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Augmented Reality Based Tajwid Reading Law Android Application

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ABSTRACT

The learning method used in learning the subjects of the Qur'an and Hadith in Schools is a common teaching method, which uses books as a source of knowledge and teachers as teachers. In this problem, the author uses a learning method using Augmented Reality (AR) as the basic law of reading aloud so that students don't get bored. Augmented Reality (AR) is a combination of real and virtual objects displayed simultaneously on a screen. Augmented Reality is created with Unity 3D, Vuforia and Android software. The application of new learning methods should increase students' interest in serious and straightforward learning. This research aims to build a recitation science learning application for children 5-10 years old using an Android-based device "so that with this application it is hoped that it will have an attractive design, as well as complete features and have materials and examples of legal reading and pronunciation." easy for children to understand and can make children understand the science of recitation from a young age. The results of this research are applications for learning the science of Tajweed for children 5-10 years old which can display the hijaiyah letters accompanied by their pronunciation and how to pronounce them, the laws of the science of Tajweed which consist of the law of nun mati/tanwin, qalqalah and the law of mad, games as material for evaluating children. The Tajwid science learning application succeeded in increasing children's understanding of Tajweed science by 57.9%. Application feasibility testing uses white box and black box methods with several test requirements. Based on the test results, functionally the application is appropriate, feasible, and can be used as a learning medium for Tajwid science and is in the "Very Good" category.

INTRODUCTION

Education is an effort to create a learning atmosphere and learning process for students in developing their potential. The science of tajwid is the basis for reading the Al-Qur'an well and correctly, and the science of tajwid is the science of learning how to sound or pronounce the letters contained in the holy book Al-Qur'an. So when reading the Koran you have to be precise and pronounce it correctly, With the development of technology and information, there will be many changes in the perspective of education and the impact of many sources of knowledge on the educational process, giving rise to new learning methods that suit the needs of the relevant institutions. Educators must be able to prepare students to face the problems, developments and use of currently developing technology to support their teaching.

The science of tajwid is the science of studying the correct and correct reading of the Al-Qur'an. the pronunciation is according to valid rules, because if you read or pronounce it incorrectly it will give a different meaning. Studying the science of recitation is fardhu kifayah. This means that if in a place, region or country there are Muslims who are experts in the science of tajwid, where people can ask them questions, then that obligation has been fulfilled. However, reading the Koran according to the provisions of the science of recitation is fardhu ain. This means that every person who reads the Qur'an must read it well and correctly in accordance with the provisions of the science of tajwid. However, currently many people do not pay attention to it, not even a few do not know what the science of tajwid is, how many reading laws are used in it? the process of learning to read the Koran.

The obstacles faced in the process of learning to read the Al-Qur'an for beginners are that in the process of pronouncing the letters they are still unable to differentiate between the pronunciation of one letter and another in hijaiyah letters with almost the same pronunciation, for example ق(Qof) and خ(Kho'), ض(Dlod) with ظ(Dho'), د(Dal) with ذ(Dzal), when pronouncing long and short hijaiyah letters, they still cannot differentiate between letters that should be read long or short. In reading the Qur'an, there are rules for pronouncing hijaiyah letters (the law of tajwid) which must be understood and comprehended by readers of the Qur'an, but in practice they are often ignored, many people just read without knowing the law. Al-Qur'an Education Park Qur'an Fathul Jannah Mosque is one of the Al Qur'an

educational parks in the city of Brebes. The number of students is twenty and there are four teaching staff. This educational park requires students to be able to read the KoranTherefore, I highly recommend learning Tajweed, even if you have learned the basics of Tajweed first. With the development of technology, the use of augmented reality technology makes learning Tajweed more fun and interesting. Based on the problems mentioned above, research was raised with the title "Tajwid science learning application for TPQ children 5-10 years old using Android-based devices" so that with this application it is hoped that it will have an attractive design, as well as complete features and materials and examples of legal reading and pronunciation that are easy for children to understand and can enable children to understand the science of recitation from a young age.

LITERATURE REVIEW

Instructional Media

Mobile technology is one of them technology is very fast at this time, Mobile phones used to be tools Communication, currently has a function has exceeded its basic function so make life easier for users daily. One of he operating systems used on mobile devices is android. Linux based operating system It has various innovations for users able to explore everythingLearning applications are programs with command processing activities needed to carry out user requests with certain goals. Applications can be used as a medium to support the teaching and learning process. New learning methods should help students understand the material more easily. Applications are components that are useful as a medium for carrying out data processing or various other activities such as creating or processing documents and files. Android is an operating system for Linux-based mobile devices that includes an operating system, middleware and applications. Android provides an open platform for developers to create their applications (Wei, Wahid, & Gusman, 2021).

The Unity3D game engine is a software designed to create or develop video games. The main functions provided by game engines usually include a renderer engine which is useful for rendering 2D or 3D graphics, a physics engine to make 3D objects act like real objects (affected by gravity, collisions), sound, scripts, animations, artificial intelligence (AI), networking, streaming, memory management, threading, and animated graphics (Dhakal, 2022). There are many Game engines designed to create Games for various platforms such as video Game consoles and desktop systems such as Microsoft Windows, Linux, and Mac OS. The knowledge of tajwid is one of the sciences very important religion that should learned by Muslims starting from age early, according to scholars that law learning the science of tajwid is fard kifayah but ractice tajwid when reading Al-Qur'an is fardu'ain or obligatory to men and women who are mukalaf or adults (Alliance & Sebastian, 2022).

Tajweed Science

Tajwid means to beautify or repair. Tajwid science is a science that studies the art of extracting letters according to their silencers and identifying their rights and properties, with the aim of avoiding linguistic errors in pronouncing the letters of the Qur'an. Tajweed science teaches many things, such as the length and brevity of reading, the relationship between letters and Mahroj. Some examples of the rules for reciting tajwid: Izhar , Idgam bigunnah , Idgam bilagunnah , Ikhfa and Iqlab. Knowledge of Tajwid is knowledge about the rules and ways of reading the Quran in the best possible way. The main discussion or what is learned in the science of tajwid is the number of 29 letters, in various harakah (rows) as well as in various types of relationships. Tajwid itself, if seen from the language, comes from the word "Jawwada" (جـ-ـد-ادت) which has the meaning of doing something beautifully, nice, and good. While in the Science of Qiraah, tajwid has the meaning of removing a letter from its place that matches the properties of the letter (Sesmiarni, Darmawati, Yuspita, & Yeri, n.d.).

The second source of law that states that we must read the Qur'an with the correct Tajwid is in the Hadith of the Prophet Muhammad S.A.W. This hadith was narrated directly by Umm Salamah r.a who is the wife of the Prophet when she was asked about how the Messenger of God read the Qur'an and the prayer. So he replied: "Know that His Majesty the Prophet Muhammad S.A.W. He prayed then slept for the same length of time as when he prayed earlier, then His Majesty returned to pray for the same length of time as when he slept earlier, then slept again for the same length of time as when he prayed earlier until dawn. Then she (Umm Salamah) exemplified the way of reading Rasulullah S.A.W. by showing (one) recitation that explains (speech) the letters one by one." (Hadith 2847 Jamik At-Tirmizi) From the hadith we can know that Umm Salamah explained about the tajwid recitation of the Qur'an that the Prophet read. And it means that even in Salat, we must still apply Tajwid Knowledge in every reading (Ali, Zulaini, & Ruhuputty, 2023).

Augmented Reality

Augmented Reality (AR) is a subset of *Virtual Environments* (VE), commonly known as *Virtual Reality (VR*). AR gives users the idea of combining the real world with the virtual world seen from the same place. AR has three characteristics. *interactive* (increasing user interaction and perception with the real world), *real-time* (real time), and three-dimensional. Currently, two AR methods are being developed: marker-based tracking and markerless AR. Marker-Based Tracking is AR that uses markers or marks on two-dimensional objects with patterns that are read by a

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computer via *a webcam* or camera connected to the computer (Ran, Slocum, Gorlatova, & Chen, 2022). Augmented reality is an interactive experience that enhances the real world with computer-generated perceptual information. Using software, apps, and hardware such as AR glasses, augmented reality overlays digital content onto real-life environments and objects. This enriches the user experience and turns one's immediate surroundings into an interactive learning environment which is particularly valuable in manufacturing and Industry 4.0 processes. It allows industrial users to become "one" with the systems and machines they work with, and to optimise and augment technology and IoT networks with human ingenuity, observation, and creativity (Ran et al., 2022).

Unity 3D

Unity 3D is an application used to create game engines. *Unity* is primarily a 3D- based game engine , but can also be used to create *2D games* . *Unity's* tools and libraries are one of the most comprehensive compared to other game development applications. *Unity* also has a free license to help students build applications. This application is also cross-platform. This means you can create apps and *games* for platforms like *Android, iOS, and Windows* (Harchristanto, 2023).

Vuforia

Vuforia is a type of software created by Qualcomm to help create *augmented reality* . The steady target for computer vision focused on image recognition is a source of *euphoria. Virtual reality, or VR, removes people from the real world and fully immerses them in a virtual world using a head-mounted display or headset. In that virtual world of imagery and sounds, users can move around in all directions, manipulate objects, and more. VR is often used in healthcare, architecture, and education* (Liu, Hui, & Su, 2023).

Blender

Blender is an application for creating 3D objects, 3D animations, visual effects and games. Blender is quite full-featured and only requires Open GL support. This application is free and contains open source. This application can also run on operating systems such as *Windows, Linux and Mac OS. AR enhances, or augments, the real world with digital information. While augmented reality apps work through mobile devices such as smartphones or tablets, in manufacturing and industrial settings where it benefits the user to have their hands free, glasses or headsets are the best gateways to the AR experienc* .

Markers

Markers are markers that have special properties depending on the markers registered with the marker . If the marker matches, the camera will recognize it and the 3D object will be displayed on the smartphone screen, otherwise the 3D object will not be displayed if the marker does not match or is not registered. There are two types of marking methods (Abdinejad, Ferrag, & Dalili, 2021):

1. *Marker Based Tracking* / Mark-based tracking, namely black and white *markers and in the shape of a box with thick black lines and a white background.*
2. *Markerless* , that is, it does not use markers or *markers* that can be detected. In this method markers can be replaced with images, logos and faces.

Android

Android is the operating system that supports *smartphones* , and because *Android* is an *open source system* , the price is cheaper than the *iPhone* . *Android* was originally developed by *Android* Inc. and acquired by *Google* in 2005. With AR, workers can gain immediate information on any machine they're interacting with (Lu et al., 2024). They can access the latest user manual or connect with an expert anywhere in the world to help them assess or repair an issue. This supports continuous production and non-disruptive performance. Android's default user interface is mainly based on direct manipulation, using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, along with a virtual keyboard. Game controllers and full-size physical keyboards are supported via Bluetooth or USB. The response to user input is designed to be immediate and provides a fluid touch interface, often using the vibration capabilities of the device to provide haptic feedback to the user. Internal hardware, such as accelerometers, gyroscopes and proximity sensors are used by some applications to respond to additional user actions, for example adjusting the screen from portrait to landscape depending on how the device is oriented, or allowing the user to steer a vehicle in a racing game by rotating the device, simulating control of a steering wheel (Lampropoulos, Keramopoulos, & Diamantaras, 2022).

Hypothesis

1. Fast Corner Detection in Augmented Reality Learning Management of the Corpse

In this research has several menu formats such as the main menu, how to read recitation, multiple choice quiz format, and essay quiz format. The resulting application has a very diverse menu. In this way, students can more quickly and easily understand the material through the application (Syaripudin, 2021).

2. *The Use of Quranic Learning Strategies Through the Wafa Method in Elementary Schools*

Research conducted by Rexy created an educational application for children aged 4-6 years. This application can project 3D animal animations. The application was created because not all parents can take their children to the zoo due to limited time and distance to the zoo (Rexy & Danyl, 2022).

3. Augmented Reality Book to Aid Learning Tadabbur Al- Quran: A Visualization Tool

A research conducted in 2020 by Ramli Rosida explored *augmented reality* as a Tajwid learning medium using a *marker -based tracking method* . The AR application that was created not only displays 3D images from the tajwid play, but also displays sound and text. The software used in this research is *macOS High Sierra, Unity 2019.1.12fl, Photoshop CC 2021, and Blender 2.79b* (Ramli, Mohid, & Abas, 2020).

METHODS

Research Tools

1. Observation
   Observation is an observation made when someone visits a research location, in order to obtain some information needed for research related to the research subject. By making observations, the author can find teacher-student problems related to these subjects (Andreas & Suryantara, 2023).
2. Interview
   Direct interviews were conducted by asking several questions related to these issues. The purpose of conducting interviews is to obtain the information that researchers need. Based on the responses given by school principals and teachers regarding the teaching and learning process of students who still learn in the old way or who tend to get bored, the author proposes a new teaching method, namely *Augmented Reality* (Agus, Putra, Ngurah, & Cahyadi, 2021).
3. Literature *study*
   research or data collection The author obtains data and information relevant to his research through journals, websites and books.

RESULT

***Concept* Analysis**

At this stage, a concept for creating an application will be designed based on the results of interviews with teachers and school principals so that the application created meets needs.

Design

The design is made to create an overview of the application that will be created.

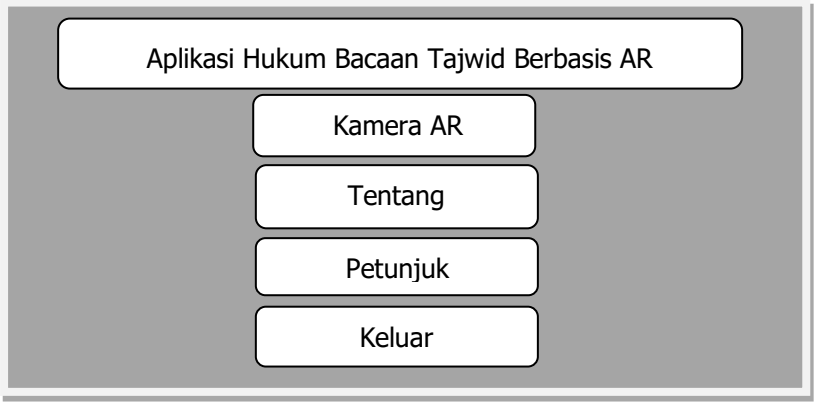

Figure 1 . Main Menu Display *Design*

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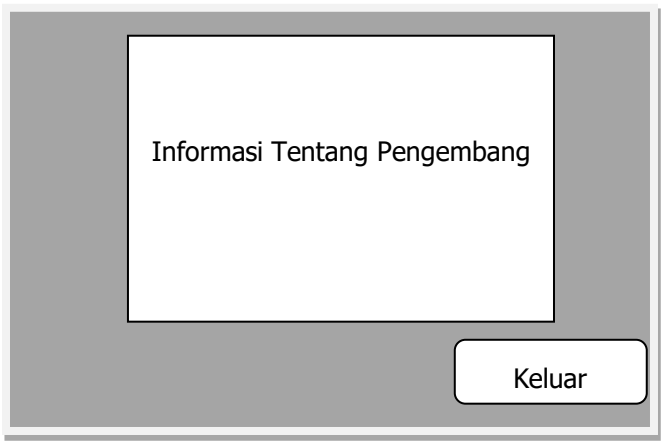

Figure 2 . Camera AR Page Design

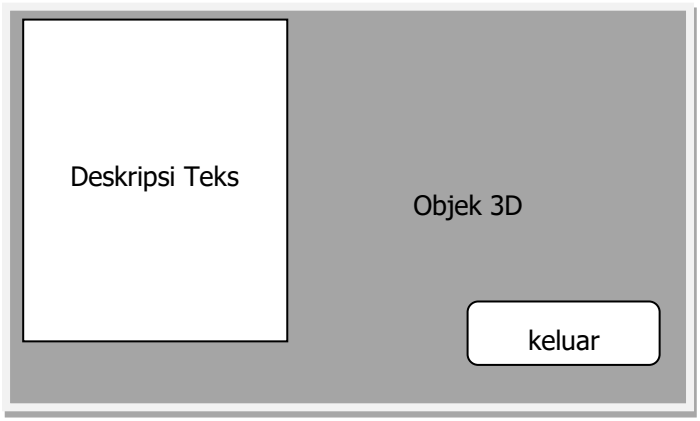

Figure 3 . About Page *Design*

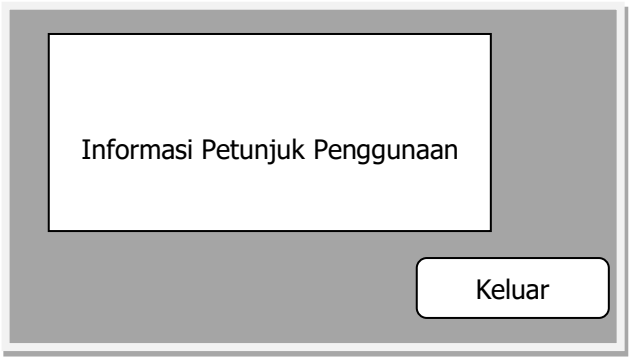

Figure 4 . How-To Page *Design*

Development Assembly **(creation or coding)**

Stages of creating an application created using the Unity application and designed using the Blender application. The Unity application is used to create applications with the initial process of importing all the designs that have been created in Blender into Unity, after which you start editing the application creation. Creating the application's main menu, about menu, instructions menu and exit has its own coding script. Previously, make a marker first on the Vuforia website, after getting enough stars you can proceed to the next stage. When all the components have been created, try them first before building them. Once you feel they are working, you can build them straight away. During the build process it takes quite a long time.

Figure 5. Application Creation in *Unity*

DISCUSSION

Implementation Testing (testing)

Testing is carried out using the black box testing method which focuses on the functionality of the software. The following is a table for testing the Tajweed law application.

Table 1 . Application testing

Input Data	Output Data	Results	Conclusion _
Open the application	Enter the application display which has 4 menus, namely AR camera, about, instructions and exit	Enter the main application display	Valid
Select the AR camera menu	Enter the camera's AR view and start scanning the marker which will display a 3D object	Enter the AR camera and when pointed at the marker displays objects, descriptions and sounds	Valid
Select the about menu	Go to the about page	Go to the about menu which contains application developer information	Valid
Select the instructions menu	Enter the instructions page	Enter the instructions menu which contains information on how to use the application	Valid
Select Exit menu	Exit the application	Exit the application	Valid

App View

Augmented Reality- based tajwid legal application .

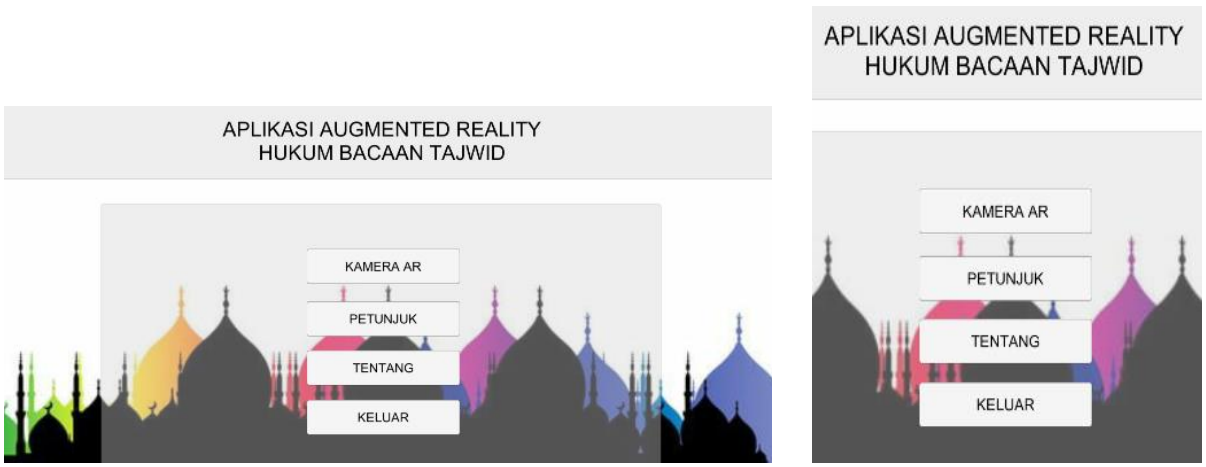

Figure 6 . Home View

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Figure 7 . Instructions Page View

Figure 8 . 3D Object View

CONCLUSION

Based on the results of the research and discussions that have been prepared, a conclusion can be drawn, namely that an *Augmented Reality* Legal Reading Tajwid application has been created. The following are suggestions from researchers for further application development and more widespread implementation for the *Augmented Reality application* of Tajwid Reading Law for the In the future, namely, the *Augmented Reality Legal Tajwid Reading* Application still has many shortcomings in terms of application design, features, 3D objects of Tajweed law and also *markers* . So the next developer can add features that are lacking in this application.

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