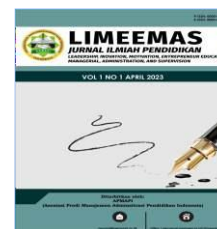


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## IMPLEMENTATION OF ANDROID FREE EDUCATIONAL GAMES AS A LEARNING MEDIUM FOR THE INTRODUCTION OF *HIJAIYAH* LETTERS AT THE ELEMENTARY SCHOOL LEVEL

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**Abstract:** The purpose of this research is to develop an Android-based educational game to introduce elementary school students to the nature of hijaiyah letters in an interactive and fun way. The development method uses the Game Development Life Cycle (GDLC) through six stages: initialization, pre-production, production, testing, beta release, and final release. Testing was carried out using alpha testing by experts and beta testing by students, using the Likert scale and N-Gain calculations. The results of alpha testing showed that the application's feasibility was 88.4% for materials and 86.6% for media. Meanwhile, the N-Gain results showed an increase in student understanding from a pretest score of 58.2 to a posttest score of 85.4, placing it in the high effectiveness category. Thus, this application is considered feasible and effective as an interactive learning medium for recognizing the nature of hijaiyah letters.

**Key Words:** Educational games, Android, hijaiyah letters, learning media, elementary school

**Abstrak:** Tujuan dari penelitian ini adalah untuk mengembangkan media pembelajaran berupa game edukasi berbasis Android guna mengenalkan sifat huruf hijaiyah kepada siswa sekolah dasar secara interaktif dan menyenangkan. Metode pengembangan menggunakan Game Development Life Cycle (GDLC) melalui enam tahapan: inisialisasi, pra-produksi, produksi, pengujian, beta release, dan rilis akhir. Pengujian dilakukan dengan alpha testing oleh ahli dan beta testing kepada siswa menggunakan skala Likert dan perhitungan N-Gain. Hasil alpha testing menunjukkan tingkat kelayakan aplikasi sebesar 88,4% dari sisi materi dan 86,6% dari sisi media. Sedangkan hasil N-Gain menunjukkan peningkatan pemahaman siswa dari skor pretest 58,2 menjadi posttest 85,4, dengan kategori efektivitas tinggi. Dengan demikian, aplikasi ini dinilai layak dan efektif sebagai media pembelajaran interaktif dalam pengenalan sifat huruf hijaiyah.

**Kata Kunci:** Game edukasi, Android, sifat huruf hijaiyah, media pembelajaran, sekolah dasar

### INTRODUCTION

Education is an essential part of life, especially in religious education. Indonesia is a country with the majority of the population being Muslim; therefore, the subject of Islam is one of the compulsory subjects in almost every elementary school. Understanding of religious teachings and building a strong spiritual personality in students can be obtained through Islamic religious education. Islamic Religious Education plays a vital role in fostering a strong understanding of Islamic values aligned with global developments and challenges (Musa et al., 2024).

The Quran is the holy book of Muslims, containing commandments and

prohibitions, as well as guidance for life from Allah SWT. Hijaiyah letters are symbols used to express the sounds of language; in the system of writing, letters are combined to form words or sentences. In Islamic religious education, learning to read the Quran is a central lesson usually taught at the elementary school level. Students begin by memorizing hijaiyah letters. The ability to recognize and read hijaiyah letters and alphabets plays a significant role in improving Arabic language skills and making the process of reading the Qur'an easier (Sari et al., 2021). In other words, learning hijaiyah letters is the basis for learning to read the Quran.

Understanding the nature of each hijaiyah letter or shifatul letter is very important in reading the Quran. Letter shifatul, according to language, is a state that settles on something else. According to the term shiftul letters, it is a newly arrived state that applies to a letter read directly from its makhraj. Understanding this aims to help distinguish letters that have almost the same sound. Like the letters ت (Ta) and ط (Tha), ت (Ta) has a light "t" sound, as in the word "hand," while ط (Tha) has a thick and deep "t" sound, with stronger pressure from the base of the tongue. Hijaiyah letters and how to read them have a different writing system stipulation from alphabetic letters. (Sari et al., 2021).

Currently, technology has penetrated every sector of life due to rapid technological development. It has many positive impacts on life, one of which is in the field of education. The use of technology in education aims to make it easier for students to understand and gain insight into lessons, thereby increasing the spirit of learning. (Anggraeny et al., 2020).

The learning methods used in elementary schools today still rely on traditional approaches that are often too monotonous, leading to boredom during the learning process. As a result, students have difficulty understanding the material given. However, developments stemming from advances in information technology and communication, such as Android-based educational games, can be used as a fun way to learn. Educational games can be a more interactive way to understand because they combine the entertainment elements of the game with educational materials, allowing users to learn while playing. With that, students can enjoy the learning atmosphere as if they were playing activities, which makes it easier for students to master the material. (Pada & Mulyo, 2023).

Educational games are games specifically designed to develop players' potential through an educational, interactive, and fun gaming experience. The main goal is to increase knowledge, skills, and positive behavior. Educational games can encourage students to learn actively and creatively, helping them better understand the material through applications that can be accessed anytime. (Tyas et al., 2020). In other words, educational games are a result of the development of information and communication technology, which allows users to gain knowledge from the material conveyed through digital games.

In a previous study conducted with the title "VR educational game introduction and prevention of the COVID-19 virus using the MDLC method for early childhood," a virtual reality-based educational game application was developed that aims to introduce and prevent the spread of the COVID-19 virus in early childhood, using the Multimedia Development Life Cycle (MDLC) method. In the context of the pandemic, many children do not understand the COVID-19 virus or how to prevent it, so this game is expected to be an engaging learning tool. The app was tested against the ISO 25010 standard,

achieving an excellent quality score of 96.11% from 15 respondents. This game features several levels that educate players about viruses and prevention measures, and includes interactive features to improve children's understanding. In this study, the learning model applied is the Interactive Learning model, which uses activities directly within the Game Development Life Cycle system development model.

Previous research conducted by (Mukroji, 1970) The study titled "Improving the Ability to Read the Qur'an Through the Introduction of Makharijul Letters in Children Using the Sorogan Method" used a quasi-experimental approach. In this study, the sorogan method was applied in groups to teach makharijul letters to children, thereby increasing their ability to read the Qur'an. The results of the study show that this method helps children clearly understand where the hijaiyah letters appear, thereby improving their reading of the Qur'an in accordance with the rules of tajweed. This approach has proven relevant for the learning of Makharijul letters. In this study, the novelty of this educational game lies in introducing the properties of hijayah letters.

Previous research conducted by (Tyas et al., 2020) The title "Designing Educational Games to Compile Qur'an Verses Based on Android" used the Interactive Multimedia System Design and Development Cycle (IMSDD) approach. This research resulted in an interactive learning application, an educational game called "Compiling Qur'an Verses," designed to support students of SD Avicenna Jagakarsa in memorizing short letters. Based on testing, the app shows high responsiveness, with an average response time of only 1 second on Android 8.0, running on a 2.45 GHz Octa-core processor. This game offers flexible accessibility and provides an interactive and fun Qur'an learning experience. In this study, the update applied is to use Android version 10.

The primary focus in this study is on the nature of hijaiyah letters, which are characteristic of conditions in the pronunciation of hijaiyah letters. The nature of hijaiyah letters explains how to pronounce them, such as restrained, buzzing, bouncing, and so on.

Based on observations and interviews conducted with teachers at SD IT Lantabur in the city of Pagar Alam, it was revealed that there are still many elementary school students who have not memorized the nature of hijaiyah letters or sifatul of letters thoroughly, the lack of children's ability to learn the nature of hijaiyyah letters is caused by the lack of attention from parents to elementary school education. In addition, the lack of parental support and motivation in the home learning process is a factor that hinders the introduction of hijaiyah letters to children.

According to a brief interview conducted by the researcher with the parents or guardians of Muhamad Al Hafiz, a parent at SDLantabur, children outside school hours prefer watching television and playing games rather than studying and memorizing lessons at school. This makes it difficult for students to understand the material presented at school fully.

According to a brief interview conducted by the researcher with Ustadz Sudirno, a recitation teacher in Temu Karya village, the nature of hijaiyah letters remains unknown to children today. Many students have difficulty memorizing the nature of hijaiyah letters because each one has distinct characteristics. This is because students at home prefer playing games on their mobile phones rather than studying. In addition, the researcher conducted several short chats with students at Lantabur Elementary School. From the chats, it can be concluded that learning outside of school hours is very

unpopular because there are many more interesting activities, such as playing, watching, and playing games.

Based on previous research and the problems that have been studied, the researcher will create an educational game to recognize the nature of the hijaiyah letter as a medium for the introduction and understanding of the nature of the hijaiyah letter in elementary school students using an android-based educational game accompanied by animations, sounds and learning experiences that are fun and not boring so that it makes it easier and enjoyable for students to learn so that they can better understand the material conveyed. Based on the above study, the researcher conducted a study entitled "Implementation of Android-Based Educational Games as a Learning Media for Recognizing the Properties of Hijaiyah Letters at the Elementary School Level".

## **METHODOLOGY**

This research uses a learning media development approach in the form of an Android-based educational game that aims to help elementary school students recognize and understand the nature of hijaiyah letters. The research was conducted at SD IT Lan Tabur, Pagar Alam City, with the primary study subjects being elementary school students in grades 4-6. This research took place from November 2024 to January 2025, with implementation carried out in a targeted manner to meet the needs of application development and media testing processes.

In the data collection process, the researcher uses the observation method as the first step to understand the real conditions of learning in schools. Observation is carried out by examining the teaching and learning process and recording students' understanding of the material on the nature of hijaiyah letters. From these observations, it was found that the learning methods used are still predominantly traditional, such as using books or direct explanations, which makes students easily bored and less interested in memorizing the properties of hijaiyah letters.

In addition to observation, the researcher also used the literature study method. Literature studies are conducted by collecting relevant theories from books and scientific journals, such as educational game theory, Android, learning media, hijaiyah letters, and the nature of hijaiyah letters in tajweed. This literature review provides an essential basis for determining which game applications align with learning objectives and remain academically relevant.

The main stage of application development is carried out using the Game Development Life Cycle (GDLC) method. This method was chosen because it is well-suited to the systematic, gradual development of gaming applications. GDLC in this study consists of six stages, namely Initiation (initialization), Pre-Production (pre-production), Production (production), Testing (testing), Beta Release, and Final Release. Each stage is carried out sequentially, starting with designing game ideas, creating storyboards, developing game system designs, and implementing games as Android applications.

In the pre-production and production stages, researchers design various game components, including storyboards, menu displays, game levels, audio, images, and game mechanics. This game is designed to have two main modes, namely learning mode and challenge mode, so that students not only play but also gain an understanding of the material. Game development is carried out using the Unity game engine, along with

several supporting applications, including Photoshop for graphic design and Clickchart for system flowcharts.

The last stage of the research methodology is application testing, which is conducted through two types: alpha and beta testing. Experts carry out alpha testing to assess the feasibility of media and materials. Meanwhile, beta testing involves students as direct users, uses assessment instruments on a Likert scale, and analyzes improvements in learning outcomes using the N-Gain method by comparing pretest and posttest results. Throughout these stages, researchers ensure that the games not only run well but also effectively improve students' understanding.

## **RESULT AND DISCUSSION**

### **Result**

The results of this study show that the development of Android-based educational games as a learning medium for recognizing hijaiyah letter traits has a positive and significant impact on the learning process of elementary school students. In general, this research not only produced an interactive learning application, but also demonstrated that the developed media has high feasibility according to expert assessment and can improve students' understanding in practice. Through a series of testing stages, including alpha and beta testing, this application is considered feasible and effective as an alternative to modern learning media, offering a more engaging experience than conventional methods.

### **An Android-based educational game application has been successfully developed and can serve as a learning medium for introducing hijaiyah letters to elementary school students.**

The Android-based educational game application in this study was successfully developed as a learning medium to help elementary school students recognize the nature of hijaiyah letters. The resulting product is an educational game application that can be used on Android smartphones. The development of this application was driven by the need for more engaging learning media, as conventional methods such as books and lectures often bored students quickly.

The success of this application's development shows that technology can be used as an innovation in religious education, especially in basic tajweed materials, such as the properties of hijaiyah letters. In the process, the researcher designed this game to suit the characteristics of elementary school students, who tend to be more easily engaged by visual media, animation, and play activities. Therefore, this application is compiled not only as entertainment but also as a means of directed learning.

This educational game was developed with the concept of interactive learning, where students can learn while playing. The hijaiyah nature material is not only presented in text form but also packaged as game challenges and activities that require direct student responses. These interactions make students more active in understanding the material, as they not only read or listen, but also practice through games.

In addition, this application is designed to create a more enjoyable, less monotonous learning experience. Through the attractive display design, use of colors, sounds, and the game's leveling system, students can feel more motivated to keep trying and completing challenges. This indirectly helps students repeat the material many times without feeling forced, as they consider it a play activity.

With this application, learning the nature of hijaiyah letters is more flexible, as students can access the material anytime, anywhere on an Android device. Learning media is no longer entirely dependent on books or teachers' classroom explanations, but can be strengthened with modern digital technology. Therefore, this educational game application can be a compelling, engaging, and relevant alternative to traditional learning.

### Quantitative Test

The results of the feasibility test through Alpha Testing indicate that the Android-based educational game application developed is very feasible to use. Experts conduct Alpha Testing as an initial evaluation to ensure that the application meets eligibility standards before being deployed to end users (students). In this stage, the assessment focuses on the main aspects: the suitability of the learning material and the quality of the media or application display.

Based on the test results, the application achieved a material feasibility of 88.4%. This figure shows that the learning content about the nature of hijaiyah letters presented in the game is appropriate, in accordance with the rules of tajweed, and relevant to the needs of elementary school students. The material presented is considered to include essential points students need to understand the nature of hijaiyah letters, so that the application can be used as an additional learning tool that supports classroom learning.

In addition to the material aspect, alpha testing also assessed the quality of the media or application display, and the results showed an 86.6% rating. This value indicates that the application meets the criteria for effective learning media, including interface design, menu layout, color selection, and ease of navigation. An attractive and interactive display is one of the advantages of this application because it can help students learn more comfortably without feeling bored.

Interestingly, these feasibility results show that the app is not only powerful in its content but also supported by a decent, user-friendly media design. This is important because a digital learning medium is not enough to present the right material; it must also be easy for students, especially elementary school children, to use, with a simple yet attractive appearance. Thus, this gaming app can provide a more enjoyable and practical learning experience.

Overall, the results of this Alpha Testing confirm that the educational game application developed has met the eligibility standards to be used as a learning medium. The high percentage of material and media aspects indicates that applications can serve as a modern learning alternative that supports the interactive learning of the nature of hijaiyah letters. Therefore, the results of this test provide a strong basis for proceeding to the user testing stage (beta testing) and broader implementation.

**Table 1. Interpretation of Alpha Testing Results**

<b>Aspects Assessed</b>	<b>Eligibility Percentage</b>	<b>Interpretation of Results</b>	<b>Brief Description</b>
Material Eligibility	88,4%	Highly Worth It	The material on the nature of hijaiyah letters is in accordance with the rules of tajweed, relevant for elementary school students, and easy to understand.
Media	86,6%	Highly Worth It	The app's display design is attractive,

Eligibility			navigation is easy, interactive features run well, and it is suitable for elementary school children.
General Conclusion	-	Highly Worth Using	The application meets the feasibility standards for learning content and media presentation, making it suitable as a learning medium.

The educational game application developed has proven to be effective in improving students' understanding of the nature of hijaiyah letters. This is clearly seen in the learning evaluation results, which show an increase in student scores after using the application. The effectiveness of this application is an essential finding because it shows that technology-based learning media are not only visually appealing but also capable of having a tangible impact on student learning outcomes.

Based on the score comparison, the average student pretest score of 58.2 indicates that, before using the application, students' understanding was still at a moderate level rather than optimal. However, after students used the educational game application, the average posttest score increased to 85.4. This increase shows that students have experienced a significant increase in ability, especially in recognizing and understanding the properties of hijaiyah letters that were previously considered difficult to memorize and comprehend through ordinary learning methods.

The increase in value was then analyzed using the N-Gain calculation, and the results fell into the high-effectiveness category. This means the educational game application can make a significant contribution to improving students' understanding more quickly and effectively. Thus, the application is not only deemed feasible as a learning medium but also proven to be an interactive learning solution superior to conventional methods such as book-based learning or lectures.

## **Discussion**

This study discusses the success of developing an Android-based educational game application as a learning medium for introducing hijaiyah letters to elementary school students. This application was designed as a solution to conventional learning problems, where students tend to be less interested in learning about the nature of hijaiyah letters through books or lecture methods. Through game-based media, learning is expected to be more interactive, fun, and aligned with the characteristics of elementary school students, who are more interested in play activities (Ardianto et al., 2025).

The development of this application uses the Game Development Life Cycle (GDLC), which consists of six stages: initiation, pre-production, production, testing, beta release, and release. This method assists researchers in systematically compiling the development stages, from designing game concepts to ready-to-use applications (Purwanto, Umar, et al., 2024). With clear stages, game development becomes more structured so that every element, such as storyboard, flowchart, menu display, and game mechanics, can be arranged according to students' learning needs (Hidayad et al., 2023).

At the design stage, this educational game is built on the concepts of interaction and challenge-based learning. The game provides activities that invite students to recognize the nature of hijaiyah letters through practice questions, quiz games, and a

'guess the nature' activity. This concept is essential because hijaiyah letters are material that requires repetition and deep understanding. With the game system and level challenges, students are encouraged to revisit the material without feeling burdened, as the learning process feels like play (Budiyanto et al., 2024).

In addition, the use of visual and audio media in games significantly increases student interest. Attractive color displays, letter illustrations, and supportive sound effects make it easier for students to focus on the learning process (Yuliana et al., 2024). This shows that digital media has advantages over print media because it can present material in a multisensory manner, involving sight and hearing simultaneously (Nasar et al., 2023). This condition strengthens students' memory in understanding the properties of hijaiyah letters.

Alpha testing conducted by experts shows that the application has a high level of feasibility. The assessment of the material obtained a score of 88.4%, indicating that the material presented in the application is in accordance with the concept of tajweed and relevant to the learning of elementary school students (Purwanto et al., 2023). Meanwhile, the media assessment scored 86.6%, indicating that the interface design, navigation, and application appearance are considered reasonable and easy to use. These results confirm that the application is not only correct in its content but also feasible as a learning medium (Marisya et al., 2023).

After being declared feasible by experts, the application undergoes beta testing with students as users. This test was conducted to determine the level of user acceptance of the application and to measure the effectiveness of the games in improving student understanding (Novia et al., 2024). From this process, it can be seen that students respond positively because the game is considered interesting, easy to play, and helps them understand the nature of hijaiyah letters in a more fun way. This proves that game-based learning media can create a more active, less monotonous learning experience (Purwanto, Despita, et al., 2024).

The effectiveness of the application is then proven through a comparison of pretest and posttest results. The average student pretest score of 58.2 shows that, before using the application, students' understanding was still not optimal. However, after using educational games, the average posttest score increased to 85.4. This improvement shows that the app can help students better understand the material (Purwanto, Marsinah, et al., 2025). In addition, according to N-Gain's analysis, the increase falls into the high-effectiveness category, indicating that the app has a significant impact on learning outcomes (Harpiansi, Anggra Prima, 2025; Marsinah et al., 2024).

The results of this study show that Android-based educational games can be an effective alternative to modern learning media, especially in Islamic religious learning, such as the introduction of hijaiyah letters. Technology-based learning media allows students to learn more flexibly because it can be accessed anytime on smartphones (Purwanto, Yuliana, et al., 2025). In addition, the use of games makes students more motivated because the learning process does not feel like a strenuous academic activity, but instead becomes a fun and challenging activity (R.A Rodia Fitri Indriani et al., 2024).

Overall, this discussion shows that the development of Android-based educational games has not only produced usable applications but has also proven effective in increasing students' understanding of the nature of hijaiyah letters (Astirini Swarastuti et al., 2024; Muhammad Iqbal et al., 2025). This application can be a learning

innovation that supports teachers in delivering material and helps students learn independently outside of school hours. Thus, this research makes a real contribution to the development of interactive learning media that align with technological developments and the learning needs of elementary school students.

## CONCLUSION

The conclusion of this study shows that the development of Android-based educational games as a learning medium for recognizing hijaiyah letters among elementary school students has been successfully carried out. The resulting application can serve as an alternative learning medium, more interactive and engaging than conventional methods, helping students understand the nature of hijaiyah letters through play. Feasibility testing through alpha testing also shows that this application is highly suitable for use, both in terms of materials and media, making it a learning medium that supports the teaching and learning process. In addition, this educational game application has proven effective in improving student understanding, as shown by increasing the average pretest score from 58.2 to the posttest score of 85.4. The results of the N-Gain analysis also showed a high effectiveness category, indicating that the app has a significant impact on student learning outcomes. Thus, it can be concluded that this Android-based educational game is not only feasible to use but also effective as an innovative learning medium for recognizing the nature of hijaiyah letters at the elementary school level.

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