		The main keyword is written in capital letters to highlight the question in the quizzes section.

Screenshots of AHMA-SP	Nielsen's Design Applied	Screenshots of AHMA-SP	Nielsen's Design Applied
	• Match interaction design with standards that users are familiar with. • Choose familiar navigation schemes.		Feature images with simple backgrounds to keep the focus on the picture.

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	• Offer a reasonable number of choices. Too many options can deter people from making the correct decisions or from deciding at all. • Feature category that indicates where they lead. • Organize content by meaningful categories.		• Indicate clickable elements. • Similarly, do not make items appear clickable if they are not.
	• Integrate videos with related content. • Feature clear indicators to help users identify video content. • Use videos to show emotion or concepts that cannot be conveyed as well in writing. • Integrate videos with the related content		• Featuring a few fancy components can increase appeal but consider the most straightforward solution first. • Provide navigational cues to orient users to the rest of the app. • Make sure the back button works.
	• Limit the use of jargon. • Minimized redundancy. • Format text for readability. • Avoid playing sound automatically, and provide easy-to-use audio controls.		Attract with clean, simplistic designs and ample white space (visual gaps).

Result and Discussion

This experiment was carried out in a public university, and there were 116 participants involved in this knowledge test using a purposive sampling technique. At the beginning of the testing session, the participants were scheduled to sit for the pre-test. Then, they were briefed on the interface and navigation of AHMA-SP. After a week, the same participants were allowed to explore the mobile app by themselves. The group was monitored and provided with help when necessary. Immediately after the treatment, they were given the post-test questions, which are named Asmaul Husna Knowledge and Awareness Instruments (AHKAI). The test results are as stated in the tables below.

Table 3: Gender

	Frequency	Per cent
Male	46	39.7
Female	70	60.3
Total	116	100.0

Table 4: Programme

Programme	Frequency	Per cent
Diploma	62	53.4
Degree	54	46.6
Total	116	100.0

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Of the 116 students involved in the experiment, 46 students were male students representing 39.7 per cent, while female students were 70, which is 60.3 per cent, as shown in Table 3. The program of study for students involved in this study consists of diploma and degree students, as depicted in Table 4. However, the majority of students involved are diploma students who make up 53.4 percent, and the rest are undergraduates at 46.6 percent.

Table 5: Descriptive Statistics

	Frequency	Minimum	Maximum	Mean	Std. Deviation
Pre-test	116	1	10	5.27	1.686
Post-test	116	3	10	7.88	1.690

The researcher created the test session questionnaire, and it has a Cronbach alpha score of 0.75, which is regarded as reliable. For this test, 2 hours were allotted. Frequency and paired sample assessments on the students' knowledge taken before and after using the app are used in the data analysis for the information gathered. From the following pre-test and post-test results indicated in Table 5, it can be noted that the minimum value is different for the test; the minimum value is 1 for the pre-test and 3 the for post-test. Meanwhile, the maximum value is the same for both tests. With this difference, it is evident that knowledge levels have increased before and after the use of AHMA-SP.

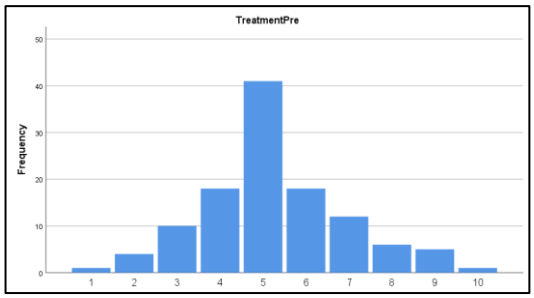

Figure 4: Knowledge (Pre-test)

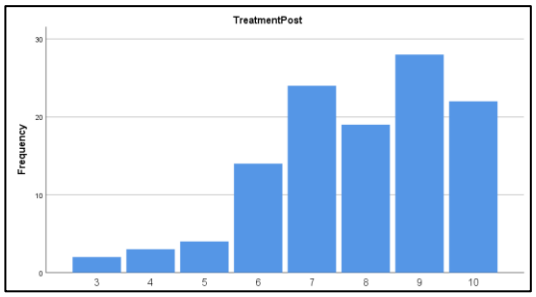

Figure 5: Knowledge (Post-test)

Based on Figure 4 and Figure 5 shows an increase in knowledge test marks before and after the experiment is performed.

Table 6: Paired Samples Test for Knowledge

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre-test Post-test	-2.612	2.059	.191	-2.991	-2.233	-13.663	115	.000

A paired-sample t-test was used to compare the pre-test and post-test. The t-test value was -13.663 with a p-value (0.000) less than a 5% significance level. As a result, there was a significant change between the pre-test and post-test. Performance on the post-test is far better than performance on the pre-test as illustrated in Table 6. There are significant differences before and after the use of AHMA-SP. The level of student knowledge has increased after the

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use of the app. Hence, it has been demonstrated that the use of the design guideline within AHMA-SP has facilitated students' learning sessions in the context of asmaul husna.

Conclusion

The prototype is assembled based on the guidelines implementing the Signaling principle and Nielsen's design guidelines after passing through complex processes. It is seen from the test results that the user's knowledge has improved with the advent of the mobile app. Similarly, their comprehension of the content of the app, context, and use of asmaul husna has drastically improved. It is hoped that the guidelines and mobile app can be examples and templates for the development of mobile apps related to Islamic content. Especially noteworthy for students in higher education, such as colleges and universities, in learning.

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