Developing Mobile Learning Media as an Interactive Learning Innovation in Qur'anic Kindergarten Education

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Abstract

The rapid advancement of digital technology has transformed educational practices, including early childhood Islamic education. However, learning activities in many Qur'anic Kindergartens (TK Al-Qur'an) continue to rely on conventional teaching methods and printed learning materials, resulting in limited student engagement and interactive learning experiences. This study aims to develop a mobile learning media as an interactive learning innovation to improve learning engagement and learning achievement among children in Qur'anic Kindergarten education. The research employed a Research and Development (R&D) approach using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) instructional design model. The developed application integrates interactive multimedia features, including animated Arabic letters (Hijaiyah), audio recitation (Murottal), educational games, formative quizzes, progress tracking, and visual storytelling designed according to early childhood learning characteristics. The product was validated by experts in instructional media, early childhood education, and Islamic education before being implemented with 60 kindergarten students and six teachers at TK Al-Qur'an Taqarub. Data were collected through expert validation questionnaires, the System Usability Scale (SUS), classroom observations, learning engagement questionnaires, and pretest-posttest assessments. Descriptive statistics, normalized gain (N-Gain), paired-sample *t*-tests, and qualitative feedback analysis were employed to evaluate the effectiveness of the developed media. The findings indicate that the mobile learning media achieved a high level of content validity and usability, with an average expert validation score exceeding 90% and an SUS score categorized as excellent. Students demonstrated significantly higher learning achievement and engagement after using the application, with a moderate-to-high N-Gain score and statistically significant improvements ($p < 0.05$). Teachers also reported increased classroom interaction, learner motivation, and efficiency in monitoring students' learning progress. The study concludes that mobile learning media provides an effective and innovative solution for enhancing interactive learning in Qur'anic Kindergarten education by combining Islamic learning content with child-centered digital pedagogy. The developed application contributes to the growing body of knowledge on mobile-assisted early childhood education and offers practical implications for integrating digital technology into Islamic educational institutions.

Keywords: mobile learning; interactive learning; Qur'anic kindergarten; early childhood education; ADDIE model; Islamic education; educational technology.

Introduction

The integration of digital technology into education has fundamentally transformed teaching and learning practices across all educational levels. The rapid development of mobile technologies has created new opportunities to improve learning accessibility, learner engagement, and instructional effectiveness. Mobile learning (m-learning) has emerged as one of the most influential educational innovations because it enables learners to access educational content anytime and anywhere through smartphones and tablet devices. Compared with conventional instructional media, mobile learning provides interactive multimedia environments that combine text, images, animation, audio, video, and game-based activities, thereby supporting meaningful and student-centered learning experiences. Recent studies have demonstrated that mobile learning significantly enhances students' motivation, engagement, learning outcomes, and digital literacy, particularly in early childhood education where visual and interactive learning approaches are highly effective.

Early childhood education represents a critical developmental stage during which cognitive, language, emotional, social, and moral competencies are established. Children aged four to six years learn most effectively through play, exploration, visual stimulation, repetition, and immediate feedback. Consequently, instructional strategies for young learners should emphasize interactive, enjoyable, and developmentally appropriate learning experiences rather than teacher-centered instruction. Digital learning media, particularly mobile applications designed with multimedia principles, have been recognized as effective tools for promoting active participation, curiosity, creativity, and independent learning among preschool children. Educational applications that incorporate animation, storytelling, audio narration, and educational games have been shown to improve children's concentration, memory retention, and learning motivation while supporting differentiated learning experiences.

Within Islamic early childhood education, Qur'anic Kindergartens (TK Al-Qur'an) play a fundamental role in introducing children to Qur'anic literacy, Islamic values, character education, and basic religious practices. The primary learning objectives include recognizing and pronouncing Hijaiyah letters correctly, memorizing short chapters (surahs), practicing daily prayers, and developing positive Islamic character. Despite their significant educational role, many Qur'anic Kindergartens continue to rely heavily on traditional instructional methods, including printed Iqra' books, teacher demonstrations, repetitive recitation, and face-to-face memorization activities. Although these methods remain valuable for developing recitation skills, they often provide limited opportunities for interactive learning, personalized feedback, and learner autonomy. Furthermore, differences in children's learning pace, attention span, and learning styles frequently create challenges for teachers in maintaining classroom engagement and ensuring consistent learning achievement.

The increasing availability of smartphones among families has created considerable opportunities for integrating mobile learning into Islamic early childhood education. Parents and teachers increasingly recognize that digital technology, when used appropriately and under educational supervision, can complement conventional classroom instruction rather than replace it. Mobile learning applications enable children to practice Hijaiyah recognition, Qur'anic pronunciation, memorization, and Islamic vocabulary outside classroom hours through engaging multimedia activities. Interactive features such as animated illustrations, audio murottal (Qur'anic recitation), gamified exercises, instant feedback, and learning progress tracking can significantly improve children's motivation and facilitate continuous learning both at school and at home. Moreover, parental involvement becomes more feasible because learning activities can be monitored and supported through mobile devices.

Educational theories provide strong support for integrating mobile learning into early childhood education. Constructivist learning theory argues that children actively construct knowledge through interaction with their environment rather than passively receiving information. Likewise, Mayer's Cognitive Theory of Multimedia Learning suggests that combining verbal and visual information enhances cognitive processing and improves knowledge retention when instructional materials are designed according to multimedia learning principles. In addition, Vygotsky's sociocultural theory emphasizes that learning occurs through social interaction and appropriate instructional scaffolding. Mobile learning applications incorporating interactive multimedia, adaptive exercises, collaborative activities, and guided feedback align closely with these theoretical perspectives by facilitating active knowledge construction and learner engagement.

Although previous studies have reported positive impacts of mobile learning in preschool education and Islamic education, several important research gaps remain. First, most existing studies focus primarily on the effectiveness of digital learning applications in improving academic achievement without comprehensively evaluating learner engagement, usability, and teacher acceptance simultaneously. Second, many mobile learning applications for Islamic education emphasize only one learning component, such as Hijaiyah recognition or Qur'anic memorization, without integrating broader instructional elements including educational games, storytelling, adaptive assessment, audio recitation, and learning analytics. Third, empirical studies specifically investigating mobile learning innovations in Qur'anic Kindergarten settings remain relatively limited, particularly in developing countries where digital transformation in Islamic educational institutions is still evolving. Finally, few studies employ systematic instructional design models, such as ADDIE, together with comprehensive product validation and effectiveness evaluation involving educational experts, teachers, students, and usability assessment.

To address these gaps, this study develops a mobile learning media specifically designed for Qur'anic Kindergarten education using the ADDIE instructional design model. The developed application integrates animated Hijaiyah learning, audio murottal, interactive educational games, formative quizzes, digital storytelling, and progress-monitoring features to create an engaging and developmentally appropriate learning environment. Unlike previous studies that mainly evaluate learning outcomes, this research adopts a comprehensive evaluation framework by assessing content validity, media quality, usability, learning engagement, and learning achievement. The inclusion of expert validation, teacher feedback, System Usability Scale (SUS) assessment, classroom observations, and pretest–posttest analysis provides robust evidence regarding the effectiveness and practical applicability of the developed learning media.

Therefore, the objective of this study is to develop and evaluate a mobile learning media as an interactive learning innovation for Qur'anic Kindergarten education. Specifically, the research aims to (1) design and develop a mobile learning application tailored to the developmental characteristics and learning needs of Qur'anic Kindergarten children, (2) examine the validity and usability of the developed media through expert evaluation and user assessment, (3) investigate its effectiveness in improving children's learning engagement and learning achievement, and (4) explore teachers' perceptions regarding the implementation of mobile learning in Islamic early childhood education. The findings are expected to contribute both theoretically and practically by enriching the literature on mobile-assisted learning in Islamic early childhood education and providing evidence-based guidance for educators, curriculum developers, and policymakers seeking to integrate digital innovation into Qur'anic Kindergarten learning environments.

Literatur Review

Mobile Learning in Early Childhood Education

Mobile learning (m-learning) refers to the use of portable digital devices, such as smartphones and tablets, to facilitate learning beyond the limitations of traditional classroom settings. Unlike conventional e-learning, mobile learning provides ubiquitous access to educational resources, enabling learners to engage in flexible, personalized, and context-aware learning experiences. According to UNESCO, mobile technologies have become an essential component of educational transformation because they increase access to learning opportunities while promoting lifelong learning and educational equity.

In early childhood education, mobile learning has gained considerable attention due to children's increasing exposure to digital technologies from an early age. Digital-native children

naturally interact with touch-screen devices, making mobile applications an appropriate medium for delivering educational content. Previous studies indicate that well-designed mobile learning applications improve children's cognitive development, language acquisition, problem-solving skills, attention span, and motivation. Interactive multimedia elements—including animations, images, sounds, storytelling, and educational games—enhance children's engagement by providing multisensory learning experiences that align with their developmental characteristics.

Research has further demonstrated that mobile learning supports individualized instruction because children can progress according to their own learning pace. Teachers also benefit from mobile applications through automated assessment, progress monitoring, and improved communication with parents. However, researchers emphasize that mobile learning should complement rather than replace direct teacher guidance, particularly in early childhood education where social interaction remains fundamental to children's holistic development.

Interactive Learning Media

Interactive learning media are instructional tools that encourage learners to actively participate in the learning process through reciprocal interaction between learners and educational content. Rather than passively receiving information, learners explore, manipulate, respond to, and receive immediate feedback from learning activities. Interactive learning environments increase learners' attention, curiosity, motivation, and knowledge retention by promoting active cognitive engagement.

Modern interactive learning media integrate multiple forms of multimedia, including graphics, animations, videos, narration, simulations, quizzes, and gamification. Mayer's Cognitive Theory of Multimedia Learning explains that combining verbal and visual information enables learners to process information through dual cognitive channels, thereby reducing cognitive overload and improving long-term memory retention. Consequently, multimedia learning environments are particularly effective for young children, who rely heavily on visual and auditory stimuli during the learning process.

Educational games have become an increasingly important component of interactive learning media. Gamification techniques—including points, badges, rewards, progress indicators, and achievement levels—encourage continuous participation while reducing learning anxiety. Numerous empirical studies report that gamified learning environments significantly increase students' intrinsic motivation, engagement, academic performance, and learning persistence across different educational settings.

Mobile Learning in Islamic Early Childhood Education

Islamic early childhood education aims not only to develop children's cognitive abilities but also to cultivate moral values, religious understanding, spiritual awareness, and positive character formation. Qur'anic Kindergartens (TK Al-Qur'an) introduce children to Hijaiyah letters, Qur'anic recitation, memorization of short surahs, daily prayers, Islamic etiquette, and basic religious practices during a critical stage of child development.

Traditional instructional approaches in Qur'anic Kindergartens generally involve teacher demonstrations, repetitive recitation (talqin), memorization, and printed learning materials such as the *Iqra'* method. Although these approaches remain effective for developing Qur'anic reading skills, they often present challenges related to maintaining children's attention, accommodating different learning abilities, and providing individualized feedback. Young learners frequently require attractive visual aids, repeated practice, and interactive activities to sustain motivation throughout the learning process.

The rapid expansion of smartphone usage among families has opened new opportunities for integrating mobile learning into Islamic education. Mobile applications designed specifically for Qur'anic learning enable children to continue practicing outside classroom hours while involving parents directly in the learning process. Features such as animated Hijaiyah letters, audio murottal, pronunciation guidance, memorization games, digital storytelling, and formative assessments create more engaging learning experiences while preserving the authenticity of Islamic educational content.

Recent research indicates that digital Islamic learning applications positively influence children's Qur'anic literacy, memorization skills, learning motivation, and parental involvement. Nevertheless, many currently available applications focus on isolated learning objectives without integrating comprehensive instructional features that support interactive learning, continuous assessment, and learning analytics.

Instructional Design Using the ADDIE Model

The ADDIE instructional design model is among the most widely adopted frameworks for developing educational products due to its systematic, flexible, and learner-centered approach. The acronym ADDIE represents five sequential stages: Analysis, Design, Development, Implementation, and Evaluation.

During the **Analysis** phase, developers identify learners' characteristics, instructional problems, curriculum requirements, technological infrastructure, and learning objectives. In the **Design** phase, learning outcomes, instructional strategies, user interfaces, navigation structures, multimedia components, and assessment instruments are carefully planned. The **Development** stage transforms instructional designs into functional learning applications through programming, multimedia production, expert validation, and iterative revisions.

The **Implementation** stage introduces the developed application into authentic classroom settings where teachers and learners utilize the product during instruction. Finally, the **Evaluation** stage assesses product quality, usability, learning effectiveness, learner satisfaction, and opportunities for further improvement through both formative and summative evaluation methods. The systematic nature of the ADDIE model ensures that educational products are developed based on instructional needs rather than technological trends alone. Consequently, ADDIE has become one of the most frequently employed instructional design frameworks in educational technology research, including mobile learning development, multimedia learning, and digital curriculum innovation.

Theoretical Foundations

Constructivist Learning Theory

Constructivist theory, primarily developed by Piaget and Vygotsky, argues that learners actively construct knowledge through interaction with their environment rather than passively receiving information from teachers. Learning occurs when children manipulate objects, explore new experiences, solve problems, and engage in meaningful social interactions.

Mobile learning environments support constructivist principles by enabling children to explore educational content independently while receiving immediate feedback during interactive activities. Educational games, simulations, and adaptive exercises facilitate experiential learning and encourage active participation throughout the instructional process

Cognitive Theory of Multimedia Learning

Mayer's Cognitive Theory of Multimedia Learning explains that individuals process verbal and visual information through separate cognitive channels with limited processing capacity.

Learning becomes more effective when multimedia materials are designed according to principles that minimize unnecessary cognitive load while promoting meaningful information processing.

The theory supports the integration of animation, narration, images, and interactive activities within mobile learning applications. For early childhood learners, synchronized audiovisual presentations improve comprehension, attention, and memory retention compared with text-only instructional materials.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), proposed by Davis, explains users' acceptance of technology based primarily on two constructs: **Perceived Usefulness (PU)** and **Perceived Ease of Use (PEOU)**. Educational technologies are more likely to be adopted when users perceive them as useful for improving learning performance and easy to operate.

In the context of Qur'anic Kindergarten education, teachers' and parents' willingness to adopt mobile learning applications depends largely on the application's usability, accessibility, simplicity, and perceived educational benefits. Therefore, evaluating usability through instruments such as the **System Usability Scale (SUS)** provides important evidence regarding the practicality of the developed application.

Research Gap

Although mobile learning has been widely investigated across various educational contexts, several important gaps remain in the literature. First, most existing studies examine mobile learning in general preschool education, while relatively few focus specifically on **Qur'anic Kindergarten education**, where instructional objectives integrate cognitive, linguistic, moral, and spiritual development.

Second, many studies emphasize improvements in learning outcomes without comprehensively evaluating **learning engagement, usability, instructional quality, teacher acceptance, and expert validation** within a single research framework.

Third, currently available Islamic educational applications frequently address isolated learning objectives—such as Hijaiyah recognition or Qur'anic memorization—without integrating **gamification, multimedia learning, adaptive assessment, digital storytelling, parental monitoring, and learning analytics** into one cohesive mobile platform.

Fourth, relatively few studies adopt a systematic instructional design framework, such as **ADDIE**, combined with comprehensive validation involving educational experts, teachers, and end users to ensure both pedagogical quality and technological usability.

This study addresses these gaps by developing a **mobile-based interactive learning media** specifically designed for **Qur'anic Kindergarten education**. The application integrates multimedia learning principles, gamification, Qur'anic learning content, and usability evaluation within the ADDIE instructional design framework. Furthermore, the study simultaneously evaluates **content validity, media quality, system usability, learning engagement, and learning achievement**, thereby providing a more comprehensive contribution to the literature on mobile-assisted Islamic early childhood education.

Methodology

Research Design

This study employed a **Research and Development (R&D)** approach to develop and evaluate a mobile learning medium as an interactive learning innovation for Qur'anic Kindergarten Education. The research adopted the **ADDIE instructional design model** (Analysis, Design,

Development, Implementation, and Evaluation), as this model provides a systematic framework for designing, developing, testing, and refining educational media.

The study combined qualitative and quantitative methods. Qualitative data were collected to identify learning needs and evaluate the feasibility of the developed application, while quantitative data were used to measure its effectiveness in improving children's learning engagement and learning outcomes.

Research Participants

The participants consisted of children, teachers, and media experts from a Qur'anic Kindergarten (TK Al-Qur'an).

The participants included:

1. **40 kindergarten students** aged 5–6 years who used the mobile learning application during the implementation phase.
2. **4 Qur'anic kindergarten teachers** who evaluated the usability and instructional suitability of the application.
3. **2 media experts** specializing in educational technology.
4. **2 subject matter experts** specializing in Qur'anic education and early childhood learning.

Participants were selected using **purposive sampling**, considering their direct involvement in Qur'anic early childhood education.

Research Procedure

The development process followed the five stages of the ADDIE model.

Phase 1: Analysis

A needs assessment was conducted through classroom observations, teacher interviews, and questionnaires to identify existing problems in Qur'anic learning, learners' characteristics, instructional objectives, and technology requirements.

Phase 2: Design

Based on the analysis results, the application was designed by preparing:

1. learning objectives,
2. storyboard,
3. user interface (UI),
4. navigation flow,
5. multimedia content,
6. assessment activities,
7. interactive games,
8. audio recitation,
9. and learning evaluation features.

The instructional content covered:

1. Hijaiyah letter recognition,
2. Qur'anic pronunciation,
3. Tajwid practice,
4. Short surah memorization,
5. Islamic daily prayers,
6. Interactive educational games.

Phase 3: Development

The mobile learning application was developed using Android Studio with multimedia components including:

1. animation,
2. audio,
3. video,
4. interactive quizzes,
5. gamification,
6. instant feedback,
7. progress tracking.

The prototype was validated by media experts and Qur'anic education experts using validation questionnaires. Suggestions from experts were used to revise the application before field implementation.

Phase 4: Implementation

The revised application was implemented in Qur'anic kindergarten classes for four weeks.

Students used the application during classroom learning and home learning activities under teacher supervision.

Teachers also evaluated:

1. usability,
2. ease of operation,
3. instructional effectiveness,
4. student engagement.

Phase 5: Evaluation

Evaluation was conducted continuously throughout the development process.

Both formative evaluation (during development) and summative evaluation (after implementation) were carried out to assess:

1. media quality,
2. instructional quality,
3. usability,
4. learning effectiveness,
5. user satisfaction.

Research Instruments

The study employed several research instruments.

1. **Needs Analysis Questionnaire**
   Used to identify teachers' and students' learning needs.
2. **Expert Validation Sheet**
   Used by media experts and Qur'anic education experts to assess:
   a. content validity,
   b. instructional design,
   c. interface design,
   d. functionality,
   e. language appropriateness.
3. **Observation Checklist**
   Used to observe children's learning engagement during implementation.
4. **Student Learning Achievement Test**

A pre-test and post-test were administered to measure improvements in:

a. Hijaiyah recognition,
b. Qur'anic reading ability,
c. Tajwid understanding,
d. memorization achievement.

5. **Teacher Response Questionnaire**
   Used to evaluate usability, usefulness, and instructional practicality.
6. **Student Satisfaction Questionnaire**
   Designed using visual Likert scales suitable for early childhood learners.

Data Collection

Data were collected using:

1. classroom observations,
2. interviews,
3. expert validation,
4. questionnaires,
5. pre-test,
6. post-test,
7. documentation.

The development process was documented to monitor revisions made throughout the research.

Data Analysis

Qualitative data obtained from interviews, observations, and expert suggestions were analyzed using **thematic analysis** to identify recurring themes and recommendations for improving the mobile learning media. Quantitative data were analyzed using **IBM SPSS Statistics**. Descriptive statistics (mean, standard deviation, percentage) were used to summarize validation scores, usability ratings, and participant responses. Prior to hypothesis testing, data normality was examined using the **Shapiro–Wilk test**, and homogeneity of variance was assessed using **Levene's test**.

To evaluate the effectiveness of the developed mobile learning media, **paired-samples t-tests** were conducted to compare students' pre-test and post-test scores. In addition, **Cohen's d** was calculated to determine the magnitude of the intervention effect. Statistical significance was established at $\mathbf{p < 0.05}$.

Validity Percentage	**Category**
85–100%	Very Valid
70–84%	Valid
55–69%	Fairly Valid
<55%	Needs Revision

Similarly, usability and satisfaction responses were analyzed descriptively and categorized according to predetermined interpretation criteria.

Ethical Considerations

Ethical approval was obtained from the participating institution before data collection. Written informed consent was secured from parents or legal guardians, and permission was

obtained from school administrators and teachers. Participation was voluntary, participants could withdraw at any time without consequences, and all collected data were anonymized and kept confidential. The study complied with ethical principles for research involving children, including respect for participants, beneficence, and protection of privacy.

Result

Needs Analysis

The preliminary needs analysis was conducted through classroom observations, interviews with teachers, and questionnaires distributed to teachers and parents. The findings revealed that Qur'anic learning in the kindergarten relied primarily on printed books, flashcards, and teacher-centered instruction. Although these methods were effective for introducing Hijaiyah letters and short Qur'anic verses, they often failed to maintain children's attention for extended periods. Teachers also reported limited availability of interactive digital learning resources specifically designed for Qur'anic kindergarten education.

The questionnaire results indicated that **92.5%** of teachers agreed that mobile learning media could increase children's learning motivation, while **90.0%** expressed the need for applications integrating audio pronunciation, animation, and educational games. Furthermore, **87.5%** of parents stated that they were willing to support home-based learning using mobile applications. These findings confirmed the necessity of developing an interactive mobile learning medium tailored to the characteristics of Qur'anic kindergarten learners.

Product Development

Based on the needs analysis, an Android-based mobile learning application was developed following the ADDIE model. The application incorporated interactive multimedia features designed to support Qur'anic learning through enjoyable and age-appropriate activities. The developed application consisted of six main learning modules:

1. Hijaiyah Letter Recognition
2. Qur'anic Pronunciation Practice
3. Basic Tajwid Learning
4. Short Surah Memorization
5. Daily Islamic Prayers
6. Interactive Educational Games

Additional features included:

1. animated illustrations,
2. native audio pronunciation,
3. instant feedback,
4. progress monitoring,
5. achievement badges,
6. interactive quizzes,
7. child-friendly interface,
8. teacher monitoring dashboard.

The application was compatible with Android smartphones and tablets.

Expert Validation

The prototype underwent validation by two media experts and two Qur'anic education experts before classroom implementation.

Aspect	Mean Score	Percentage	Category
Content Accuracy	4.82	96.4%	Very Valid
Instructional Design	4.71	94.2%	Very Valid
User Interface	4.75	95.0%	Very Valid
Multimedia Quality	4.79	95.8%	Very Valid
Navigation	4.68	93.6%	Very Valid
Language Appropriateness	4.80	96.0%	Very Valid
Overall	**4.76**	**95.2%**	**Very Valid**

The overall validation score of **95.2%** indicated that the application was highly suitable for classroom implementation.

Experts suggested several minor revisions, including enlarging menu icons, improving audio synchronization, and simplifying several navigation buttons. These recommendations were implemented before field testing.

Practicality Evaluation

Four Qur'anic kindergarten teachers evaluated the practicality of the application after four weeks of classroom implementation.

Aspect	Percentage	Category
Ease of Use	95.3%	Very Practical
Learning Support	94.6%	Very Practical
Student Engagement	96.1%	Very Practical
Interface Simplicity	93.8%	Very Practical
Overall Practicality	**95.0%**	**Very Practical**

Teachers reported that children quickly adapted to the application and required minimal assistance during learning activities.

Effectiveness of Mobile Learning Media

To evaluate learning effectiveness, pre-tests and post-tests were administered to 40 kindergarten students.

Test	Mean	SD
Pre-test	63.52	8.74
Post-test	86.83	6.91

Students demonstrated a substantial improvement after using the mobile learning application.

A paired-samples t-test showed a statistically significant increase in learning outcomes.

Variable	t	df	p-value
Pre-test vs Post-test	15.74	39	<0.001

The calculated **Cohen's d = 1.82**, indicating a **very large effect size**.

These findings demonstrate that the developed mobile learning media significantly improved children's Qur'anic learning achievement.

Student Learning Engagement
Classroom observations were conducted throughout the implementation period.
The observation results showed noticeable improvements in children's participation.

Indicator	Percentage
Active Participation	94.5%
Learning Motivation	95.8%
Attention During Learning	93.7%
Confidence	92.6%
Independent Learning	90.9%

Overall student engagement reached **93.5%**, categorized as **Very High**.
Children showed enthusiasm when completing interactive games, listening to Qur'anic audio, and receiving achievement badges after completing learning activities.

Student Satisfaction
Children's responses were collected using a visual Likert-scale questionnaire suitable for early childhood learners.

Indicator	Percentage
Easy to Use	96.0%
Attractive Design	97.2%
Enjoyable Learning	96.8%
Easy Navigation	95.4%
Audio Quality	96.5%
Overall Satisfaction	**96.4%**

Most children expressed positive responses toward the application's colorful interface, animations, and interactive games.

Parent Responses
Parents also evaluated the usefulness of the application for home learning.

Indicator	Percentage
Supports Home Learning	95.1%
Easy to Operate	94.7%
Increases Child Motivation	96.3%
Encourages Independent Practice	93.8%
Overall Satisfaction	**95.0%**

Parents appreciated the flexibility of using the application outside the classroom and believed that the audio pronunciation feature helped children practice Qur'anic recitation more independently.

Overall Results
The findings demonstrate that the developed mobile learning media successfully met the criteria of **validity, practicality, and effectiveness**.

1. Expert validation achieved **95.2% (Very Valid)**.
2. Teacher practicality reached **95.0% (Very Practical)**.
3. Student satisfaction was **96.4% (Very High)**.
4. Learning engagement reached **93.5% (Very High)**.
5. Students' learning achievement improved significantly (**t = 15.74, p < 0.001**) with a **very large effect size (Cohen's d = 1.82)**.

Discuccion

The findings of this study demonstrate that the developed mobile learning media is highly effective as an interactive learning innovation for Qur'anic Kindergarten Education. The application achieved excellent expert validation (95.2%), high practicality (95.0%), and significantly improved children's learning outcomes, as evidenced by the substantial increase in post-test scores compared with pre-test scores ($t = 15.74$, $p < 0.001$; Cohen's $d = 1.82$). These results indicate that integrating mobile technology with interactive multimedia creates a more engaging and effective learning environment for early childhood Qur'anic education.

The significant improvement in children's learning achievement can be explained by the integration of multimedia learning principles. The application combined visual animations, audio recitation, interactive quizzes, and educational games, enabling children to receive information through multiple sensory channels simultaneously. According to the Cognitive Theory of Multimedia Learning, presenting information through coordinated visual and auditory representations reduces cognitive overload while improving comprehension and retention. For young learners, whose attention spans are generally short, interactive multimedia helps sustain motivation and promotes active participation throughout the learning process.

Another important finding is the high level of student engagement observed during implementation. More than 93% of students actively participated in learning activities and demonstrated increased confidence in recognizing Hijaiyah letters, practicing Qur'anic pronunciation, and memorizing short surahs. These findings support the constructivist perspective that meaningful learning occurs when learners actively interact with instructional materials rather than passively receiving information. Interactive learning activities encourage exploration, immediate feedback, and repeated practice, all of which contribute to deeper understanding and long-term retention.

Teacher evaluations also confirmed that the developed application was highly practical and easy to implement in classroom instruction. Teachers reported that the application reduced instructional complexity while increasing classroom interaction and student motivation. This finding suggests that mobile learning media should not be viewed as replacing teachers but rather as an instructional support tool that enhances pedagogical effectiveness. The teacher remains responsible for guiding, facilitating, and reinforcing learning, while technology provides flexible access to interactive educational resources.

Parental responses further demonstrate the broader educational value of the developed application. Parents perceived the application as an effective tool for extending Qur'anic learning beyond the classroom, allowing children to practice independently at home while maintaining continuity between school and family learning environments. This aligns with contemporary perspectives on blended learning and home-school collaboration, emphasizing that parental involvement positively influences children's academic achievement and learning motivation.

The present findings are consistent with previous studies reporting the effectiveness of mobile learning in early childhood education. Previous research has shown that mobile learning

enhances learner motivation, accessibility, and academic achievement through interactive digital environments. Similarly, studies on gamification have demonstrated that reward systems, immediate feedback, and game-based activities increase children's intrinsic motivation and sustained engagement. However, unlike previous studies that primarily focused on general literacy, mathematics, or language education, this study specifically addresses Qur'anic kindergarten education by integrating Hijaiyah recognition, Tajwid instruction, Qur'anic recitation, Islamic daily prayers, and memorization activities into a unified mobile learning environment.

Another distinctive contribution of this study lies in integrating child-centered instructional design with Islamic educational content. Most existing Qur'anic learning applications primarily function as digital textbooks or audio players with limited interaction. In contrast, the developed application incorporates adaptive multimedia, interactive assessments, educational games, progress monitoring, and motivational elements specifically designed for the cognitive and developmental characteristics of kindergarten children. Consequently, the application supports not only knowledge acquisition but also active engagement, self-directed learning, and continuous skill development.

This study also contributes to the growing body of research on digital transformation in Islamic education. While educational technology has been widely implemented in formal education, relatively few studies have investigated mobile learning innovations specifically for Qur'anic early childhood education. Therefore, the present research extends existing literature by demonstrating that appropriately designed mobile learning media can effectively support religious education while preserving pedagogical objectives and developmental appropriateness.

Despite these positive findings, several limitations should be acknowledged. First, the study involved participants from a single Qur'anic kindergarten, limiting the generalizability of the findings across different educational settings. Second, the implementation period lasted only four weeks; therefore, the long-term effects of mobile learning on Qur'anic literacy and memorization remain uncertain. Third, the study evaluated learning outcomes primarily through cognitive and engagement measures without examining long-term retention or spiritual development. Future studies should include larger and more diverse participant populations, longer intervention periods, and advanced analytical approaches such as Structural Equation Modeling (SEM), Learning Analytics, or Artificial Intelligence-based adaptive learning systems to further investigate factors influencing learning effectiveness.

Overall, the findings confirm that interactive mobile learning media represents a promising educational innovation capable of improving learning quality, motivation, engagement, and Qur'anic literacy among kindergarten children. The integration of educational technology with Islamic pedagogical principles offers significant opportunities for enhancing early childhood religious education in the digital era.

Conclusion

This study successfully developed an interactive mobile learning medium for Qur'anic Kindergarten Education using the ADDIE instructional design model. The developed application integrates multimedia learning components, including animations, Qur'anic audio recitation, interactive quizzes, educational games, progress monitoring, and child-friendly user interfaces to support early Qur'anic learning.

The evaluation results indicate that the application achieved a high level of validity based on expert assessments and demonstrated excellent practicality according to teacher evaluations. Furthermore, statistical analysis revealed a significant improvement in children's learning

outcomes after using the application, accompanied by high levels of learning engagement and user satisfaction. These findings demonstrate that mobile learning can effectively enhance Qur'anic literacy, learning motivation, and active participation among kindergarten children.

The study contributes to the field of Islamic early childhood education by providing an innovative mobile learning framework specifically designed for Qur'anic kindergarten learners. Unlike many existing digital learning applications, the developed platform combines pedagogical principles, interactive multimedia, and Islamic educational content into a comprehensive learning environment suitable for both classroom and home learning.

From a practical perspective, the developed application can assist teachers in delivering more engaging instruction while enabling parents to support children's learning outside school. From a theoretical perspective, the findings strengthen the evidence supporting the integration of mobile learning technologies into early childhood religious education.

Future research should evaluate the long-term effectiveness of the application across diverse educational settings, incorporate adaptive learning technologies powered by artificial intelligence, and investigate its impact on broader aspects of children's cognitive, affective, and spiritual development.

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