



Design Development of Mobile Application for Quran Memorization Integrating Tajwid and Tahfiz

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Abstract

Conventional Quran memorization methods in Islamic boarding schools often encounter challenges of time, space, and limited adaptive media, while the growing demand for digital-based education highlights the need for innovative solutions. This study aims to design and develop an Android-based mobile application integrating tajwid learning and tahfiz memorization features to enhance Quran education. Employing a Research and Development approach with the Waterfall model, the research was conducted at one Qur'an boarding school in an Indonesian city, involving 52 participants consisting of 40 santri, 8 tahfiz teachers, and 4 administrators. Data were collected through observation, in-depth interviews, questionnaires, and documentation, and analyzed using descriptive quantitative methods. The results show significant improvements: weekly memorization increased by 76.4 percent, tajwid quiz scores rose from 58.6 to 84.3 representing a 43.9 percent improvement, and daily submission consistency improved from 47.5 percent to 82.1 percent. User Acceptance Testing revealed a satisfaction rate of 96.2 percent, while Black Box Testing confirmed all functions operated according to specifications. The study concludes that the design and development of a mobile application integrating tajwid and tahfiz effectively enhance the quality and consistency of Quran memorization. The findings imply that mobile-based innovations can modernize Islamic education, offering scalable solutions for pesantren and Islamic schools to meet contemporary learning needs while preserving the sacred tradition of Quran memorization.

INTRODUCTION

The Quran is the holy book of Muslims and holds a central place in religious life and education. Memorizing the Quran (tahfiz) is a noble practice that has been a tradition in Islamic education for centuries. In this rapidly evolving digital age, the demand for more effective, efficient, and adaptive learning methods is on the rise (Engkizar et al., 2026; Oktavia et al., 2025; Sabrina et al., 2022). The younger generation, known as “digital natives,” exhibits different learning tendencies

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compared to previous generations namely, they are more responsive to interactive, visual, and technology-based media (Dhahir, 2020; Htay et al., 2025; Prensky, 2020).

Advances in mobile learning technology have brought about a paradigm shift in the world of education, including Islamic education. The use of smartphones as a learning tool is no longer uncommon among Indonesian students. Data from the Central Statistics Agency (2023) shows that smartphone penetration among students aged 13–25 has reached 91.7%, a figure that reflects the immense potential for utilizing technology in religious education (Statistik, 2023). This situation opens up vast opportunities for the development of mobile applications specifically designed to support the process of memorizing the Quran (Lim & Arnomo, 2022; Sari et al., 2025).

Conventional tahfiz learning is known to have a number of limitations. The *talaqqi* method in which students recite their memorized verses directly in front of a teacher is indeed pedagogically effective, but it requires the physical presence of a teacher, flexible scheduling, and consistent sessions, which are often difficult to meet in the context of modern life. On the other hand, an understanding of tajwid which is a prerequisite for fluent recitation of the Quran is often not well integrated into the memorization process, resulting in memorization that is frequently suboptimal from a phonological perspective (Aziz & Romadlon, 2020; Aziz et al., 2021).

Etymologically, Quranic memorization (tahfiz) derives from the Arabic root *hafiza-yahfazu*, meaning “to guard” or “to preserve.” In the context of Quranic learning, tahfiz refers to the process of memorizing all or part of the Quranic verses correctly so that they can be recited at any time without referring to the *mushaf* (Pratama & Amanah, 2021). The tahfiz process requires consistency, structured repetition, and supervision by a competent teacher. Commonly known tahfiz learning methods include *talaqqi*, *tikerar* (repetition), and *murajaah* (review). In contemporary developments, various studies indicate that integrating technology into the tahfiz process can enhance memorization effectiveness, particularly through the use of high-quality audio recitations and programmed repetition systems (Lubis & Nasution, 2021).

Linguistically, tajwid means to beautify or improve. In the context of reciting the Quran, tajwid is the science that studies how to pronounce the letters of the Quran in accordance with their proper rules and requirements, covering aspects such as *makbraj al-buruf* (the points of articulation), *shifat al-buruf* (the characteristics of letters), as well as the rules of recitation such as *idgham*, *ikhfa*, *iqlab*, and *izhar* (Al-Jazari, 2022). A solid foundation in *tajwid* is a prerequisite for high-quality Quranic recitation, whether in *tilawah* or in memorization. Research by Mukhlis & Hidayat, (2023) shows that students with a strong understanding of tajwid tend to have more consistent memorization quality and find the *murajaah* process easier.

Mobile learning (m-learning) is defined as learning that takes place via mobile devices such as smartphones and tablets, which allows for flexibility in time, place, and pace of learning according to the individual needs of learners (Crompton, 2020). The main theories underpinning m-learning include constructivism (Vygotsky), cognitivism, and connectivism (Siemens, 2020). In the context of Islamic education, m-learning offers a solution to geographical and time constraints that often pose barriers in traditional learning. The results of a meta-analysis by Hwang & Fu, (2019) of 86 studies show that m-learning consistently improves learning outcomes by an effect size of 0.52 compared to conventional methods.

Various Quran learning apps are now available on the market, including Quran Companion, iQuran, Hifz Journal, and Alquran Indonesia. However, a review of these apps revealed that most focus on recitation and translation, while systematic memorization features integrated with interactive tajwid learning remain very limited (Permana & Sari, 2022). Research by Syarifuddin et al., (2023) identified that users of Quran apps in Indonesia expect additional features such as memorization progress tracking, tajwid quizzes, and evaluative feedback from teachers. Mobile app development generally follows a number of software development life cycle (SDLC) models. The Waterfall model, introduced by Woodward & Kimmons, (2019) and refined by Pressman & Maxim, (2020), is the most commonly used model in the development of structured, requirements-based systems. This model consists of sequential phases: requirements analysis, design, implementation, testing, and maintenance. The selection of the Waterfall model in this study was based on the stability of the functional requirements, which were comprehensively identified at the outset of the research, as well as time and resource constraints that necessitated strict and structured planning (Maulani et al., 2021).

The urgency of developing a mobile app that integrates memorization and tajwid instruction is becoming increasingly clear, given that the two are complementary aspects. Effective memorization is not only about the ability to recall the sequence of verses but also about the accuracy of pronunciation in accordance with the rules of tajwid. Several previous studies have shown that the use of digital applications can enhance motivation and learning outcomes in the context of Quranic education (Pradana et al., 2022; Wibowo & Kurniawan, 2021).

Some relevant studies that form the basis of this research include: Hakim and Santoso (2021), who developed an Android-based memorization app but did not integrate interactive tajwid features; Aziz et al., (2021), who developed a tajwid learning medium but did not integrate it with a memorization monitoring system; and (Engkizar et al., 2025; 2026; Fadillah et al., 2023), who examined the effectiveness of mobile learning in Islamic education in general without focusing on tahfiz. Based on this review, a significant research gap has been identified: the absence of a mobile application that comprehensively integrates tahfiz features (audio recitation, verse repetition, daily targets, progress monitoring) with interactive tajwid learning (materials, quizzes, evaluations) within a single integrated platform. The novelty of this study lies in the holistic integration of the tahfiz and tajwid modules within a single android app ecosystem, complemented by a data-driven progress monitoring system and a memorization evaluation mechanism that employs a real-time feedback approach. This study formulates two main research questions: The design and development of a mobile app for memorizing the Quran by integrating the principles of tajwid and tahfiz.

METHODS

This study employs a Research and Development (R&D) approach, which is a research method used to develop a specific product and test its effectiveness (Anidar et al., 2026; Engkizar et al., 2025; 2026; Putra et al., 2020; Rambe et al., 2025; Sugiyono & Sudaryono, 2021). The development model used is the Waterfall model, which consists of five main stages: i) requirements analysis, ii) system design, iii) implementation, iv) testing, and v) deployment and maintenance. The selection of this model is based on the clarity of functional requirements that can be comprehensively identified from the outset, thereby enabling structured and

systematic planning. To make it more engaging, the author presents this in the form of the following diagram illustrating the stages of the Waterfall model.

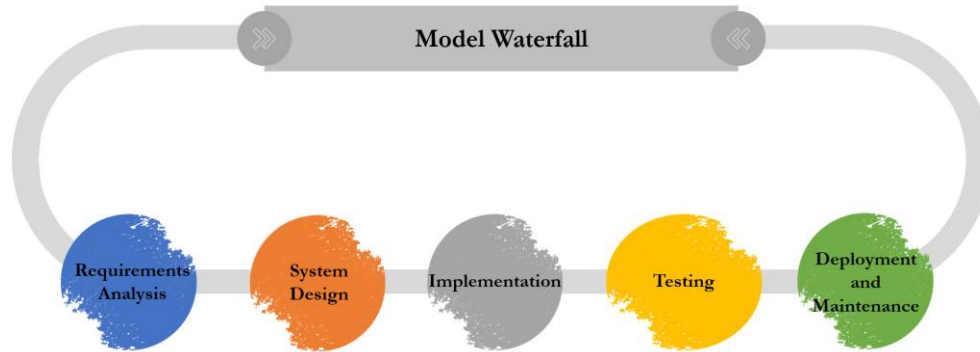


Fig 1. Stages of the Waterfall Model

Quantitative data from the questionnaire were analyzed using descriptive statistics (mean, percentage, and standard deviation) as well as a paired t-test to compare conditions before and after using the application. User satisfaction levels were calculated based on the percentage of positive responses (“Strongly Agree” + “Agree”) on the UAT instrument. Qualitative data from interviews and observations were analyzed using the thematic approach by Miles and Huberman (2022), which includes data reduction, data presentation, and drawing conclusions.

Table 1. Research Respondent Profile

Category	Number	Percentage (%)
Students	40	76.9
Tahfiz Teachers	8	15.4
Boarding School Managers	4	7.7
Total	52	100

RESULT AND DISCUSSION

User Needs Analysis

Based on the results of the interviews conducted:

We are very happy and feel that this app has been a great help to us, because it makes the process of memorizing the Quran much easier. Previously, we had a hard time finding friends to help us review our memorization (Informant 1); I find this app very helpful because the audio feature makes it easier for me to memorize the Quran, and the materials provided are also very comprehensive (Informant 2)

From the students’ perspective, the interview and questionnaire results identified the following key needs: a) availability of high-quality *murottal* audio from renowned qaris, b) a configurable automatic verse repetition feature, c) a visual and motivating system for tracking memorization progress, d) easy-to-understand tajwid materials accompanied by audio examples, and e) interactive tajwid quizzes. From the perspective of tahfiz teachers, the identified needs are: a) a dashboard for real-time monitoring of students’ progress, b) automatic notifications regarding the consistency of students’ submissions, c) the ability to provide written feedback through the app, and d) progress reports in a printable format.

System Design

System design began with the creation of a Use Case Diagram that identifies three main actors: students, tahfiz teachers, and administrators. Students have

access to memorization features (audio, repetition, targets), tajwid materials, quizzes, and self-assessments. The tahfiz teacher has access to the monitoring dashboard, feedback features, and progress reports. The Administrator has access to all content and user management.

The application architecture uses the Model-View-ViewModel (MVVM) pattern, which separates business logic from the user interface, resulting in more structured and maintainable code. The backend uses the Firebase Realtime Database for real-time progress data synchronization, Firebase Authentication for user account management, and Firebase Storage for storing *murottal*/audio files. The app was developed using android studio with the Kotlin programming language and requires a minimum Android SDK version of 8.0 (Oreo) to support the majority of Android devices currently on the market.

App Setup

Steps to Use Tarteel AI

- Download & Install. Open the Play Store / App Store → search for “Tarteel: AI Quran Memorization” → Install
- Sign Up & Set Up Your Profile. Open the app → Create an account using your email or Google account. Set your memorization level: beginner, have memorized a juz, etc.
- Select Learning Mode. There are 3 main modes: memorization, review, daily Reading



Fig 2. Download & Install

To start recording, use the built-in microphone. And to hide the verse for memorization

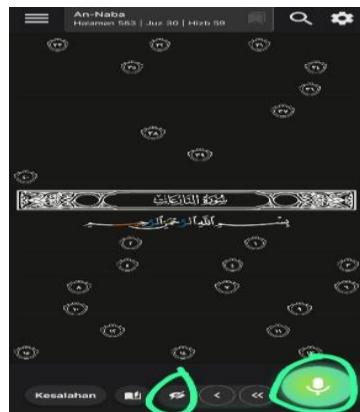


Fig 3. To start recording

To read and display the verse



Fig 4. To read Alquran

If you read it incorrectly, the verse will vibrate and turn red



Fig 5. Read it incorrectly

System Testing

System testing was conducted in two phases. The first phase was Black Box Testing, performed by the development team to verify that each application function operates according to the specified requirements. The results of the Black Box Testing for the application's 10 main functions are presented in table 2.

Table 2. Results of Black Box Testing for the Tarteel AI Application

No	Tested Function	Test Scenario	Expected Result	Status
1	User Registration	Input new student data	Account successfully created	PASS
2	Login	Input valid email and password	Access to dashboard	PASS
3	Play <i>Murottal</i> Audio	Select surah and press play	<i>Murottal</i> audio plays according to surah	PASS
4	Automatic Verse Repetition	Activate repeat verse feature	Verse repeats according to	PASS

			settings	
5	Daily Memorization Target	Set target of 5 verses per day	Target saved and displayed on dashboard	PASS
6	Progress Monitoring	Check weekly progress chart	Chart displays memorization data	PASS
7	Interactive Tajwid Material	Open lesson on nun <i>sukun</i> rules	Lesson content displayed completely	PASS
8	Tajwid Quiz	Answer 10 quiz questions	Score and explanations displayed	PASS
9	Memorization Evaluation	Record recitation of selected verse	Feedback appears after recording	PASS
10	Daily Notification	Set morning notification schedule	Notification appears as scheduled	PASS

The results of the Black Box Testing showed that all 10 tested functions passed with a “PASS” status, indicating that the application functions in accordance with the established specifications without any critical failures. The second phase was the User Acceptance Test (UAT), which involved 52 respondents after four weeks of using the application. The UAT results are presented in table 3.

Table 3. User Acceptance Test (UAT) Results for the Tarteel AI Application

No	Statement	SS (%)	S (%)	TS (%)	STS (%)
1	The application is easy to use by students	65.4	30.8	3.8	0
2	The <i>murottal</i> audio feature helps memorization	73.1	26.9	0	0
3	Tajwid material is easy to understand	57.7	38.5	3.8	0
4	Monitoring feature helps teachers	75.0	25.0	0	0
5	Tajwid quiz improves understanding	61.5	34.6	3.8	0
6	Interface design is attractive and intuitive	53.8	42.3	3.8	0
7	Application runs smoothly on Android devices	69.2	26.9	3.8	0
8	Memorization target feature increases motivation	71.2	28.8	0	0

Legend: SS = Strongly Agree; S = Agree; TS = Disagree; STS = Strongly Disagree

The UAT results show a very high level of acceptance across all user groups. Overall, the average percentage of respondents who gave positive responses (SS + S) reached 96.2%, exceeding the established acceptance threshold of 80%. The statements with the highest scores were that the monitoring feature helps teachers

(100% positive) and the audio recitation feature aids memorization (100% positive). The statements with the lowest scores though still high were that the interface is attractive and intuitive (96.1% positive) and that the tajwid material is easy to understand (96.2% positive).

An analysis of the app's effectiveness in improving memorization quality was conducted using a paired t-test on data collected before and after four weeks of app use. The results of the statistical analysis are presented in table 4.

Table 4. Comparison of Memorization Effectiveness Indicators Before and After App Use

No	Indicator	Pre-Test	Post-Test	Improvement	Sig.
1	Average verses memorized per week	12.3	21.7	+76.4%	0.001
2	Accuracy of <i>makhraj</i>	62.8	81.5	+29.8%	0.003
3	Reading fluency (WPM)	45.2	67.8	+50.0%	0.001
4	Tajwid quiz score (out of 100)	58.6	84.3	+43.9%	0.000
5	Consistency of daily submissions (%)	47.5	82.1	+72.8%	0.002

($\alpha = 0,05$)

The data in Table 4 show a significant increase across all measured indicators. The most significant increases occurred in the average number of verses memorized per week (76.4%) and the consistency of daily submissions (72.8%). This is consistent with the findings of [Wibowo & Kurniawan, \(2021\)](#), who stated that gamification through daily targets and progress visualization significantly improves learning consistency.

The effect of tajwid features on the quality of memorization is reflected in the increase in tajwid quiz scores (43.9%) and the accuracy of *makhraj* (29.8%). These improvements confirm the hypothesis that the integration of structured tajwid instruction into the memorization process contributes to improved phonological quality of recitation. These findings reinforce the argument by [Aziz et al., \(2021\)](#) that contextual tajwid instruction that is, learning tajwid concurrently with the memorization process is more effective than tajwid instruction that is separate from the memorization context.

The user satisfaction rate of 96.2% obtained in this study surpasses the results of similar studies by [Pradana et al., \(2022\)](#), who found a satisfaction rate of 88.5% for a Quran memorization app without an integrated tajwid feature, and [Permana & Sari, \(2022\)](#), who found a rate of 91.3% for a tajwid app without a Quran memorization feature. This indicates that the integration of both features into a single platform provides meaningful added value for users.

Compared to existing apps on the market, such as Quran Companion and Hifz Journal, Tarteel AI has a competitive advantage in terms of its integration of interactive tajwid features and a progress-monitoring system that connects students and teachers. However, limitations that need to be acknowledged include: i) recitation evaluation is still self-administered without AI-based automatic correction, ii) the platform is currently only available for Android, and iii) *murottal* content is limited to three qaris. These limitations open up important avenues for further research.

CONCLUSION

This research successfully developed the Android mobile app “Tarteel AI,” which integrates Quran memorization and interactive tajwid learning features into a single, unified platform. The development process utilized the Waterfall model, which was systematically implemented through five stages: requirements analysis, system design, implementation, testing, and deployment. All application functions passed Black Box Testing with a “PASS” status across the 10 functions tested.

In terms of effectiveness, the Tarteel AI app was proven to increase the average number of verses memorized per week by 76.4%, Tajwid quiz scores by 43.9%, accuracy of articulation points by 29.8%, reading fluency by 50.0%, and consistency of daily submissions by 72.8%, with all improvements being statistically significant ($p < 0.05$). User satisfaction reached 96.2% in the “satisfactory” category based on UAT. The contribution of this research is the integration of tahfiz and tajwid features into a single mobile app ecosystem, which can serve as a reference for the development of similar apps at other tahfiz institutions.

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DECLARATIONS

Author contribution

Nurul Fathinah F Hamid: data curation, writing-original draft preparation and editing, conceptualization, **Ulfah Hawwa' binti Muslich Achmad:** methodology, **Rifadlin Amin:** validation, visualization, supervision, software.

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The data and the grammatical structure in this article have been validated and verified by English language experts and no AI-generated sentences are included in this article.

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Conflict of interest

The authors declare that this research was conducted without any conflict of interest in the research.

Ethical clearance

The research company has agreed to carry out the research and is willing if the results of this research are published.

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