Leveraging Prototype Method for Designing Tajweed Mobile Based Learning

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Abstract

In today's fast-paced society, individuals often struggle to find dedicated time for studying the Qur'an. This research aims to address this challenge by designing and developing a Mobile-Based Tajweed Learning Application. By harnessing the power of mobile devices, this application provides users with a platform for independent and accurate Tajweed Science learning. To bridge the gap between developers and users, the Prototype Method is employed in the development process. This collaborative approach offers several benefits, including concept testing, cost and time savings, increased user involvement, iterative improvements, risk reduction, and enhanced communication. By actively involving users throughout the development cycle, the application can better align with their requirements and expectations, leading to an improved end product. The effectiveness and reliability of the mobile-based Tajweed learning application are rigorously validated through black box testing. This thorough testing method ensures that the application functions as intended, delivering a seamless learning experience to users. Furthermore, the application leverages the Flutter framework, enabling optimal performance and responsiveness. The framework's features, such as hot reload, contribute to efficient development and ensure a smooth user experience. The results of the Tajweed Mobile Based Learning project demonstrate that the application effectively provides learning materials and facilitates practice sessions with ease. By utilizing this mobile application, users can access comprehensive Tajweed resources conveniently and independently, overcoming the time constraints often associated with studying the Qur'an. This research showcases the potential of mobile technology to enhance Quranic education and empower individuals in their Tajweed journey.

Keywords: Learning Model, Tajweed Science, Mobile Application, Prototype Method

1. INTRODUCTION

In our rapidly advancing world, technology has become an integral part of our lives, touching every aspect, including the realm of worship. A prime example of this is the digital Al-Quran, which has revolutionized our engagement with the Holy Book. With a simple tap on our smartphones, we can effortlessly immerse

ourselves in the recitation of the Qur'an through the Al-Quran application, rendering the need for a physical copy obsolete. However, while this digital innovation offers unprecedented convenience, it also brings to light a persistent challenge: the mastery of Tajweed science [1]. Tajweed science stands as an indispensable discipline that every devout Muslim should strive to acquire, as it plays a pivotal role in ensuring the correct recitation of the Qur'an. Tajweed encompasses a multifaceted understanding of the intricate nuances of pronunciation, including the unique properties of each letter and the rules governing their articulation. Furthermore, it involves the essential knowledge of where to pause (waqaf) and where to resume reading (ibtida') [2].

Unfortunately, many individuals face a significant hurdle in accessing competent teachers or educational institutions that offer comprehensive Tajweed lessons. This predicament poses a formidable obstacle to those eager to delve into the depths of this sacred science. Nevertheless, there is a glimmer of hope on the horizon. Tajweed learning applications have emerged as a pivotal solution, acting as beacons of knowledge, guiding learners through the intricacies of Tajweed, regardless of their geographical location or demanding schedules. These innovative applications bestow upon aspiring learners the gift of boundless accessibility, facilitating their educational journey in Tajweed at a time and place of their choosing. In a world brimming with commitments such as work, studies, and familial responsibilities, these applications emerge as empowering tools, enabling individuals to embark upon their educational quests at their own pace and convenience, while circumventing the burdensome task of commuting to physical classes.

To address this issue, there is a pressing need for a digital-based Tajweed learning medium that can be accessed anytime, anywhere, in the form of a mobile application. Among various types of mobile devices, smartphones stand out as nearly ubiquitous [3]. While smartphones are primarily used for communication, their numerous features, such as audio and video processing, document handling, and more, allow for additional applications. While some individuals have already created similar applications that have been published, these existing applications only focus on explaining the science of recitation. In contrast, the proposed application aims to provide a comprehensive learning experience through practice questions, audio materials, and other updated resources. As such, the researcher's Tajweed application differs significantly from previous ones.

Previous studies have explored recitation and Tajweed, including a research paper titled "Android-Based Tajweed Learning Applications" [4]. This study aimed to develop a Tajweed learning application for Android devices, utilizing the HIPO (Hierarchy Plus Input Process Output) method for system development and Java as the programming language. Another study sought to create recitation learning media for Android, employing the ADDIE (Analysis, Design, Development,

Implementation, and Evaluation) method [5]. Based on the aforementioned data, the researcher chose to employ the Dart programming language and the Flutter framework in the development of the system, with the prototype method as the chosen development approach.

The prototyping model enables developers to test and validate concepts before investing substantial time and resources into creating a complete system. Through prototyping, developers gain firsthand experience of how the system functions in real-life scenarios and obtain feedback from users and stakeholders. This process helps identify shortcomings and areas for improvement, ensuring that the developed system meets existing needs and expectations. Additionally, the prototyping model fosters collaboration and communication among the development team, users, and other stakeholders. With a runnable and testable prototype, the team can directly interact with the evolving system, facilitating better discussions, a deeper understanding of requirements, and enabling users and stakeholders to provide more constructive and accurate feedback [6].

2. METHOD

The method employed in this study is the prototype method, which is a software development approach facilitating effective collaboration between system developers and users. Its purpose is to address disparities between developers and users by utilizing a physical working model of the system, known as a prototype, which serves as the initial version of the system. Through this prototyping method, an intermediary system prototype is created, enabling developers and users to interact during the development process of information systems [7]. The prototype method encompasses several essential steps that must be undertaken, as shown in Figure 1 [8]:
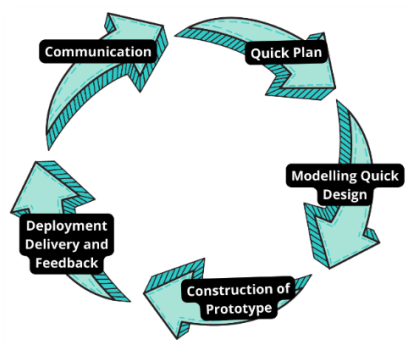

Figure 1: Stages of the Prototype Method

1. Communication, during this stage, authors identify and collect data related to the issues at hand. This analysis involves direct interviews with prospective

application users. The communication stage in the prototyping method comprises a series of crucial steps aimed at ensuring a clear understanding between the development team, designers, and users regarding the prototype under construction. This stage ensures effective communication of goals, features, and expectations for the prototype while gathering relevant feedback to inform future iterations.

2. Rapid Planning, after conducting software requirements analysis, authors proceed to devise a plan to align user requirements or system requirements with the collected information. The purpose of this stage is to quickly and succinctly plan what will be achieved through the prototype and how to accomplish it. The initial step in rapid planning is to identify the purpose of the prototype, wherein the team gains a clear understanding of the desired outcomes from building the prototype. Whether it is testing a new concept, gathering user feedback, or assessing technical feasibility, the objectives must be clearly defined and measurable. Once the goals are set, the subsequent step is to establish the scope and boundaries of the prototype. This decision helps concentrate efforts on the most important and relevant features and functionality.

3. Quick Design Modeling, during this stage, authors describe the system model using the Unified Modeling Language (UML). The primary focus lies on the information structure and the representation of the interface to be developed. Quick Design Modeling is an early stage in prototyping development, involving the rapid and simple design of concepts. The objective is to generate initial ideas and visual representations that can engage users, gather feedback, and validate ideas before advancing to more detailed stages of prototyping development.

4. Prototype Construction, at this stage, authors translate the design and system requirements into a program and conduct trials on the resulting system. Prototype Construction within the prototype method refers to the process of building or creating a physical or digital prototype used to test and demonstrate the planned product's features and functionality. This stage entails transforming the conceptual design into an interactive form for users or stakeholders. Prototype Construction involves materializing the design from the concept into a tangible form, which can be achieved through physical prototyping using materials such as plastic, wood, paper, or metal, or digital prototyping facilitated by design or development software.

5. Deployment, Delivery, and Feedback, the final stage entails the deployment of the prototype to users, collecting feedback for assessment, and using that feedback to enhance the system according to user needs. Deployment, Delivery, and Feedback are pivotal stages in the prototyping method, involving the rollout of the prototype to relevant users or stakeholders, gathering feedback, and utilizing it to improve the prototype and guide subsequent development.

3. RESULTS AND DISCUSSION

3.1. Problem Analysis

The learning of Tajweed follows the principle of fardu kifayah, whereas its practical application in Qur'an recitation is deemed fardu ain. However, the reality reveals a prevailing lack of understanding among individuals regarding the science of recitation. Researchers have delved into this matter and found that the primary reason for this knowledge gap is the scarcity of time available to people, as they are engrossed in various pursuits such as livelihood, general education, and other activities. Nevertheless, there is no justification for individuals to neglect allocating time for Tajweed learning, considering its obligatory nature as explained earlier. Researchers assert the necessity for an alternative approach that facilitates effective and efficient Tajweed learning. This alternative perspective entails leveraging information technology, commonly referred to as Tajweed learning based on information technology. The implementation of this Tajweed application yields numerous significant benefits for users seeking to enhance their Qur'an recitation by comprehending the rules of Tajweed. This application offers an interactive and immersive learning experience, enabling users to assimilate the recitation principles through diverse mediums, including text, audio, video, and interactive exercises. Consequently, the learning process becomes more captivating, comprehensible, and ultimately more effective.

By utilizing this application to learn Tajweed, users can refine their Qur'an recitation skills in accordance with the established rules. The application provides lucid explanations and exemplifications of correct pronunciation, idgham occurrences, ghunnah rules, and other essential guidelines. Consequently, users can recite the Holy Qur'an with unparalleled clarity and beauty. Furthermore, this recitation application permits users to record their recitations and compare them with appropriate samples. This feature empowers users to listen to their recordings and identify and rectify any mistakes in their recitation. It serves as a valuable tool for enhancing the quality of their personal recitation and rectifying errors that may have gone unnoticed previously.

3.2. System planning

During the system design phase, the researcher employed the Unified Modeling Language (UML), which serves as the widely accepted graphical language for describing object-oriented software development systems. The UML approach encompasses two key stages, namely use case diagrams and activity diagrams. Unified Modeling Language (UML) holds the status of a standardized language employed in software engineering for the purpose of modeling, designing, and documenting systems based on objects. UML offers a comprehensive set of

notations and methodologies to represent the structure, behavior, interactions, and components of a system in a diagrammatic format that can be comprehended by developers, stakeholders, and other modelers [9].

3.2.1 Use Case Diagrams

Use case diagrams serve as a specific type of diagram utilized in software engineering to depict the interactions occurring between actors, whether they are users or external systems, and the system under development. The primary objective of this diagram is to elucidate the system's functionality within the context of its usage. By employing use case diagrams, a clearer understanding of system requirements and behavior is achieved, facilitating effective communication of this information to the development team and other stakeholders [8]. These diagrams capture the overall relationship existing within the system. In the process of designing the use case diagrams, the researchers focused solely on a single actor, namely the users. The users are able to select various Tajweed science materials, such as makhorijul letters, nun sukun, mim sukun, and qolqolah. Additionally, they can engage in practice exercises and have the option to exit the application. The depiction of the use case diagram is presented in Figure 2.
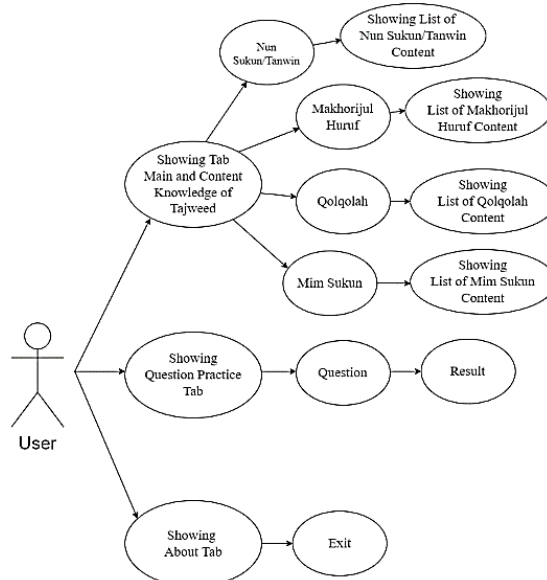

Figure 2: Display of Use Case Diagram

3.2.2 Activity Diagrams

The activity diagram represents a vital type of diagram employed in software engineering to illustrate the workflow or sequence of activities within a process or

system. These diagrams play a crucial role in modeling the activities or tasks executed by objects or actors within the system, while also capturing the relationships and dependencies between these activities [8].

The Activity Diagram showcased exemplifies the activity flow within a mobile-based Tajweed learning application. Upon launching the application, a splash screen is displayed for a duration of three seconds, followed by direct access to the main page. Within the main page, users have the option to select Tajweed materials such as makhorijul letters, mim sukun, nun sukun, and qolqolah. Furthermore, the main page allows users to navigate to the practice questions section, which contains inquiries pertaining to the science of recitation. The application also presents the users with the results of their answers. Additionally, an "about" page can be accessed from the main page, which includes a button triggering a message dialog for application exit. The activity diagram providing a visual representation of this flow can be observed in Figure 3.
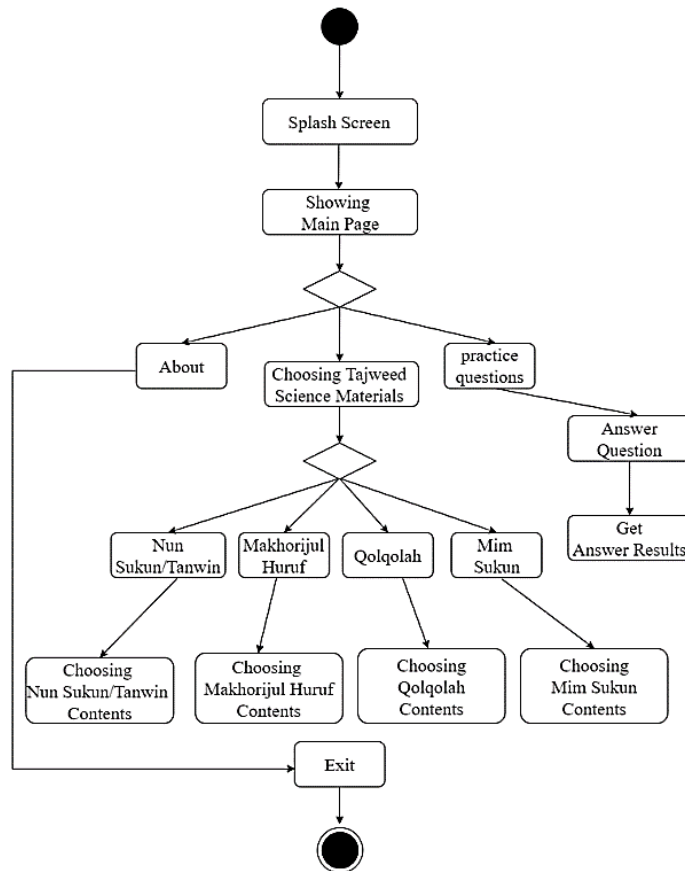

Figure 3: Display of Activity Diagram

3.3. Interface Design

The main page is meticulously designed to feature four Tajweed material menus, complemented by a bottom navigation bar that facilitates seamless access to the practice questions start page and the about page. Each menu encompasses a distinct area of focus for study. The first menu delves deeply into the intricacies of the law of nun breadfruit and tanwin, effortlessly redirecting users to a dedicated page solely dedicated to the exploration of this specific topic. The second menu places utmost emphasis on makhorijul Letters, expertly guiding users towards an exclusive page that enables them to master the art of letter pronunciation. The third menu revolves around the captivating realm of qolqolah, providing a comprehensive page that enlightens users about the myriad types of qolqolah letters. Lastly, the Mim Sukun Law menu serves as an invaluable guide, proficiently steering users towards the highly informative Mim Sukun Law Study page. Figure 4 captivatingly showcases the splash screen page, which warmly greets users upon their initial launch of the application, while Figure 5 exquisitely presents a detailed representation of the main page, capturing its essence and functionality.
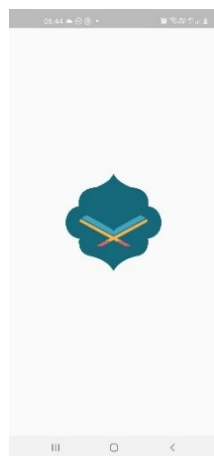

Figure 4: Splash Screen Page　　　**Figure 5:** Main Page

The Makhorijul Letters menu unveils a comprehensive exploration of Arabic pronunciation and letter production from specific positions within the mouth. This first menu page offers a detailed explanation of Makhorijul Letters, accompanied by a menu list encompassing various groups of these letters. Delving further, the second page provides a meticulous breakdown of each Makhorijul letter group, supplemented with audio aids. Understanding Makhorijul Letters equips us with the knowledge required to articulate Arabic letters accurately. By studying the precise locations and manners in which each letter is formed within the mouth, throat, and lips, we enhance our ability to pronounce Arabic letters

flawlessly. This page, exemplified in Figure 6, serves as an indispensable resource for cultivating clear and precise Arabic pronunciation.

The Nun Sukun page, also featuring a menu, elucidates the intricacies of the Nun Sukun rule, or the law of tanwin in Tajweed. Within the first menu page, users encounter a comprehensive explanation of Nun Sukun, accompanied by a menu showcasing various lawful options related to Nun Sukun. Transitioning to the second detail page, users are greeted with a comprehensive explanation of the Nun Sukun rules, further enhanced by audio support. The Nun Sukun rule comes into play when Nun Sukun (نْ) encounters specific letters. This page meticulously explores two types of Nun Sukun laws: Nun Sukun Law Meets Jaiz Letters, which encompasses letters without distinct Tajweed properties. Within this law, three possibilities exist: idgham, iqlab, and izhar. Figure 7 vividly demonstrates the details of this rule, offering a visual representation of the concepts discussed.
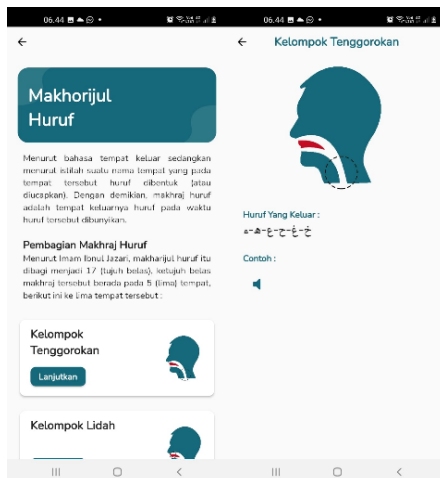
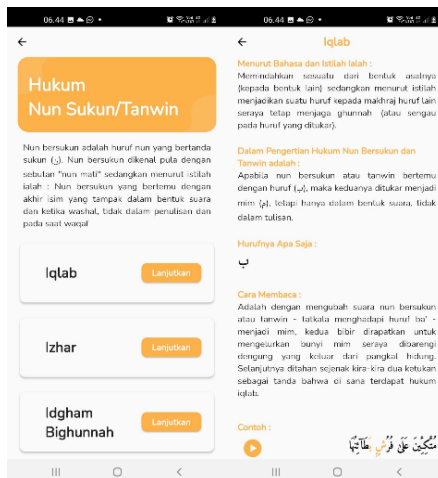

Figure 6: Makhorijul Letters Page

Figure 7: Nun Sukun Page

Another significant aspect of the design encompasses the pages dedicated to Mim Sukun and Qolqolah. The Mim Sukun page presents a comprehensive explanation of Mim Sukun, accompanied by a list of lawful menus pertaining to Mim Sukun. Moving to the detail page, users are met with an in-depth exploration of the legal aspects of Mim Sukun, supplemented with audio support. This page serves as a platform to elucidate the Tajweed rules governing the interaction between the letter Mim Sukun (مْ) and subsequent letters. Two types of Mim Sukun laws are discussed: Izhar Law and Ikhfa Law. Izhar Law applies when Mim Sukun encounters letters that are pronounced distinctly and audibly, without any alteration or blending of sounds. Conversely, Ikhfa Law applies when Mim Sukun meets letters that are pronounced with a subtle refinement of sound, accompanied by a slight "ghunnah" effect. Additionally, Idgham Mimi, a form of idgham in

Tajweed, occurs when Mim Sukun (مْ) is followed immediately by the letter Mim (م). In Idgham Mimi, Mim Sukun is pronounced with a prolonged ghunnah sound and seamlessly blends with the subsequent Mim letter. Figure 8 visually portrays the concepts explained in this section.

On the Qolqolah page, users are introduced to an explanation of qolqolah, which is a significant Tajweed rule governing the pronunciation of letters with a "vibrating" or "pushing" sound. The term "qalqalah" originates from Arabic, meaning "vibrate" or "bounce." Within the realm of Tajweed, five letters are identified to exhibit qalqalah: ق (Qaf), ط (Tha), ب (Ba), ج (Jim), and د (Dal). The first menu page provides a detailed explanation of qolqolah, accompanied by a menu list outlining the various qolqolah rules. Transitioning to the second detail page, users are treated to an in-depth explanation of the qolqolah rules, complemented by audio support. This page serves as a comprehensive guide, assisting users in understanding the intricacies of qolqolah and its application. Figure 9 visually represents the five letters associated with qalqalah, offering users a clear visual reference.
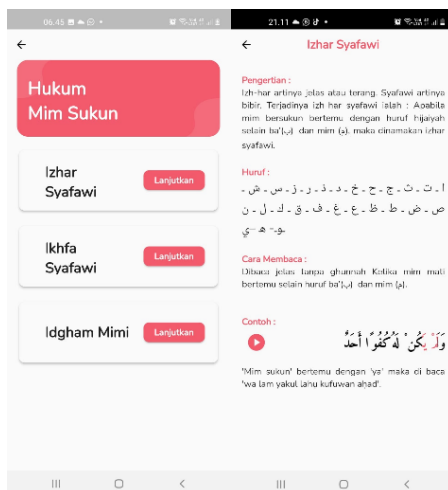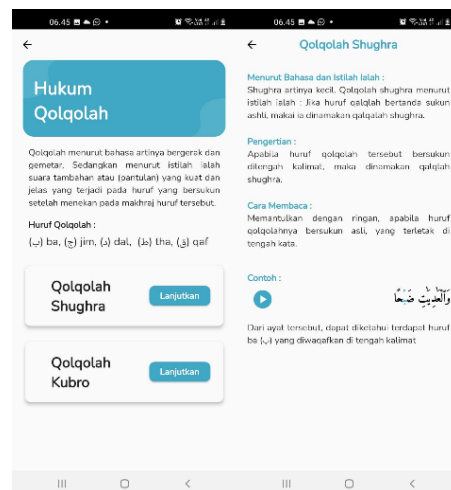

Figure 8: Mim Sukun Page

Figure 9: Qolqolah Page

The application also includes three pages dedicated to practice questions. The first page serves as the starting point, featuring a prominent start button that leads users to the question page. Moving forward, the second question page presents a series of ten multiple-choice questions designed to test users' knowledge. Upon completing the questions, users are directed to the third results page, which displays the answer results in numerical format. These practice questions pages, illustrated in Figure 10, offer an interactive learning experience, allowing users to assess their understanding and progress.

Additionally, an about page is available, offering users essential information about the application. This page includes an exit button, which, when pressed, triggers a message dialog prompting users to confirm their intention to exit the application. This feature ensures a seamless user experience. Figure 11 visually showcases the layout of the about page, providing users with a clear reference.
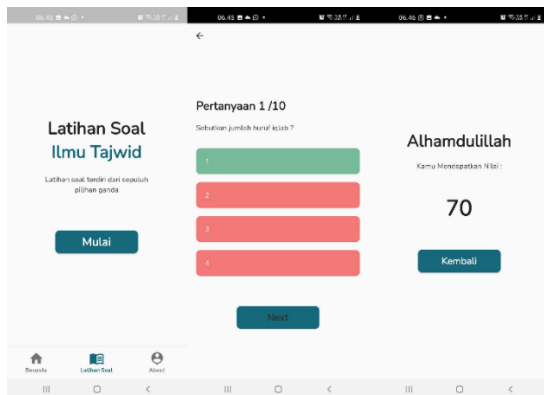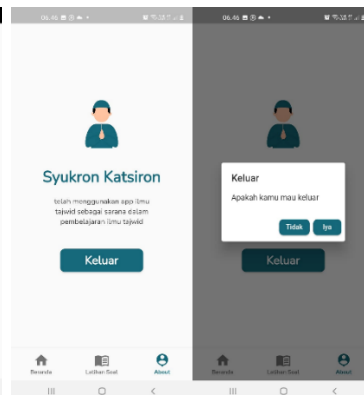

Figure 10: Practice Questions Page   **Figure 11:** About Page

3.4. Implementation

During the implementation stage, the authors employed the Flutter framework to code the application. Flutter, an SDK and open-source framework developed by Google, facilitates the creation of applications using the Dart programming language[10]. Utilizing the Flutter framework offers numerous advantages, one of which is its hot reload feature. This feature proves highly beneficial as it enables rapid display of application updates on an emulator or smartphone connected to the code editor. Consequently, the researchers opted for the Flutter framework as the technology for developing the recitation application. Once the implementation stage concludes, the project proceeds to the final stage: testing.

3.5. Testing

During the testing phase, the authors employed black box testing as their chosen methodology. Black box testing is a software testing method that primarily focuses on assessing the functionality of a system, without delving into its internal implementation details. In this approach, the system is treated as a "black box," with the emphasis placed on observing inputs and outputs[11]. This method allows for thorough examination of system behavior without requiring knowledge of its internal structure[12]. Testing using the black box technique is documented in Table 1, providing a comprehensive overview of the testing process and its outcomes. This rigorous testing approach ensures that the application meets the desired functional requirements, verifying its reliability and performance.

Table 1: Black Box Testing

No	Item	Test Method	Expected Results	Results	Status
1	Opening the application	The user pressed the tajweed learning application icon	The application system displays the splash screen page for three seconds, continues to the main page	expected	Succeed
2	Selecting the alphabet menu	user pressed the alphabetical menu button	The application system displays a makhorijul letter page and a list of makhorijul letter group material which is equipped with sample images and audio	expected	Succeed
3	Selecting the nun sukun menu	The user pressed the menu button nun sukun	The application system displays the nun sukun page and a list of materials for the nun sukun rules which were equipped with sample images and audio	expected	Succeed
4	Selecting the mim sukun menu	User pressed mim sukun menu button	The application system displays the mim sukun page and a list of material for the mim sukun rules, which includes sample images and audio	expected	Succeed
5	Selecting the Qolqolah menu	User pressed Qolqolah menu button	The application system displays a qolqolah page and a list of qolqolah rules material which was equipped with sample images and audio	expected	Succeed
6	Selecting the practice menu on the bottom navbar	The user pressed the practice question icon button	The application system will display the start page of practice questions containing the start button to work on practice questions	expected	Succeed

No	Item	Test Method	Expected Results	Results	Status
7	Selecting the about menu on the bottom navbar	The user pressed the about icon button	The application system will display an about page containing the exit button to exit the application which when pressed will appear a dialog box containing the 'yes' and 'no' buttons	expected	Succeed

The conducted tests during the application's evaluation phase yielded positive outcomes, affirming the functionality and usability of the different features. The test results provide valuable insights into the application's performance and user experience. Opening the application proved to be a smooth process, with the splash screen page appearing for the expected duration before transitioning seamlessly to the main page. This demonstrates that the initial launch process operates as intended, providing users with a visually appealing introduction to the application. Furthermore, selecting the alphabet menu successfully led users to the makhorijul letter page, where they could access a comprehensive list of makhorijul letter group materials accompanied by sample images and audio. This feature ensures users can effectively learn and practice Arabic alphabet pronunciation, enhancing the educational value of the application.

The test focusing on the nun sukun menu confirmed that the application provided the expected content related to the nun sukun rules. Users were able to access a dedicated page containing informative materials, including sample images and audio. This feature aids users in understanding and applying the rules of nun sukun accurately, contributing to their overall learning experience. Similar to the nun sukun menu, the mim sukun menu performed as expected. Users were directed to a designated page presenting materials explaining the mim sukun rules, accompanied by relevant sample images and audio. This functionality enhances users' understanding and pronunciation of mim sukun, ensuring effective learning.

Selecting the Qolqolah menu successfully directed users to the qolqolah page, where a comprehensive list of qolqolah rules materials, complete with sample images and audio, was available. This feature allows users to grasp the principles of qolqolah accurately, further enhancing their Tajweed learning journey. The practice menu, accessed via the bottom navbar, fulfilled its purpose by presenting users with a start page for practice questions. The inclusion of a start button allowed users to initiate their practice sessions effortlessly, promoting active engagement and reinforcing their knowledge and skills.

Lastly, the about menu provided the expected functionality, displaying an about page that contained an exit button. When users pressed the exit button, a dialog box with 'yes' and 'no' options appeared, facilitating a smooth exit from the application. This feature ensures users have a seamless and convenient experience while navigating through the application and managing their usage. Overall, the successful outcomes of these tests indicate that the application's features are well-implemented, allowing users to access relevant content, engage in practice sessions, and navigate through the application effortlessly. The positive results reflect the effectiveness of the application in facilitating Tajweed learning and providing a user-friendly experience.

4. CONCLUSION

In conclusion, the research has successfully produced a recitation application that serves as a valuable tool for users aspiring to enhance their Quranic recitation skills. Through the utilization of this application, users can learn Tajweed principles and refine their ability to recite the Quran accurately, adhering to the rules of Tajweed. The application offers clear explanations and exemplars of proper pronunciation, as well as detailed guidance on idgham, ghunnah, and other essential laws. This comprehensive approach empowers users to recite the Holy Quran with unparalleled clarity and profound beauty. Furthermore, this study has yielded the development of a mobile-based Tajweed learning application that enables individuals to independently comprehend, study, and practice the science of Tajweed. Serving as a self-contained educational resource, the application equips users with the necessary knowledge and tools to explore the intricacies of Tajweed at their own convenience and pace. During the testing phase, the application demonstrated its competence by successfully meeting the expected results, utilizing the black box testing method. This approach focused on evaluating the application's functionality and user-friendliness, without necessitating in-depth knowledge of its internal workings. The application's performance aligned precisely with the anticipated outcomes, further substantiating its effectiveness and reliability.

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