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My Alphabet Application: Alphabet Introduction Learning Media for 1st-grade Elementary School using Augmented Reality Technology

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ABSTRACT

Reading skills can be initiated by familiarizing children with letter recognition first. Students who cannot recognize and differentiate letters will have difficulty reading. Implementing interactive learning media in the learning process can enhance students' motivation, leading to a higher interest in participating in learning activities. Augmented Reality (AR)-based learning media is one approach to creating an interactive learning environment. The research methodology used in this study is the Multimedia Development Life Cycle (MDLC), which consists of six stages: concept, design, material collecting, assembly, testing, and distribution. This research aims to create a better learning atmosphere for alphabet recognition by incorporating interactivity. This is intended to engage students throughout the learning process. Evaluation is conducted using the black box method to validate the application. The evaluation results demonstrate that the application functions according to the developer's plan, making it suitable for elementary school alphabet recognition learning activities.

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1. INTRODUCTION

The language skills students need to master include listening, speaking, reading, and writing. Reading skills must be acquired before students develop writing skills (Pardede, 2020). The early reading stage begins with letter recognition, aiming to familiarize children with letters. In this initial reading activity, students learn to differentiate letters, pronounce them correctly, and combine them to form words.

Based on observations, students often struggle to recognize and differentiate alphabet letters, resulting in mispronunciations. This can be influenced by several factors, including the lack of exposure to letter recognition at home, as not all children have been taught letter recognition by their parents (Lestari et al., 2021). Additionally, the introduction to alphabet letters in Grade 1 thematic books is primarily presented through songs (Nelwan et al., 2020). Furthermore, in the letter recognition process, students practice identifying characters' names in books by observing and pronouncing their letters together (Arifian, 2017).

According to the findings of the PISA 2018, Indonesia is among the four countries where teachers are highly enthusiastic about teaching (Kurniawati, 2021). However, many teachers heavily rely on the provided textbooks at school (Magdalena et al., 2020), indicating the need for innovation in developing diverse and varied learning resources that support 21st-century learning, especially in student alphabet letter recognition.

The impact of the COVID-19 pandemic has raised concerns about early reading skills, both from internal factors (within the child) and external factors (outside the child) (Kusuma et al., 2019). Both factors contribute to the difficulties children face in early reading. The main challenges students encounter include problems in letter recall, differentiating similar-looking letters, and distinguishing vowels (Meo et al., 2021). The use of vowels and consonants can hinder the reading of certain words.

As future teachers, who are always hailed for their innovations, utilizing digital technology, such as the application of Augmented Reality (AR), can significantly enhance the learning of alphabet letter recognition (Aprilia & Rosnelly, 2020). The interactive nature of AR can make the learning process more engaging and capture students' attention. Incorporating AR features through a physical pocketbook adds variety to the learning media and provides a more enjoyable approach to learning alphabet letters.

The relevant study to this research is "The Implementation of AR in Bacteria Classification Learning Media", conducted by (Febriza et al., 2021). The study was conducted using the Multimedia Development Life Cycle (MDLC) method, which consists of six stages: concept determination, design creation, material collection, production, testing, and distribution. The testing stage involved the Black Box testing method conducted by an expert in software engineering. The research findings indicate that AR-based learning media is highly engaging for users. The AR-based Bacteria Classification learning media can be used as an alternative learning media for high school students.

The following relevant study is conducted by (Saputri et al., 2018) titled "Development of Science Learning Media Using Augmented Reality (AR) Based on Android for Third Grade Students of SDN 015 Tarakan". The research method used in this study is the Research and Development (R&D) method. The developed learning media obtained a validation score of 90.6%. This validation score indicates that the AR-based science learning media is highly valid. The research findings show that elementary school students are enthusiastic and interested in AR-based science learning media. According to the students, the developed learning media is engaging in terms of design, fonts, images, and language.

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Another study titled "Development of Augmented Reality (AR) Learning Media in Class V MI Wahid Hasyim" conducted by (Mukti, 2019) showed that Augmented Reality (AR) learning media is suitable for student learning sources. The developed learning media received a response rate of 82.57% from teachers and 90.2% from students, with positive feedback, resulting in an excellent category. AR learning media also improved student learning outcomes by 35.8%.

Another relevant study was conducted (Arrum & Fuada, 2022) titled "Strengthening Online Learning at SDN Jakasampurna V in Bekasi City, West Java, Using Augmented Reality (AR) Interactive Learning Media". The research showed that using AR-based learning media can increase students' interest in learning and create a sense of joy. Through interactive AR-based learning media, students can also learn about technological advancements.

Furthermore, a relevant study titled "Implementation of Augmented Reality-Based Learning Media for Improving Students' Mathematical Understanding in Terms of Learning Styles" conducted by (Larasati & Widyasari, 2021) showed that AR learning media could be used for all learning styles, from kinesthetic, visual, to auditory. The applied learning media can increase students' engagement during learning activities. Moreover, implementing AR-based learning media can enhance students' understanding abilities with the support of explanations from teachers.

Based on the above studies, it can be concluded that using AR-based learning media can enhance the learning process. AR-based learning media can make students more enthusiastic and interested in participating in the learning process. Furthermore, AR-based learning media can improve students' understanding, improving learning outcomes.

2. RESEARCH METHODS

2.1. Research Stage

The methodology used in this research is the Multimedia Development Life Cycle (MDLC). The multimedia development methodology comprises six phases: Concept, Design, Material Collecting, Assembly, Testing, and Distribution.

1) Concept

This application aims to improve the process of letter recognition learning by incorporating interactivity and striving to capture students' attention through creative and innovative learning interfaces. In this phase, the author establishes several criteria that form the concept of the application to be developed. The expected criteria for this application are as follows:

a. The application should be compatible with Android-based smartphones.
b. Users should be able to view 3D objects of alphabet letters, including capital letters, lowercase letters, and words starting with those letters, along with their corresponding images.

2) Design

In this stage, there are several activities, including designing the application interface using Canva (**Figure 1a),** creating button designs using Corel Draw **(Figure 1b),** creating media cards for each alphabet letter from A to Z**,** and developing 3D objects of alphabet letters using Sketchup. When the application user opens the AR section, they are required to point the camera towards the designated media card, and a 3D object will appear on top of the card.

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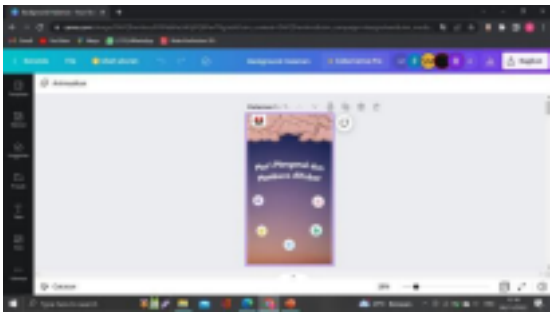

Figure 1a. Interface using canva.

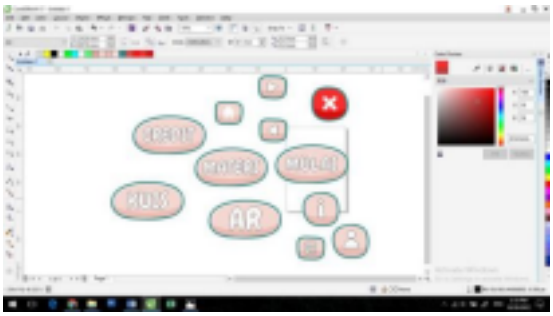

Figure 1b. Interface using Corel Draw.

3) Material Collecting

In this stage, the collection of materials needed for the development of the Multimedia Application for Alphabet Recognition using Augmented Reality takes place. The materials included in this application consist of the definition of letters, vowel materials, and consonant materials.

4) Assembly

The application is developed in this stage based on the concept that aligns with the collected materials and pre-designed interfaces. This ensures that the application functions as intended. The previously designed Media Cards are then imported into Vuforia to generate key points for each card. Each Media Card corresponds to one 3D object, starting from the letter A to Z.

5) Testing

In this stage, testing is conducted to determine whether each media card encounters any errors. The success indicator in this testing is when the 3D object appears above the media card by the letter highlighted by the camera **(Figure 5)**. If the 3D object does not occur or does not match the media card highlighted by the camera, the testing is considered unsuccessful.

Figure 2. Object 3D appears above the media card.

6) Distribution

In this stage, the marketing process of the My Alfabet application targeted at 1st-grade elementary school students takes place.

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2.2. Literature Review

2.2.1. Interactive Application

An application is a computer or mobile device program designed to execute a predefined set of functions (Dewi et al., 2021). Something interactive can be understood as accommodating responses from the user (Faroqi & Maula, 2014). Interaction has a cause-and-effect relationship because there is a two-way form of action and response (Bali & Naim, 2020). Therefore, an interactive application is an application that requires an action from the user, and the application responds and accommodates accordingly based on the programmed instructions.

2.2.2. Augmented reality

Augmented reality is a term used to describe the merging of the real and virtual worlds, creating the impression that there is no longer a boundary between them (Arifitama & Permana, 2015). Augmented reality is an interactive technology that combines the real and virtual worlds, allowing for the seamless delivery of information to users (Ramadhan et al., 2021). Based on the definitions above, augmented reality can be understood as an interactive technology that merges the real world with the virtual world, creating a seamless integration between the two.

2.2.3. Alphabet Letter

Alphabet is a learning process that introduces children to the basic letters (Faris & Lestari, 2016). Alphabet serves as a foundation for children to develop reading and writing skills. It is divided into two forms: vowel letters, which are the living letters such as A, I, U, E, O, and consonant letters, which are the non-vocal letters such as B, C, D, F, G, H, J, K, L, M, N, P, Q, R, S, T, V, W, X, Y, Z (Chabibbah & Kaulam, 2014). Therefore, the alphabet can be understood as the essential learning of reading and writing skills, consisting of two types of letters: vowel letters, which are living letters, and consonant letters, which are non-vocal letters.

3. RESULT AND DISCUSSION

Based on the project framework in Figure 1, this section discusses the system of the "My Alphabet" application, hardware markers, 3D objects, analysis, design, implementation, and testing of the educational media application for 1st-grade elementary school students, namely the "My Alphabet" application.

3.1. Application system “My Alphabet”

To understand the "My Alphabet" application system, it is necessary to depict the process or instructions to facilitate its use by users. Therefore, the method or instructions of this application are illustrated through a flowchart and use case diagram. The following is an overview of these depictions.

3.1.1. Flowchart

To illustrate the process or sequence of instructions in Augmented Reality learning media is depicted using the following flowchart in **Figure 3.**

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3.1.2. Use case diagram

An actor is a system that plays a role in providing or obtaining information from other systems. Actors in the "My Alphabet" application include elementary school students, parents, and teachers. The system in this application starts by opening the "start" event. Then, there are six events: opening the material feature, Augmented Reality (AR), credits, user instructions, about, and home. The interaction between the user and the learning media application system is represented using a use case diagram shown in **Figure 4.**

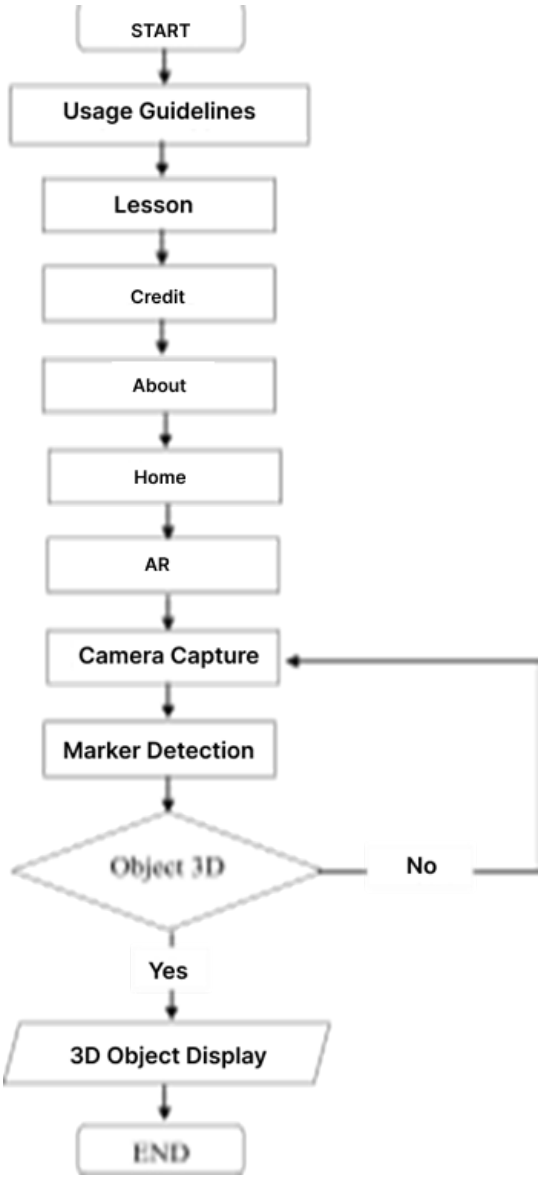

Figure 3. Flowchart AR “My Alphabet”.

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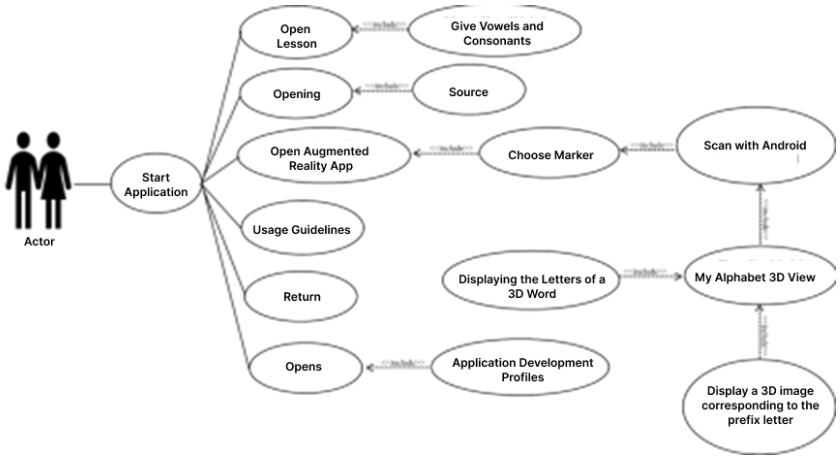

Figure 4. Use case "My Alphabet" application.

3.2. Software Design

The "My Alphabet" application is designed for Android users with a 1080 x 1350 pixels portrait resolution. This application consists of a total of 15 pages, including 1 home page, 1 menu page, 6 pages for learning materials, 1 page for AR scanning, 1 page for credits, 1 page with user instructions, and 1 page for the about section, which contains the developer profile of Multireality Group 3. **Figure 5** are Initial view of the application design created by Unity.

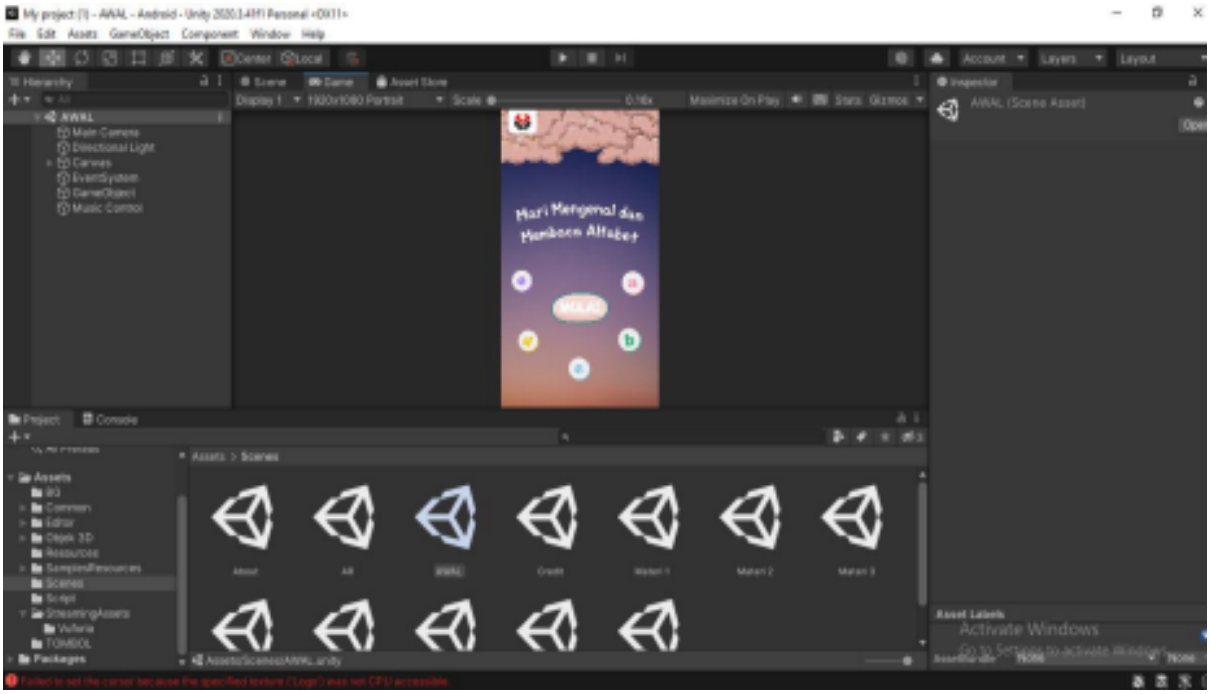

Figure 5. The initial view of the application in Unity.

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Then, **Figure 6** is the display design of the main menu feature on the "My Alphabet" application that will be implemented; this display is loaded in Unity.

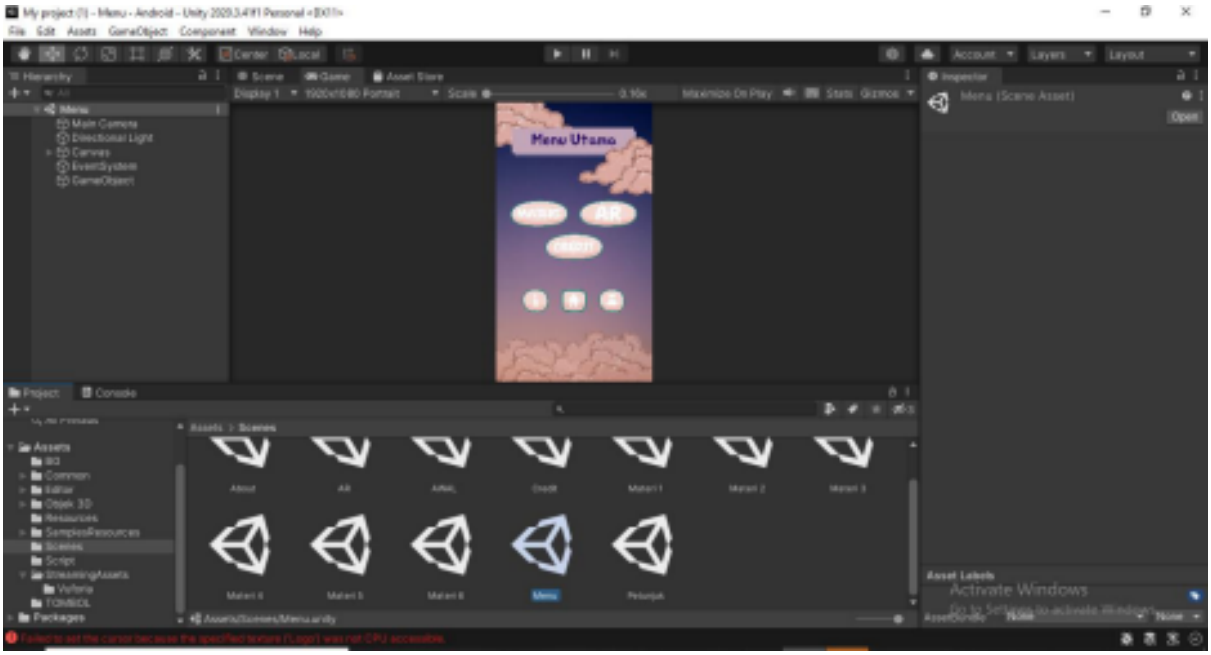
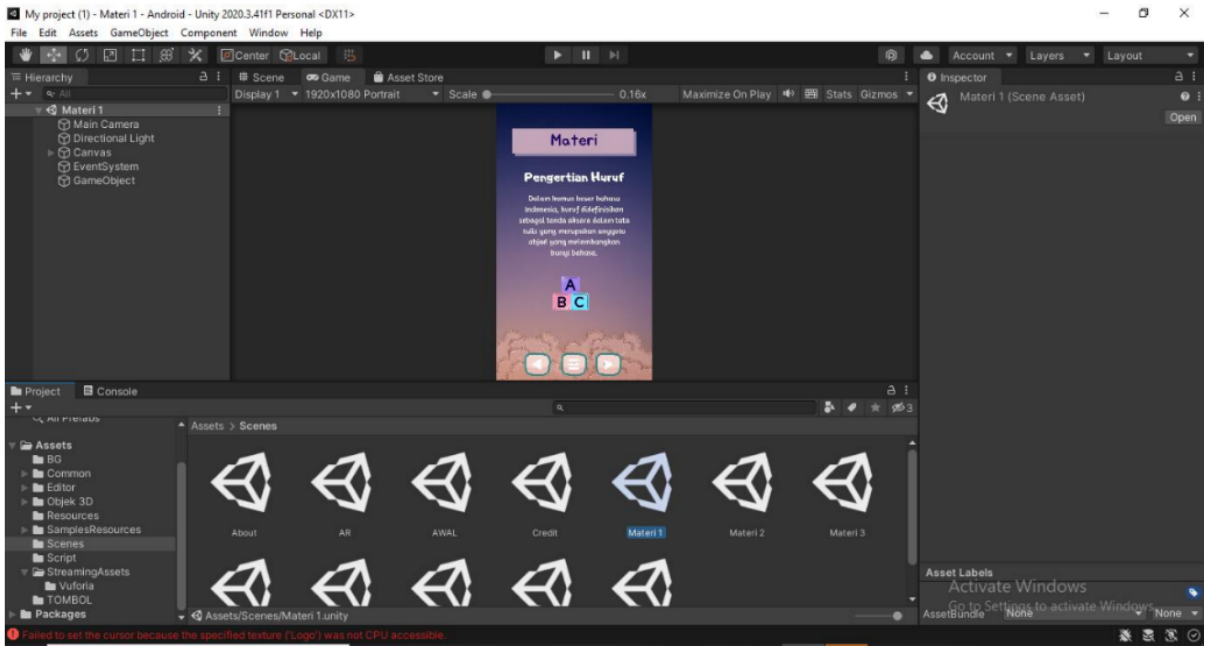


Figure 6. Application menu display in Unity.

Then, **Figure 7** is the display design of one of the main features in the "My Alphabet" application that will be implemented, namely the feature that displays material about the meaning of letters; this display is loaded in Unity.



Gambar 7. Material display 1 (meaning of letters)

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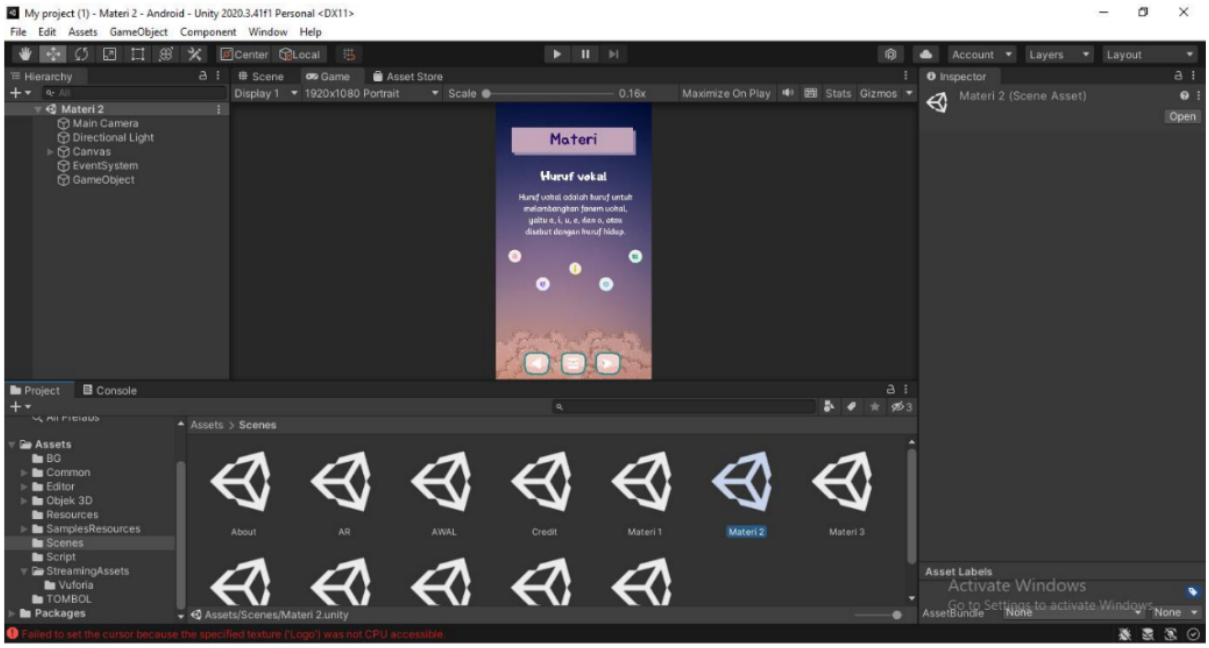
Then, **Figure 8** is the display design of one of the second main features in the "My Alphabet" application that will be implemented, namely the feature that displays material about the meaning of local letters; this display is loaded in Unity.



Gambar 8. Material display 2 (meaning of vowels)

Then, **Figure 9** is the display design of one of the three main features in the "My Alphabet" application that will be implemented, namely the feature that displays material about various local letters; this display is loaded in Unity.

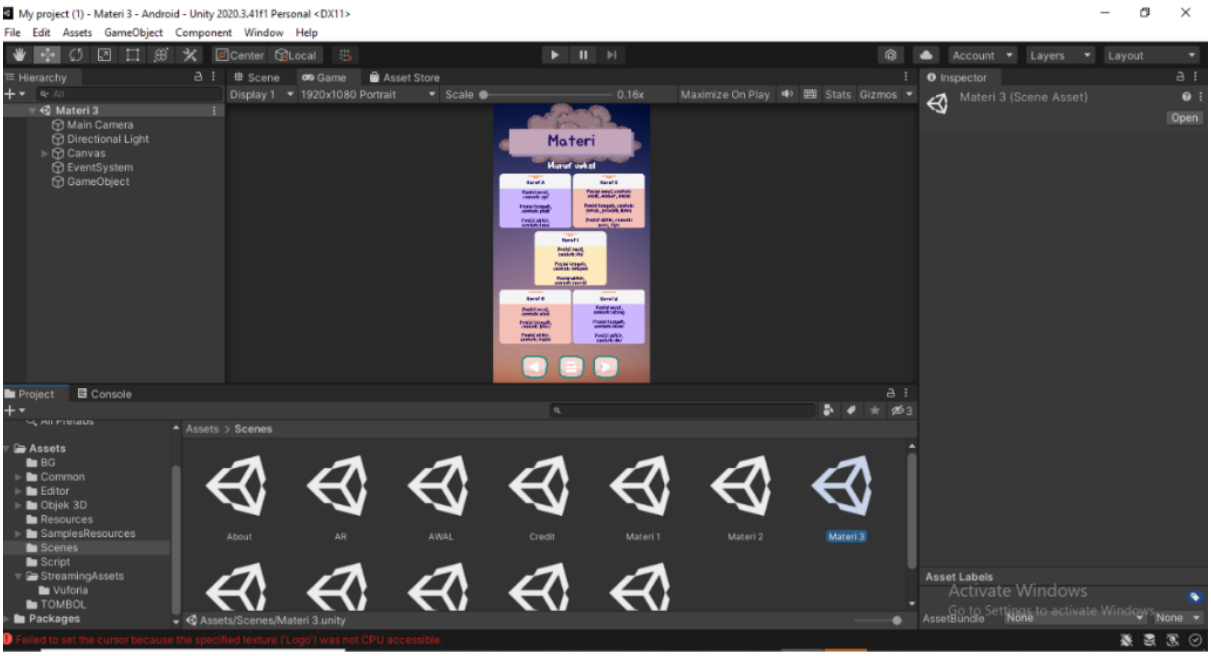


Figure 9. Material display 3 (various kinds of vowels)

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Next, the design in **Figure 10** is the display design of one of the four main features in the "My Alphabet" application that will be implemented, namely the feature that displays material about the understanding of consonant letters; this display is loaded in Unity.

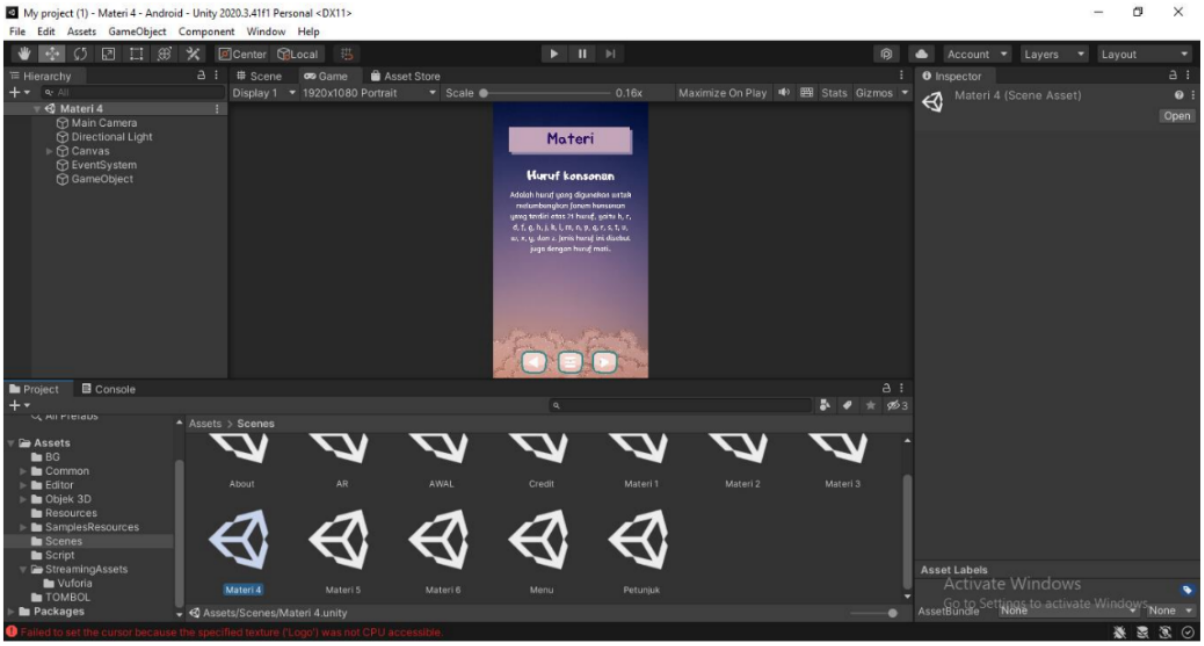

Figure 10. Material display 4 (meaning of vowels)

Next, the design in **Figure 11** is the display design of one of the five main features in the "My Alphabet" application that will be implemented, namely the feature that displays material about the use of consonant letters in everyday life; this display is loaded in Unity.

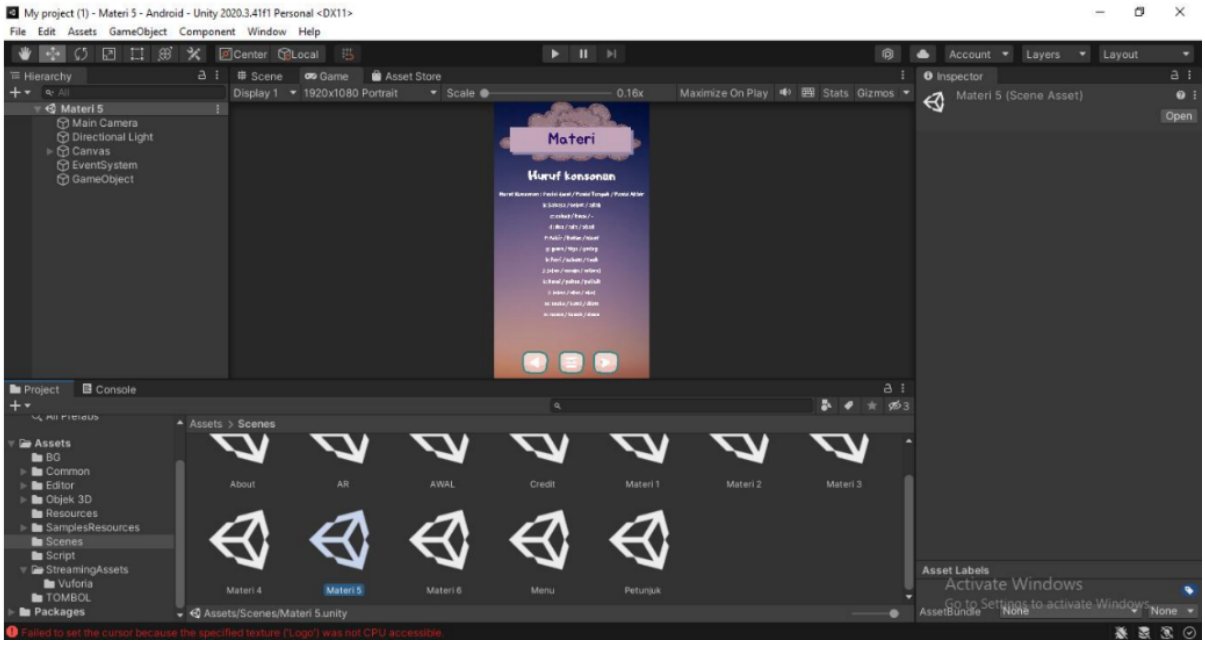

Figure 11. Material display 5 (examples of the use of consonants)

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3.3. Implementation

This application is implemented or used exclusively on Android devices. If installed on a different device, it will not be used or cannot be installed. For the implementation of this product, it was tested using Android version 12 with a screen size of 6.5 inches and a resolution of 1080 x 2400.

The "My Alphabet" app on Android is represented by a file view, as shown in **Figure 13**, which includes its size description and the .apk extension. This file view provides a comprehensive overview of the app's installation package. By examining the size description, users can gauge the amount of storage space required to install the app on their Android devices. The .apk extension signifies that the file is in the Android Package format, the standard format for distributing and installing Android applications. This file view is crucial for users who want to download, install, and manage the "My Alphabet" app on their Android devices efficiently.

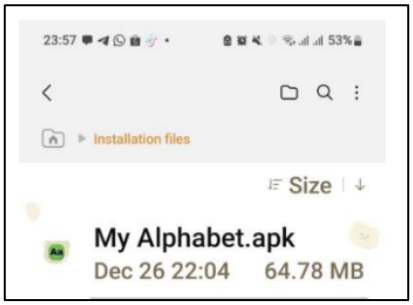

Figure 13. View of the "My Alphabet" application file on Android.

Figure 14 displays the "My Alphabet" application installed on an Android device. This screenshot captures the app's user interface, showcasing its presence on the smartphone's home screen or app drawer. The figure represents the visual confirmation that the "My Alphabet" app has successfully been installed and is ready for use on the user's handheld device.

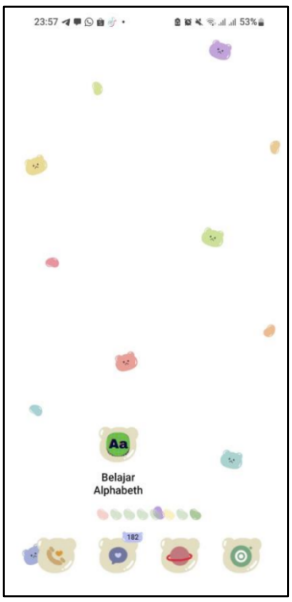

Figure 14. Display the "My Alphabet" application file that has been installed on Android.

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3.4. Evaluation

The developers conducted black box testing on the My Alphabet application using an Android device in the development environment to ensure its smooth operation and minimal errors. Black box testing, which focuses on observing the outcomes of executing the application, was employed. The testing results, as represented in the table, provide valuable insights into the application's performance and functionality, helping the developers identify any issues that need to be addressed before the final release. By conducting thorough testing, the developers can ensure that the My Alphabet application delivers a seamless and error-free user experience on Android devices.

Table 1. API clarification results table.

Test Case	Expected result	Obtained Result	Info
Application Installation	Successfully installed and running well on Android OS 7.0 and above.	Successfully installed on the test device with the Android 12 operating system.	Valid
Application Interface	The application appears according to the size of the installed device.	It runs successfully on smartphones with a 16:9 aspect ratio screen and installs successfully on devices with a 6-inch screen, indicating that the application is responsive.	Valid
Main menu button	The buttons on the menu function properly by directing to the intended pages.	Successfully navigates to the corresponding pages.	Valid
Alphabet letter markers.	The marker is detected and displays augmented reality (AR) content according to the scanned marker using a smartphone.	AR content is successfully displayed according to the scanned marker. Markers that are not scanned do not appear.	Valid
Exit the application	Successfully exited the application	The testing went well.	Valid

4. CONCLUSION

Based on the development of the My Alphabet application, it can be concluded that the Android application based on Augmented Reality for alphabet recognition is in accordance with its design and analysis. The My Alphabet application can assist primary school students, especially first-grade students, in learning and memorising the alphabet. This application provides a realistic virtual experience in the real world by visualising three-dimensional objects that can be interacted with, such as sliding and rotating, so that all sides can be seen.

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The interactive presentation of learning materials will make students more interested and enthusiastic about learning, which can impact their understanding abilities.

The developers tested the My Alphabet application using the black box method on an Android device. The testing resulted in the following findings: the My Alphabet application successfully operated according to the planned specifications set by the developers. The application was successfully installed on Android OS 7.0 and appeared correctly on devices with varying screen sizes. The buttons within the application functioned as intended, allowing users to navigate through the app seamlessly. The marker detection feature accurately displayed the corresponding Augmented Reality (AR) content, and the exit button performed well, allowing users to exit the application smoothly.

5. AUTHORS' NOTE

The author declares that there is no conflict of interest regarding the publication of this article. The author confirms that this paper is free from plagiarism.

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