

AI-DRIVEN LEARNING MODEL IN ISLAMIC SCHOOL: ENHANCING STUDENTS' MEMORIZATION STRATEGY

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Abstract. This study investigates the implementation of Artificial Intelligence (AI)-driven learning models in Islamic senior high schools integrated with Tahfidz Islamic boarding schools to enhance students' Quran memorization strategies. Employing a qualitative case study approach, the research explores how AI-assisted applications, particularly Tarteel AI and Quran Memorizer, are utilized alongside traditional Tahfidz methods to support memorization, revision, and retention of Quranic verses. Data were collected through in-depth interviews with school leaders, Tahfidz teachers, and students, as well as participant observations and document analysis. The findings indicate that AI-assisted learning tools contribute to more structured and engaging memorization practices by providing repetition features, real-time feedback, personalized learning experiences, and gamified activities that increase students' motivation and participation. The study also reveals that AI functions as a complementary tool rather than a substitute for teachers, supporting independent learning while maintaining the central role of educators in guiding students' spiritual and moral development. Nevertheless, several challenges were identified, including concerns regarding the preservation of traditional learning values, the potential for technological distraction, varying levels of digital literacy among teachers, and unequal access to technological infrastructure. The findings suggest the importance of strengthening AI literacy among educators, developing ethical guidelines for AI implementation in Islamic education, and fostering collaboration between educational institutions, technology developers, and Islamic scholars. This study contributes to the growing discourse on the digital transformation of Islamic education by demonstrating how AI can be integrated into Quran memorization learning while preserving the pedagogical and spiritual values of Islamic educational traditions.

Keywords: AI-Assisted Learning; Islamic Education; Tahfidz Learning; Quran memorization; Digital Transformation.

INTRODUCTION

Artificial Intelligence (AI) in education is a relatively new phenomenon and remains a subject of controversy in terms of its use and implementation[1]. Nevertheless, the presence of AI is increasingly being utilized to make education more advanced and innovative, enabling it to keep pace with rapid developments, particularly in the field of Information and Communication Technology (ICT). In Indonesia, especially in modern Islamic education, AI—particularly tools like ChatGPT—is beginning to be employed to enhance the quality of the learning process, making it more innovative and enjoyable[2].

When discussing Islamic schools that implement Tahfidz-based curricula integrated with boarding school systems (pesantren), where memorizing the Quran is a core component of the educational program, the application of AI presents both opportunities and challenges[3]. The traditional methods of Quran memorization, which have long been practiced in Islamic schools and pesantren, may no longer be fully adequate to accommodate the diverse learning styles and needs of students in the modern era—especially those belonging to Generation Z and Generation Alpha, who were born into the rapid expansion of technology[4].

As a consequence, there is a need for innovation in instructional strategies that leverage AI technology to support the teaching and learning process. This will help make learning more engaging and enjoyable, while also encouraging students to participate more actively in the educational experience[5].

This study explores "AI-Driven Learning Models in Islamic Schools: Enhancing Memorization and retention," to fill the gap in the lack of innovation in traditional memorization learning amidst the rapid development and innovation in the field of technology. The featured study investigates how AI-

powered platforms can enhance students' memorization of the Quran by employing adaptive and fun learning strategies, and personalized repetition schedules[6]. By employing a mixed-method approach—including qualitative analyses of traditional practices and quantitative assessments of AI-assisted learning experiences—the research provides empirical evidence on the effectiveness of AI in improving both the efficiency and memorization of Quran for students in Islamic educational settings.

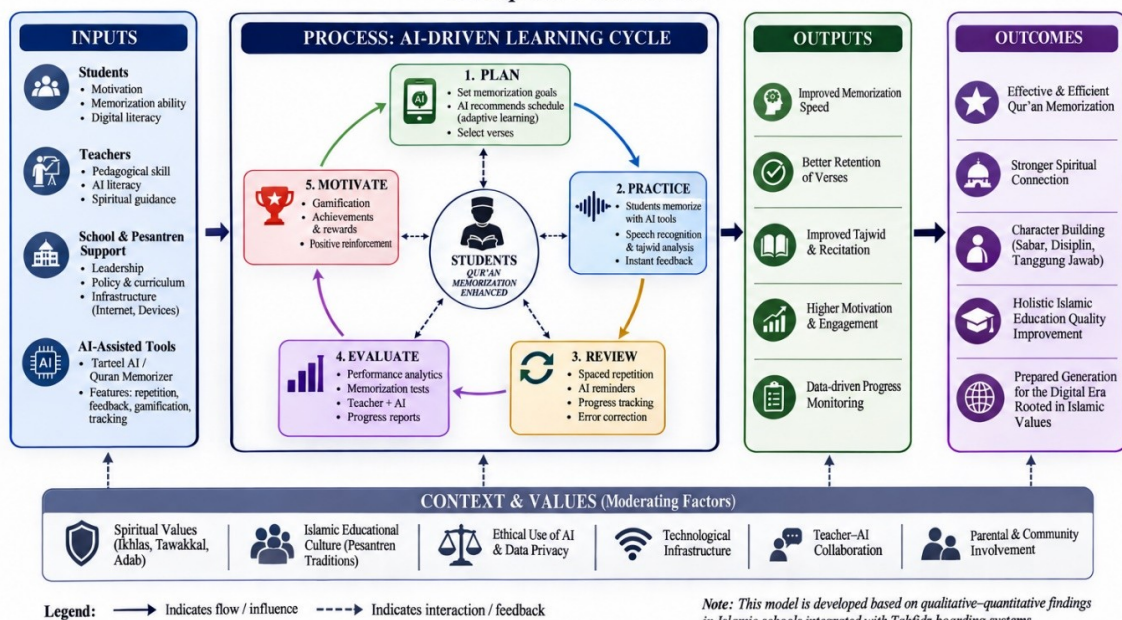
AI-driven learning models offer promising solutions to the longstanding challenges of student engagement and motivation in memorization-based learning[7]. AI systems can accommodate the varied learning speeds and styles of pupils through customized learning routes, adaptive repetition schedules, and gamification techniques[8]. Studies have indicated that the integration of AI-powered tools in educational contexts significantly improves memorization efficiency and enhances students' intrinsic motivation to learn[9].

In the context of Islamic education, the use of AI is particularly relevant in addressing issues such as cognitive overload and disengagement associated with conventional rote learning methods[10]. AI-assisted platforms can enhance interactive and student-centered learning environments by providing real-time feedback and promoting active engagement[11]. Moreover, the integration of AI technology with traditional memorizing methods offers a harmonious strategy that respects the profound legacy of Islamic education while leveraging the advantages of technological advancement[12]. The implementation of AI in Islamic educational institutions presents several problems. Concerns regarding the ethical implications of AI use in religious education, skepticism from educators, and limited access to technological resources[13].

By contributing to the ongoing discourse on educational modernization, this work not only advances academic understanding of AI's role in religious learning but also provides practical pathways for fostering meaningful collaboration between technologists and Islamic scholars[14]. As AI continues to reshape the educational sector, its thoughtful application in Islamic schools has the potential to revitalize traditional learning models, ensuring their relevance and effectiveness in the digital age[15].

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Conceptual Framework



METHODS

This study employed a qualitative case study approach to explore the implementation of Artificial Intelligence (AI)-driven learning models in enhancing students' memorization strategies in Islamic schools integrated with Tahfidz Islamic boarding schools. A qualitative approach was selected because the research aimed to gain an in-depth understanding of the experiences, perceptions, interactions, and educational practices associated with the use of AI-assisted learning tools in Quran memorization activities. The case study design enabled the researcher to investigate a contemporary phenomenon within its real-life

educational context and to understand how technological innovation interacts with the religious, cultural, and pedagogical values embedded in Islamic education[16].

The study was conducted at Daarul Qur'an Senior High School integrated with Tahfidz Islamic Boarding School in Tangerang, Indonesia. This institution was selected purposively because it represents one of the Islamic educational institutions that has integrated digital technology and AI-assisted applications into its Tahfidz learning activities. The school also provides a unique context where traditional Quran memorization methods coexist with contemporary educational technologies, making it an appropriate setting for examining the opportunities and challenges of AI implementation in Islamic education[17].

The participants of this study were selected using purposive sampling and snowball sampling techniques. Purposive sampling was employed to identify individuals who possessed rich information regarding the use of AI in Tahfidz learning, while snowball sampling was used to identify additional participants recommended by initial informants. The participants consisted of the school principal, vice principal for curriculum affairs, Tahfidz teachers, information technology coordinators, and students actively engaged in Quran memorization programs utilizing AI-assisted applications. Students were selected from different grade levels and varying memorization achievement categories to ensure diversity of perspectives and experiences. The selection process continued until data saturation was achieved, meaning that no substantially new information emerged from subsequent interviews.

Data were collected over several months through in-depth interviews, participant observations, and document analysis. In-depth semi-structured interviews were conducted with all participants to explore their experiences, perceptions, beliefs, motivations, and evaluations regarding the implementation of AI-assisted learning applications such as Tarteel AI and Quran Memorizer. An interview guide was developed to ensure consistency across interviews while allowing flexibility for participants to elaborate on emerging issues. Each interview lasted approximately 45–90 minutes and was audio-recorded with participants' consent. Follow-up interviews were conducted when clarification or deeper exploration of specific themes was required[17].

Participant observation was undertaken to obtain a comprehensive understanding of how AI-assisted learning tools were utilized in actual educational settings. The researcher observed Tahfidz learning activities, students' memorization practices, teacher-student interactions, and the integration of AI applications into classroom and boarding school environments. Field observations focused on students' engagement, learning behaviors, motivational responses, interaction patterns, and the pedagogical strategies employed by teachers. Detailed field notes were maintained throughout the observation process to document contextual information and reflective insights.

Document analysis was conducted to complement interview and observation data. The documents reviewed included school profiles, curriculum documents, learning schedules, institutional policies, Tahfidz program guidelines, student memorization records, training materials, school reports, photographs, and other relevant documents related to the implementation of AI-assisted learning. Document analysis provided additional contextual information and served as a means of triangulating findings obtained from other data sources.

The researcher acted as the primary instrument in the study. As a qualitative researcher, the researcher was directly involved in data collection, interpretation, and meaning construction. To minimize personal bias, reflexive practices were continuously employed throughout the research process. Reflexive journals were maintained to document assumptions, observations, methodological decisions, and emerging interpretations. This process enabled the researcher to critically evaluate how personal perspectives might influence data interpretation.

Data analysis followed the interactive model proposed by Miles, Huberman, and Saldaña, consisting of data condensation, data display, and conclusion drawing and verification. The analysis began with the transcription of interview recordings and organization of observation notes and documentary materials. During the data condensation phase, the researcher carefully reviewed the data, identified meaningful units of information, and assigned initial codes to significant statements. Similar codes were subsequently grouped into broader categories reflecting recurring patterns and concepts.

In the data display stage, categorized data were organized into thematic matrices, conceptual maps, and narrative descriptions to facilitate interpretation and comparison across participants and data sources. This process enabled the researcher to identify relationships among themes and understand how different stakeholders perceived the role of AI in Quran memorization. Particular attention was given to themes related to learning effectiveness, student motivation, engagement, technological adaptation, spiritual concerns, teacher roles, institutional support, and challenges encountered during implementation[18].

The final stage involved drawing conclusions and continuously verifying findings throughout the research process. Emerging interpretations were compared against raw data, alternative explanations were considered, and conclusions were refined through iterative analysis. The objective was to ensure that interpretations accurately represented participants' experiences and were grounded in empirical evidence.

To ensure the trustworthiness of the study, several validation strategies were employed. Credibility was established through prolonged engagement in the research site, persistent observation, member checking, and triangulation. Member checking was conducted by sharing interview summaries and preliminary interpretations with participants to confirm accuracy and authenticity. Data triangulation involved comparing information obtained from principals, teachers, students, and institutional documents. Methodological triangulation was achieved by integrating interviews, observations, and document analysis.

Transferability was enhanced through thick description of the research context, participant characteristics, institutional culture, and learning environment, enabling readers to assess the applicability of findings to similar contexts. Dependability was ensured through systematic documentation of research procedures, data collection processes, coding decisions, and analytical steps. Confirmability was strengthened through maintaining an audit trail and preserving all research records, allowing external review of the analytical process[19].

Ethical considerations were carefully observed throughout the study. Prior to data collection, permission was obtained from school authorities and all participants. Informed consent was secured from each participant after explaining the purpose, procedures, benefits, and voluntary nature of the study. Participants were assured that their identities would remain confidential and that pseudonyms would be used in all reports and publications. Furthermore, all collected data were securely stored and used exclusively for academic purposes.

Through this qualitative case study approach, the research generated a comprehensive understanding of how AI-assisted learning models influence Quran memorization practices, shape students' learning experiences, affect teacher pedagogical strategies, and interact with the spiritual values that characterize Islamic educational institutions. The findings provide valuable insights into the opportunities and challenges of integrating emerging technologies into traditional Islamic learning environments while preserving their religious and educational foundations.

RESULTS AND DISCUSSION

Daarul Qur'an Tangerang: Balancing Academic and Spiritual Education

The facilities at Senior High School integrated with Islamic Boarding School, Daarul Qur'an Tangerang include internet access via Telkom Speedy and electricity supplied by PLN. The school actively integrates information and communication technology to support its teaching and learning processes[20]. For parents seeking a Senior high school that harmonizes academic excellence with religious education, Daarul Qur'an Tangerang offers a balanced and compelling option. The school is committed to nurturing intelligent, well-mannered, and Islamically grounded young generations[21].

Meanwhile, Daarul Qur'an Senior High School is designed as a leading Islamic education institution under the auspices of the Daarul Qur'an Nusantara Foundation[22]. The school aims to provide a holistic educational solution by integrating religious and general education, developing cognitive, affective, and psychomotor domains, and fostering synergy among school, family, and community[23]. Its commitment to becoming a pioneer of quality Islamic education is not merely a slogan but is realized through the implementation of a Full Day School system and the application of active learning approaches (PAIKEM), positioning teachers as exemplary role models. This is reflected in the high level of parental satisfaction with the educational services provided[24].

According to interviews conducted with the Principal of Daarul Qur'an between May 15 and 17, 2019, the school's quality assurance is carried out through both internal and external mechanisms. Internal audits are conducted once per academic year by local government authorities, while external audits take place every five years under the National Accreditation Board. The internal audits cover various aspects such as curriculum, students, infrastructure, and school policies, technically overseen by the local Education Office. Additionally, the central Daarul Qur'an Foundation also conducts biannual (every semester) quality audits through an appointed supervisory team. With continuous monitoring from internal, external, and foundation-level audits, the educational quality at Daarul Qur'an Senior High School is consistently maintained and improved[25].

One of its flagship programs is the Tahsin and Tahfidz program for all students. The Tahsin program uses the DaQu method, which is the official method from the central Daarul Qur'an Foundation, guided by Ustadz Yusuf Mansur[17]. To improve human resource quality, the school principal has initiated various

training programs for both teaching and administrative staff. Training for teachers includes curriculum implementation, English and Arabic language proficiency, as well as Tahsin and Tahfidz instruction[26]. For administrative personnel, training programs include excellent service training in collaboration with hospitality partners such as Graha Wisata. The school's facilities are also well-equipped, featuring spacious air-conditioned classrooms, a DaQu Mart, student shuttle services, and a well-designed prayer hall (mushola)[27]. In the area of Tahsin and Tahfidz, teacher competency is strengthened through regular training at the Daarul Qur'an Islamic Boarding School Foundation Center in Tangerang. This activity is conducted annually and continuously as an effort to maintain and improve the quality of Tahsin and Tahfidz teaching at Senior High School Daarul Qur'an Semarang[28].

Form of the DaQu Method Curriculum at Daarul Qur'an, Tangerang. The DaQu Method curriculum is a distinctive curriculum applied at Daarul Qur'an Senior High School as part of the habituation program that distinguishes this school from other schools. This curriculum focuses more on forming daily habits that reflect Islamic values within the school environment. The core principle of the DaQu Method curriculum is Iqamatul Wajib wa Ihyaus Sunnah, which means upholding obligations and reviving sunnah practices. This is realized by performing obligatory prayers together at the beginning of their time, such as Dhuhr and Asr prayers performed in congregation at the school mosque. Outside of school hours, students are directed to continue this habit at home with their families. The hope is that these good habits will not only remain within the school environment but also become embedded in the students' and their families' daily lives[29]. Thus, Islamic values are not only taught cognitively but are also instilled in attitudes and behaviours. Practicing the sunnah of the Prophet covers all forms of sayings, actions, and approvals that are part of Islamic law. This effort aims to revive public awareness of the importance of the sunnah, which has begun to be neglected. Allah SWT has affirmed in the Qur'an (QS. Al-Ahzab: 21) that the Prophet Muhammad (peace be upon him) is the best example for Muslims, especially for those who hope for Allah's mercy and the Last Day and constantly remember Allah.[30] This verse indicates a close connection between emulating the Prophet's sunnah and the perfection of one's faith. The stronger a person's desire to imitate the Prophet's behavior, the higher their level of faith[31].

Implementation of the DaQu Method Curriculum in daily school life. The implementation of the DaQu Method curriculum in daily school life consists of seven key aspects: performing obligatory prayers in congregation at the beginning of their time, performing Dhuha and sunnah prayers (qabliyah and ba'diyah), memorizing and reflecting on the Qur'an (Tahsin and Tahfidz), giving charity and fasting sunnah, teaching and learning activities, and the habituation of praying and making supplication, accompanied by attitudes of sincerity, patience, gratitude, and acceptance (ridha)[32].

Obligatory conducting prayers on time. The virtue of congregational prayer is emphasized in a hadith of Prophet Muhammad SAW, stating that congregational prayer is 27 times more rewarding than praying alone. Scholars agree that congregational prayer is more encouraged and holds a higher status[33]. At Daarul Qur'an Senior High School, the habit of performing congregational prayers at the beginning of their time is incorporated into the DaQu Method curriculum. This habituation not only strengthens students' spirituality but also shapes positive character traits. They are taught discipline, orderliness, and how to be role models for others. During congregational prayer, students also learn social values such as speaking kindly, being polite, respecting others, and building brotherhood within the framework of faith[34].

Qur'an memorization and contemplation (tahsin and tahfidz). Reading the Qur'an, either by heart or from the mushaf, brings many blessings in life. In a hadith narrated by Ibn Abbas, the Prophet Muhammad (peace be upon him) described a heart devoid of the Qur'an as an uninhabited house. This shows the importance of making the Qur'an an integral part of daily life[35]. A person who enjoys reading the Qur'an will find immense pleasure and never feel bored, whether day or night. Like wealth used in the right way by a righteous person, reading the Qur'an also yields immense benefits if done out of love and deep understanding of its meaning. A consistent Qur'an reading habit will form a routine that is hard to abandon and will become part of life.[36] The Qur'an itself is the holy book revealed by Allah SWT to Prophet Muhammad SAW and offers countless benefits, as stated in QS. Al-Waqi'ah verse 77, which calls it a "noble recitation." Besides being a life guide, reading it is also an act of worship[37].

At SMA Daarul Qur'an, memorization and reflection on the Qur'an are focused through tahsin (proper recitation) and tahfidz (memorization). These activities are part of Daarul Qur'an's mission to raise a generation that fulfills religious obligations and revives the practice of sunnah. Tahsin and tahfidz are core subjects that receive the most instructional hours compared to other subjects. Before submitting their memorization to the teacher, students are required to perform muroja'ah (reviewing) their previous memorization, typically done during free time such as before the teacher enters the classroom, before Dhuha prayer, and after Dhuhr prayer. This aligns with the vision of Daarul Qur'an to cultivate a Quranic generation ready to become future leaders[38].

Charity and voluntary fasting. To become students who earn Allah's pleasure and His Paradise, both physical and spiritual health are necessary. Physical health is attained through a healthy lifestyle, including food, sleep, and regular exercise. Meanwhile, spiritual well-being is fostered through worship such as obligatory and sunnah prayers, Qur'an interaction, voluntary fasting, and giving charity. Charity (sadaqah) is a voluntary act of giving by Muslims with no fixed amount or time. It can be in the form of money or any other kind of good deed. Charity cultivates social empathy in children from an early age, making them more sensitive to their surroundings and helpful toward others[39]. At Senior high School Daarul Qur'an Tangerang, charity is a daily routine for all school members. Its goal is to purify the heart so students are more receptive to learning. There is no set amount for donations—what matters is that students become accustomed to giving, whether it be in the form of money or other items, with coordination from their homeroom teachers[40].

Prayer is a means of drawing closer to Allah SWT. We never know whose prayer will be answered; therefore, it is important to pray for one another. At Daarul Qur'an Senior High School integrated with Pesantren, students are trained to always pray after obligatory prayers, whether for themselves, their families, teachers, or their school. This habit builds student character to be patient, sincere, and reliant on Allah in facing all learning processes[41].

Implementation of the DaQu Method Curriculum

The DaQu Method curriculum can be categorized as a hidden curriculum, which refers to educational programs that are not written down but have a significant impact on student behaviour change. The principal explained that this curriculum is a unique characteristic of Daarul Qur'an senior High School that differentiates it from other schools, as it focuses on character building through the habituation of worship from an early age. This school integrates three curriculum: International Curriculum (Cambridge): Applied to Math, Science, and English subjects, aiming to provide a globally competitive education. National Curriculum, DaQu Method Curriculum: Focuses on habituating obligatory and sunnah worship practices as the school's flagship program[38].

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The grand vision of SMP Daarul Qur'an is to produce hafidz and hafidzah who make the Qur'an their life guide. The learning process is carried out five days a week (Monday to Friday) with a full day school system. Teachers play a vital role in guiding students, and the entire school community is involved in the learning process as mandated by the foundation[42].

Enhancing Students' Memorization Strategy with Artificial intelligence (AI)

AI Assisted Tool (Tarteel Ai or Quran Memoriser) are applied as the strategy to support Tahfidz teaching learning process to be more innovative and effective in memorising Quran in Darul Quran Senior High School. As memorizing Quran is not easy to do, and several students got difficult to memorize Quran. Based on the interview, observation and Documentation, AI Driving Learning Model in Darul Quran Senior High School integrated with Tahfidz Islamic Boarding School, can be complement for Tahfidz teachers to teach Tahfidz as AI assisted Tool can strengthen student memorisation and retention. Artificial intelligence improve the process of memorization. AI-assisted technologies, such as Tarteel AI and Quran Memorizer, are utilized as a technique to enhance the innovation and effectiveness of the Tahfidz teaching-learning process for Quran memorization at Darul Quran Senior High School. Since Memorizing the Quran presents challenges, and numerous pupils encounter difficulties in this endeavor.

According to interviews, observations, and documentation, the AI-driven learning model at Darul Quran Senior High School, integrated with the Tahfidz Islamic Boarding School, can significantly augment Tahfidz teachers' instruction by enhancing student memorization and retention. AI (Artificial intelligence) enhances the memorization process. The subsequent findings pertain to field research regarding the utilization of AI-assisted technologies to aid pupils in memorizing the Quran within Darul Quran high schools affiliated with Tahfidz boarding institutions. The role of AI in enhancing memorization. Interviews with students and Tahfidz teachers indicate that the AI Quran Memorizer or Tarteel AI application is significantly beneficial for students in the processes of memory and revision, particularly before or after sessions with Tahfidz teachers[43]. The Quran application platform facilitates independent and systematic

memorization and review for pupils. A reminder mode is available for memory periods based on the scheduled settings, with an option to select the number of verses to be memorized regularly. A capability exists for repeating the recitation of verses up to 11 times, utilizing either text or its omission, accompanied by auditory assistance from International Hafidz.

A.N.T., in the capacity of a Hafidz Student, remarked, "The application is quite effective in assisting students with Quran memorization." This function can enhance memory retention when memorizing the Quran. The utilization of cellular phones remains restricted to memorization periods, when awaiting or queuing to present learned verses to the teacher, or during school holidays on Sundays and designated visiting hours for students. The statement from this Hafidz student indicates that students believe their memorization has improved through the utilization of the AI Quran memorizer app and Tarteel AI (Interview on May 5, 2025). S.T.A., in the capacity of a Tahfidz teacher, noted that AI digital platform programs such as "Tarteel AI" and "Quran Memorizer" are familiar to pupils, as they utilize these tools to practice memorization prior to presenting it to the teacher (Interview on May 5, 2025). Thus the function of AI Assisted learning tool can supplement the roles of a teacher or friend by providing assistance in listening and rectifying errors to ensure accurate memorization of the Quran. The Quran Memorizer application, or Tarteel AI, facilitates advancement through organized practice, assisting in the memorization process.

The Enhancement of Students' Motivation to Memorize the Quran via AI Tools

According to the findings from interviews, observations, and documentation, the AI-assisted tool, referred to as the Tarteel AI Application or Quran Memorizer, renders the process of memorizing the Quran enjoyable and engaging. This is facilitated by gamified features within the application that enhance students' memorization capabilities through interactive elements, such as random card games featuring segments of the verses being memorized. The Tarteel AI application includes features such as quizzes that prompt users to predict the continuation of a verse by presenting only a fragment of one mufrodhat for each verse. The fragment is revealed upon reading the verse and pressing a button, allowing students to instantly ascertain the accuracy of their memorization of the subsequent verse. The pupil promptly recognizes his or her errors. Consequently, it serves as an enjoyable activity for diverse age groups, encompassing both youngsters and adults, contingent upon the passages selected for memorization. E.F.N. asserted that "this application is appropriate for high school students such as himself, as it provides an innovative method for enhancing memorization in an enjoyable manner." (interview, on May 7, 2025). This was similarly communicated by five other Tahfidz students that utilized the Tarteel AI or Quran Memorizer application for Quran memorization. Consequently, it may be inferred that the Tarteel AI or Quran Memorizer App enhances the enjoyment of the Quran memorization process.

What are the spiritual concerns? S.Y.M. stated, "The Ministry of Education, Culture, Research, and Technology (DIKNAS) has conducted training on the utilization of AI applications for Darul Qur'an educators at Integrated High Schools within Islamic Boarding Schools" (interview, on May 5, 2025). Nonetheless, S.Y.M. has conveyed that some Tahfidz teachers are hesitant to incorporate AI into their pedagogical methods, particularly in the memorization of the Quran. They are concerned that the advantages of memorizing the Quran through traditional methods, which involve direct reading from the text, may be diminished. Without stringent oversight, mobile phones may divert attention from Quranic memorization, as they can be utilized for recreational activities, such as accessing social media or playing online games, during study periods, thereby distracting students in the classroom. S.Y.M. has said,

"In my view, contemporary children require creative technological learning. As Tahfidz teachers, we must also be prepared to acquire the skills necessary to cultivate our students' technological literacy and empower them to utilize it constructively in their learning. Indeed, we acknowledge and have repeatedly permitted the utilization of AI-assisted tools for memorizing, as applications such as Tarteel AI and Quran Memorizer are effective in facilitating independent memorization prior to submission to us, the Tahfidz teachers. However, I am concerned about the blessings, and I doubt that the students exhibit self disciplines by using the Quran application, while neglecting other online games or social networking platforms throughout the process of remembering. The utilization of cellular phones is, in fact, restricted (interview with S.Y.M., on May 7, 2025)."

Consequently, there are reservations regarding the implementation of AI applications in the memorization of the Quran within classroom settings, as it is believed that AI undermines the "blessings" associated with traditional learning. Additionally, students may be prone to distractions from engaging with other applications for recreational activities, such as gaming or social media, while attempting to memorize the Quran in class.

The obstacles to using AI-assisted learning. Interviews with the principal, teachers, and students at Darul Quran High School Tangerang, an integrated Islamic Boarding School, indicate that the internet and WiFi connectivity are robust, and the technical facilities are satisfactory. In this school, the utilization of

cellular phones for the benefit of pupils is permitted, although with time restrictions, so limiting the use of AI-assisted learning platform such as Quran Memorizer or Tarteel AI. However, some of Islamic institutions continue to be devoid of internet connectivity and sufficient technological infrastructure. Consequently, the integration of AI to enhance the teaching-learning process will face challenges. Consequently, inadequate connectivity and restricted device access may hinder the optimal use of AI-assisted solutions.

Collaboration between AI and educators. Upon inquiring with multiple educators regarding the potential for AI to supplant teachers, they unanimously concurred that despite AI's advanced intelligence, which surpasses human memory and data storage capabilities by a factor of 200, it lacks emotional depth and cannot fulfill the role of a mentor that teachers provide. AI lacks empathy, feelings, compassion, and spirituality; it is incapable of serving as a role model or influencing character, moral ideals, or ethics. Such tasks can solely be accomplished by educators. Consequently, regarding IQ or academic intelligence, AI surpasses humans; yet, it lacks emotional and spiritual dimensions. Therefore, AI does not pose a threat to the role of teachers but rather serves as a complement to them. (Interview with S.Y., M.S.T.P., and S.N., on May 7, 2025).

Qualitative Analysis Theme and Summary

Theme	Summary
AI supports memorization	AI aids progress through structured practice.
Motivation boost	Gamified features make memorization enjoyable.
Spiritual concerns	Worries about AI diminishing "blessings" in traditional learning or distracted by other Fun activities, such as Sosmet.
Technical barriers	Poor connectivity and limited device access.
AI-teacher collaboration	AI complements (not replaces) teachers.

Analysis Using Mixed Methods Approach: AI-Driven Learning Models in Islamic Boarding Schools

This study adopts a mixed methods approach, combining quantitative and qualitative methods to evaluate the effectiveness of AI-based learning models in improving memorization strategy among students (santri) in Senior High schools integrated with pesantren. This approach provides a more comprehensive overview: quantitative data measures the objective impact of AI technology, while qualitative data explores the subjective experiences of students and teachers, as well as cultural and implementation challenges in the field.

Quantitative Findings: A survey involving 90 students revealed that 70% experienced a 20% increase in memorization speed after using the AI-based application. Further statistical analysis using t-tests and linear regression confirmed the significant effect of AI on memory retention, with a p-value < 0.05. These findings indicate that AI features such as adaptive learning—which adjusts repetition based on individual ability—and speech recognition—which provides real-time feedback on pronunciation and tajweed—are effective in accelerating the memorization process.

Qualitative Findings: Perceptions, Experiences, and Challenges. In-depth interviews revealed that students found the memorization process more engaging, structured, and enjoyable due to gamification and personalization features. During Focus Group Discussions (FGDs), some teachers initially expressed scepticism about AI, fearing it might less blessing and provide destruction for students in focusing in their memorizing Quran in the classroom with social media or other online games. However, after implementation, they recognized AI as a supportive tool that enhances traditional methods like sorogan and musyafahah. Nonetheless, cultural resistance remains a challenge, particularly concerns that technology may reduce the spiritual value of Qur'anic memorization. Moreover, limited access to Cellular phone device poses technical barriers.

Data Integration and Triangulation. Quantitative and qualitative data support each other. For instance, 70% of students reported significant improvements in memorization, which is reinforced by their statements that spaced repetition features helped them overcome difficult verses. However, some discrepancies emerged: while AI improved results, some students showed increasing dependence on the technology, potentially reducing the discipline and perseverance typically developed through conventional methods.

Practical and Theoretical Implications. For Islamic school and Islamic boarding school, the study recommends AI literacy training for teachers so they can integrate the technology effectively with traditional teaching methods. The development of locally relevant AI applications—such as speech datasets with Indonesian accents—is essential to improve speech recognition accuracy. For technology developers, it is important to tailor AI content to align with Islamic values, including incorporating tafsir (exegesis) into chatbot systems. Data privacy protection is also a major concern, requiring anonymization of memorization data and audio recordings according to pesantren ethics.

Theoretically, this study proposes a new framework: the AI-Tahfidz Framework, which integrates cognitive, spiritual, and technological aspects[44]. This contribution enriches the literature on Islamic education digitalization rooted in local values and Islamic school and pesantren culture. Implementation of AI-assisted tool app in the Research Setting. The Quran memorizer or Tarteel AI, serves to assist teachers in teaching memorizing Quran and motivate their students. **Research Limitations.** This study has limitations in generalizability due to the sample being drawn from High School integrated with pesantren with adequate technological infrastructure. A technology usage bias also appeared, as students who were already familiar with digital devices showed higher performance than those unfamiliar. External variables such as family background and learning environment were also difficult to control[45].

Mitigation Strategies and Data Validity. Several strategies were applied to enhance validity: Triangulation of data between memorization scores, direct observation, and interviews to avoid single-source bias. Purpose sampling in interviews, selecting students from various memorization proficiency levels[46]. A pilot test was conducted in a small class to validate instruments before wider application.

Further Practical Implications. Pesantren are advised to use AI tools that align with Islamic values (ad-free and appropriate content) and integrate them with traditional teaching systems. Teachers must be trained to use AI as a complement rather than a replacement for their role. This study concludes that AI-based learning models hold great potential in modernizing Islamic education systems, provided that implementation remains mindful of spiritual values, local culture, and the synergy between technology and tradition.

CONCLUSION

This study concludes that AI-driven learning models, particularly through applications such as Tarteel AI and Quran Memorizer, significantly enhance the effectiveness and efficiency of Quran memorization in Islamic senior high schools integrated with Tahfidz boarding systems. Quantitative findings demonstrate a statistically significant improvement in students' memorization scores, with a mean increase 13 points between pre- and post-tests. Qualitative analysis reveals increased motivation, structured repetition, and learner engagement due to gamified and adaptive features of the AI tools.

AI tool can enhance Memorization through structured practice and Gamified features make memorization enjoyable. Despite concerns from educators regarding spiritual integrity and potential distractions, the integration of AI proves to be a valuable complement—not a replacement—to traditional Tahfidz instruction. As The study underscores the importance of teacher-AI collaboration, ethical guidelines, and AI literacy to maximize benefits. It recommends future research on long-term retention effects and the development of culturally contextual AI tools aligned with Islamic educational values. Overall, this research contributes to the modernization of Islamic education by harmonizing classical memorization practices with emerging technologies.

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REFERENCES

- [1] D. Pembelajaran et al., "PANDUAN PENGGUNAAN GENERATIVE ARTIFICIAL INTELLIGENCE (GenAI)," 2024.
- [2] R. Theresa, L. Pratiwi, and M. Yunus, "MANFAAT DAN TANTANGAN PENGGUNAAN ARTIFICIAL INTELLIGENCE (AI) BAGI GURU DAN PESERTA DIDIK DI ERA SOCIETY 5 . 0," vol. 3, no. 2, 2025, doi: 10.17977/um084v3i22025p488-494.
- [3] S. Rifky, "Dampak Penggunaan Artificial Intelligence Bagi Pendidikan Tinggi," *Indones. J. Multidiscip. Soc. Technol.*, vol. 2, no. 1, pp. 37–42, 2024, doi: 10.31004/ijmst.v2i1.287.
- [4] L. Lukman, Riska Agustina, and Rihadatul Aisy, "Problematika Penggunaan Artificial Intelligence (AI) untuk Pembelajaran di Kalangan Mahasiswa STIT Pemalang," *Madaniyah*, vol. 13, no. 2, pp. 242–255, 2024, doi: 10.58410/madaniyah.v13i2.826.

- [5] E. Crotty, A. Singh, N. Neligan, C. Chamunyonga, and C. Edwards, "Artificial intelligence in medical imaging education: Recommendations for undergraduate curriculum development," *Radiography*, vol. 30, pp. 67–73, 2024, doi: 10.1016/j.radi.2024.10.008.
- [6] A. Zaenurrosyid, A. Kahfi, and H. Sholihah, "A.Zaenurrosyid THE MODEL OF MEMORIZING QUR'AN FOR PRIMARY SCHOOL STUDENTS AND THE MANAGEMENT OF TAHFIDZ BOARDING SCHOOL," *Santri J. Pesantren Fiqh Sos.*, vol. 1, no. 2, pp. 169–188, 2020, doi: 10.35878/santri.v1i2.247.
- [7] T. Matos, W. Santos, E. Zdravevski, P. J. Coelho, I. M. Pires, and F. Madeira, "A systematic review of artificial intelligence applications in education: Emerging trends and challenges," *Decis. Anal. J.*, vol. 15, no. April, p. 100571, 2025, doi: 10.1016/j.dajour.2025.100571.
- [8] I. T. Sanusi et al., "Stakeholders' insights on artificial intelligence education: Perspectives of teachers, students, and policymakers," *Comput. Educ. Open*, vol. 7, no. June, p. 100212, 2024, doi: 10.1016/j.caeo.2024.100212.
- [9] I. H. Y. Yim, "Artificial intelligence literacy in primary education: An arts-based approach to overcoming age and gender barriers," *Comput. Educ. Artif. Intell.*, vol. 7, no. December 2023, p. 100321, 2024, doi: 10.1016/j.caeai.2024.100321.
- [10] S. S. Hasnida, R. Adrian, and N. A. Siagian, *Transformasi Pendidikan di Era Digital*, vol. 1, no. 1. 2024. [Online]. Available: <https://kumparan.com/aan-herdian89/transformasi-pendidikan-di-era-digital-1zG74l1pzc4/4>
- [11] F. Prasetya et al., "Harnessing artificial intelligence to revolutionize vocational education: Emerging trends, challenges, and contributions to SDGs 2030," *Soc. Sci. Humanit. Open*, vol. 11, no. January, p. 101401, 2025, doi: 10.1016/j.ssaho.2025.101401.
- [12] N. Annamalai, B. Bervell, D. O. Mireku, and R. P. K. Andoh, "Artificial intelligence in higher education: Modelling students' motivation for continuous use of ChatGPT based on a modified self-determination theory," *Comput. Educ. Artif. Intell.*, vol. 8, no. September 2024, p. 100346, 2025, doi: 10.1016/j.caeai.2024.100346.
- [13] H. Retnawati et al., "A Systematic Review of the Use of Technology in Educational Assessment Practices: Lesson Learned and Direction for Future Studies," *Int. J. Robot. Control Syst.*, vol. 4, no. 4, pp. 1656–1693, 2024, doi: 10.31763/ijrcs.v4i3.1572.
- [14] C. Wang et al., "Application of artificial intelligence for feature engineering in education sector and learning science," *Alexandria Eng. J.*, vol. 110, no. September 2024, pp. 108–115, 2025, doi: 10.1016/j.aej.2024.09.100.
- [15] S. Azap*, "Title Page Artificial Intelligence (AI)'s Role in Language Teacher Education: EFL Learners' Views on the Concept of 'ChatGPT' Through Metaphorical Analysis," *Soc. Sci. Humanit. Open*, vol. 11, no. February, p. 101394, 2025, doi: 10.1016/j.ssaho.2025.101394.
- [16] Sugiyono, "METODE PENELITIAN KUANTITATIF, KUALITATIF, DAN R&D," 2022.
- [17] M. Fauzi and A. K. Fata, "Modernisasi Pesantren Tahfiz: Studi atas Pesantren Daarul Qur'an Tangerang Modernization of Tahfiz Islamic Boarding School: Study on..., " *POTENSIA J. Kependidikan Islam*, 2021, [Online]. Available: https://www.researchgate.net/profile/Ahmad-Fata/publication/357677443_MODERNISASI_PESANTREN_TAHFIZ_Studi_atas_Pesantren_Daarul_Qur'an_Tangerang/links/61d9a285d450060816992e03/MODERNISASI-PESANTREN-TAHFIZ-Studi-atas-Pesantren-Daarul-Quran-Tangerang.pdf?ori
- [18] E. Murdiyanto, *Metode Penelitian Kualitatif (Sistematika Penelitian Kualitatif)*. Yogyakarta: Yogyakarta Press, 2020.
- [19] J. Miles, M.B. Huberman, A.M. & Saldana, *Qualitative Data Analysis, A Methods Sourcebook*. USA: Sage Publications. Terjemahan Tjetjep Rohindi Rohidi, UI-Press, 2014.
- [20] H. Sholihah and A. Zaenurrosyid, "The Implementation of Tahfidz Islamic Boarding School Management Based on Ziswaf Fundings," 2020, doi: 10.4108/eai.27-8-2020.2303223.
- [21] T. Tarmizi and M. Mitrohardjono, "Implementasi Manajemen Mutu di Pesantren Tahfiz Daarul Quran," *Tahdzibi*, vol. 5, no. 2, pp. 81–104, 2020, doi: 10.24853/tahdzibi.5.2.81-104.
- [22] H. Sholihah, U. Islam, and S. Agung, "PROSIDING SPIRIT MENGUASAI SAINS DAN BAHASA ERA PANDEMI COVID-19 BAGI Abstrak," *KOPEMAS Konf. Nas. Pengabd. Kpd. Masy.*, 2020.
- [23] H. Sholihah, F. Syukur, I. Ismail, A. Z. Rosyid, and K. Amantai, "The Roles, Opportunities, and Challenges of PAI Teacher's Leadership in Senior High Schools," *Cendekia J. Kependidikan dan Kemasyarakatan*, vol. 22, no. 1, pp. 29–43, 2024, doi: 10.21154/cendekia.v22i1.8185.
- [24] H. Z. R. Ahmad, "Ekspresi Keagamaan, Dan Narasi Identitas: Studi Program Pesantren Tahfidz Intensif Daarul Quran Cipondoh Tangerang," *Harmoni*, vol. 13, no. 2, pp. 51–69, 2014.
- [25] N. S. Amalia, H. Ahmad, and U. Albab, "CURRICULUM INTEGRATION IMPLEMENTATION MODEL : INDEPENDENT CURRICULUM DINIYAH," vol. 02, no. 01, pp. 62–69, 2024.
- [26] M. Yahya, P. T. Otomotif, and W. T. Elektro, "Prosiding Seminar Nasional Implementasi Artificial Intelligence (AI) di Bidang Pendidikan Kejuruan Pada Era Revolusi Industri 4.0," *Pros. Semin. Nas.*, pp. 190–199, 2023, [Online]. Available: <https://journal.unm.ac.id/index.php/Semnasdies62/index>
- [27] M. Zibbat and A. Hariri, "Eksistensi Pendidikan Pesantren Dalam Sistem Pendidikan Nasional Berdasarkan Undang-Undang Pesantren," *Al-Ulum J. Pemikir. dan Penelit. ke Islam.*, vol. 11, no. 1, pp. 103–117, 2024, doi: 10.31102/alulum.11.1.2024.103-117.
- [28] W. H. Andy and Kardoyo, "Human Resources Development Analysis Based on Total Quality Management at Daarul Qur'an Elementary School Semarang," vol. 443, no. Iset 2019, pp. 336–340, 2020, doi: 10.2991/assehr.k.200620.065.
- [29] H. Sahila, Listiowati, and Aprilliantoni, "Perkembangan Pesantren Di Era Teknologi Informasi," *Idarah Tarb. J. Manag. Islam. Educ.*, vol. 5, no. 3, pp. 327–333, 2024, doi: 10.32832/itjmie.v5i3.16645.
- [30] K. Kardi, H. Basri, A. Suhartini, and F. Meliani, "Challenges of Online Boarding Schools In The Digital Era," *Attadzkir Islam. Educ. J.*, vol. 2, no. 1, pp. 37–51, 2023, doi: 10.59373/attadzkir.v2i1.11.
- [31] M. Z. Rohman, "From Print To Screen: Methodology, Media, and Transition of Qur'anic Learning in Indonesia," *Khazanah J. Stud. Islam dan Hum.*, vol. 17, no. 2, p. 191, 2019, doi: 10.18592/khazanah.v17i2.3211.

- [32] A. A. Tejamukti, H. M. Az-zahra, and R. I. Rokhmawati, "Pengembangan Antarmuka Website PPPA Daarul Qur ' an Malang Dengan Menggunakan Metode Goal Directed Design," *Pengemb. Teknol. Inf. dan Ilmu Komput.*, vol. 2, no. 12, pp. 6277–6285, 2018, [Online]. Available: <http://j-ptiik.ub.ac.id>
- [33] A. H. Ummah, "Dakwah Digital dan Generasi Milenial (Menelisik Strategi Dakwah Komunitas Arus Informasi Santri Nusantara)," *Tasâmuh*, vol. 18, no. 1, pp. 54–78, 2020.
- [34] Adriana, "Model Pembelajaran Berbasis Deep Learning Bagi Siswa Inklusi di Pendidikan Vokasi," *Systematic Literature Review*, J. Tiarsie, vol. 18, no. 4, pp. 1–9, 2021.
- [35] M. N. Anwar, M. N. Ahad, C. Anwar, H. Q. M. Asaad, M. K. Hasan, and B. Omanee, "Correlation and Prediction of Students' Level of Reading Comprehension through Their Perception of the Application of Transition Words," *Educ. Res. Int.*, vol. 2022, 2022, doi: 10.1155/2022/2082982.
- [36] D. Syahfitri, "Impelementasi Metode ODOA (One Day One Ayat) Dalam Meningkatkan Kemampuan Menghafal Al Qur'an Di Kelas VIII Di Ponpes Al Ikhwan Serapuh," *Khazanah J. Islam. Stud.*, vol. 1, pp. 28–37, 2022.
- [37] S. Syarifah and D. Ifadah, "Integration of The Science Plus Senior High School Curriculum Baitul Qur'an Boarding School Sragen," *Int. Soc. Sci. Humanit.*, vol. 2, no. 2, pp. 467–478, 2023, doi: 10.32528/issn.v2i2.254.
- [38] R. Rahmawati, "Implementasi kurikulum daQu method di sekolah dasar Daarul Qur'an kota Semarang," pp. 1–182, 2018, [Online]. Available: <https://core.ac.uk/download/pdf/162196028.pdf>
- [39] A. W. Triatmo, R. Karsidi, D. T. Kartono, and Suwanto, "A political ideology of the Indonesian Islamic philanthropy: a case study of Suryakarta Berama foundation," *Indones. J. Islam Muslim Soc.*, vol. 10, no. 2, pp. 353–380, 2020, doi: 10.18326/IJIMS.V10I2.353-380.
- [40] M. Hafidz, "The Role of Pesantren in Guarding the Islamic Moderation," *INFERENSI J. Penelit. Sos. Keagamaan*, vol. 15, no. 1, pp. 117–140, 2021, doi: 10.18326/infsl3.v15i1.117-140.
- [41] S. Sauri, S. Gunara, and F. Cipta, "Establishing the identity of insan kamil generation through music learning activities in pesantren," *Heliyon*, vol. 8, no. 7, p. e09958, 2022, doi: 10.1016/j.heliyon.2022.e09958.
- [42] A. Basyit, M. Mitrohardjono, and Z. Arif, "Implementation of Islamic Education Management System for the Tahfizh Al-Qur'an House in Tangerang," *Int. J. Res. Innov. Soc. Sci.*, vol. V, no. Vii, pp. 2454–6186, 2021, [Online]. Available: www.rsisinternational.org
- [43] H. Hartono, E. Widiyati, and C. Anwar, "Group Work in Zoom Breakout Rooms to Enhance English-Speaking Self-efficacy for Active Learning Activities," *Stud. English Lang. Educ.*, vol. 10, no. 1, pp. 137–154, 2023, doi: 10.24815/siele.v10i1.26021.
- [44] B. Vadivel, S. Alam, C. Anwar, and H. Teferi, "Examining the Relationship between Antisocial Behavior and the Academic Performance of Teenagers: The Role of Schools and Causes of the Antisocial Behavior," *Educ. Res. Int.*, vol. 2023, 2023, doi: 10.1155/2023/9463882.
- [45] C. Anwar, F. Yavuz, U. Islam, and S. Agung, "Integrating Technology into English Language Teaching at Indonesian High Schools : Teachers ' Reflections," vol. 12, no. 2, pp. 809–826, 2025.
- [46] K. Y. Nugroho, C. Anwar, and H. Hartono, "Social Constructivist Mentoring Program to Support Teacher Professional Development: An Action Research Approach," *Qual. Rep.*, vol. 29, no. 5, pp. 1416–1436, 2024, doi: 10.46743/2160-3715/2024.6634.