An Educational Mobile Application for Writing Letters, Words, and Punctuation Marks According to PUEBI (General Guidelines for Indonesian Spelling)

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Abstract

Indonesian is a compulsory subject for every student in Indonesia. One of skills that must be possessed in learning Indonesian is writing. In writing, there are various basic rules, to overcome errors in writing, PUEBI is used. In education, technology and information are used as learning media. The game type application can be used as a learning tool with the concept of playing while learning, which is a quiz game model or augmented reality. This research aims to develop an educational mobile application with a theme of writing letters, words, and punctuation marks according to PUEBI. The research method used is research and development methods. The research uses a development model with the Software Development Life Cycle Waterfall method. The application was developed using Unity software and the Vuforia Augmented Reality SDK. In the application, there are 3 menus: Menu Materi, Menu Kuis, and Menu Teks & AR. On the Menu Materi there are learning materials about PUEBI, on the Menu Kuis there are questions and quiz discussions, and on the Menu Teks & AR, there are general knowledge texts, PUEBI discussions, and the augmented reality feature that brings up 3D objects to visualize objects from the text. Based on the results of questionnaire testing from 30 respondents, more than 70% answered "Agree" that the application can improve user understanding of writing Indonesian spelling according to PUEBI.

1. Introduction

Indonesian is a compulsory subject for every student in Indonesia (Nurhasanah, 2017). One of the language skills in learning Indonesian is writing. Writing means pouring ideas into a written form or telling something to others through writing. Writing can be interpreted as an expression of someone's feelings that are told through writing (Dalman, 2013). In other words, through writing, we can communicate with other people indirectly (Pranoto, 2004). Writing is a very complex activity compared to the other three skills, such as listening, speaking, and reading. In writing, there are various basic rules that must be understood and applied

so that a piece of writing can be understood by readers (Iskandarwassid and Sunendar, 2011). To overcome errors in writing, PUEBI is used.

General Guidelines for Indonesian Spelling (PUEBI) are the Indonesian grammar system, which is outlined in the Regulation of the Minister of Education and Culture Number 50 of 2015. The contents of PUEBI contain rules for using letters, writing words, using punctuation marks, and writing absorption elements. Among the contents of PUEBI are the writing of letters, words, and punctuation marks. Letters are script marks in writing which are members of the alphabet that symbolize the sound of the language (KBBI), words are elements of language that are spoken or written as embodiments of feelings and thoughts used in language (KBBI), and punctuation marks plays a role to show structure, intonation, and pause a piece of writing while reading (KBBI).

Factors that cause Indonesian spelling errors include internal and external factors. Internal factors include low interest and motivation to study or read, while external factors include inadequate infrastructure and lack of understanding of language (Nurjanah, et al., 2014). Advances in technology such as gadgets and computers, on the one hand, bring benefits, but on the other hand, they can have a negative impact on children's development. Long time playing games or smartphones is something that needs to be watched out for because it can distance a person from reading or studying activities (Prasetyono, 2008). Based on the Programme for International Student Assessment (PISA) report in 2019, the reading score of the Indonesian people is ranked 72 out of 77 countries. This can happen because children at home tend not to have reading books to read so children prefer to do other activities (Sari, 2018).

Writing errors are still very common, not only among children or students but also occur in college students and adults. According to the results of Sukmawaty's research (2017), the thesis compiled by STMIK Kharisma Makassar students has errors related to the correct preparation of Indonesian grammar, which can cause miscommunication such as ideas not being absorbed properly by readers. According to the research results of Tamara, et al. (2020), there are still many writing errors on social media, for example, punctuation marks errors on the official Ahmad Dahlan University social media account, this can be caused by the habit of writing without paying attention to the basic rules of correct writing. According to the results of Silalahi's research (2020), several factors for the occurrence of writing errors are due to the rules for writing Indonesian spelling only used as a complement and just to know, lack of interest in reading, lack of access to reading materials, and lack of information regarding writing Indonesian spelling.

Today's technology has become a tool to help human life. One of them is smart handheld device technology or smartphone. Currently, various groups and ages have used smartphones to help facilitate daily activities. There are many features that can be done using a smartphone, such as chatting or sending text messages. One of the common problems that smartphone users have when sending messages is the incorrect spelling in Indonesian so that when the message is received by the reader or interlocutor it can be interpreted differently. In the current era, letters, words, and punctuation marks are not only used in writing reading materials. However, there are also various writings such as e-mail in the form of electronic mail, on social media in the form of comments, and on messaging applications in the form of text messages.

Advances in technology and information provide changes in various fields. In the field of education, technology and information are used as learning media because they are considered to provide convenience in terms of time, effort, and cost efficiency. With the development of technology, various types of applications have emerged with educational themes, both in writing and visually. Applications of game-types can be used as a means of learning media with the concept of playing while learning, one of which is the quiz game model or augmented reality. According to Mustaqim (2019), augmented reality (AR) is a technology that combines the real world and the virtual world into two or three dimensions simultaneously. Augmented reality technology can be used to replace tools, media, objects, or modules which are quite expensive, users can still do learning by seeing or using objects as they really are, but this time in virtual form. With augmented reality, it can be used as an alternative learning media and it is hoped that learning activities can be more attractive to users.

Access to reading materials and awareness of the importance of speaking properly and correctly in Indonesian society is still very minimal. From the review that has been done by researcher, the number of innovations in developing learning media applications with the theme of learn Indonesian spelling according to PUEBI is very limited. Like the applications available on the Google Play Store market, there are only a few applications with the theme of learn Indonesian spelling according to PUEBI, offering learning material about PUEBI in their applications. Learning media using mobile devices will be more efficient because it can be done anywhere and anytime so that learning objectives are easier to achieve. With the development of this application, it is hoped that it can help users improve their understanding of writing Indonesian spelling according to PUEBI.

Based on the background above, the researcher will develop an application with an educational theme regarding writing letters, words, and punctuation marks according to PUEBI with the title "An Educational Mobile Application for Writing Letters, Words, and Punctuation Marks According to PUEBI".

1.1 Literature Review

Previous research contains research in the form of journals, thesis, or final project that are used by researcher as a writing reference, theoretical basis, or application development ideas. The following is a list of research used by researcher:These questions are: which aspects should I include in a literature review?; how should I go about synthesizing information in a literature review?; how should I structure a literature review? what writing style should I use when compiling a literature review?

1. Study 1:

Table 1. Previous Research 1

Title	Aplikasi Augmented Reality Untuk Pembelajaran Bahasa Inggris Pada Anak Sekolah Dasar (Augmented Reality Application for Learning English in Elementary School Children)
Writer	Mohammad Fitra Mokodompit
College	Fakultas Teknik, Universitas Sam Ratulangi Manado
Year	2021
Brief Description	This study aims to design and develop an augmented reality application for learning English in elementary school children. Learning English is felt to be very necessary and important for children, considering that in the current era English is a second language for learning besides the mother tongue. Technology is developing rapidly, one of which is augmented reality technology which can allow users to see real 3D objects using a smartphone. Researcher designed an English learning application using augmented reality technology with smartphone media that provides information and a 3D appearance of the object being discussed. With the hope that children can do English learning with more interesting media.

Application Display	

Fig 1. Display of AR English Application

2. Study 2:

Table 2. Previous Research 2

Title	Implementasi Augmented Reality (AR) Pada Aplikasi Kosa Kata Peralatan Rumah Tangga Dalam Bahasa Inggris Untuk Anak Usia Dini Berbasis Android (Implementation of Augmented Reality (AR) in Housewares Vocabulary Applications in English for Early Childhood Android-Based)
Writer	Imam Fakhri Jundi
College	Fakultas Ilmu Komputer dan Teknologi Informasi, Universitas Sumatera Utara Medan
Year	2017
Brief Description	This study aims to design and develop an Android-based housewares appliance vocabulary application in English. With the development of technology, one of the technologies in terms of graphic computing is augmented reality (AR). Researcher develop applications with learning methods using flash cards. The HEVA (Housewares English Vocabulary Application) application was developed by utilizing augmented reality technology and learning methods using flash cards by presenting English vocabulary learning materials Android-based for early childhood, in augmented reality implementing Marker-Based Augmented Reality technology the flash card method used as markers.

Application Display	  *Fig 2. Display of AR English Application*

1.1.2 Related Theory

Related theories contain theories or concepts that are closely related to problems in the research conducted. It functions as foundation of thinking in solving research problems.

1.1.2.1 Educational Applications

Educational applications or games are types of applications designed to assist the learning process because they relate to the field of education. The application created contains tools, rules, and challenges to educate users about learning material (Rachman, 2017). It can be concluded, educational applications or games are application that were created to help learning media because the application does not only function as a game, but also contains learning material. Educational applications or games can also be used for online or distance learning. Some classes include discussions around learning that aim to improve social relations between users (Novak, 2012).

According to Griffith in (Rachman, 2017) some of the benefits of educational applications or games include:

1. Applications or games can provide new experiences and challenges that can increase enthusiasm for learning.
2. Applications or games provide knowledge to users with the latest technology.
3. Applications or games can help knowledge of skills in the field of technology, especially in the field of computers.
4. Applications or games can be used as simulations.
5. Applications or games can provide entertainment so that learning is not boring.

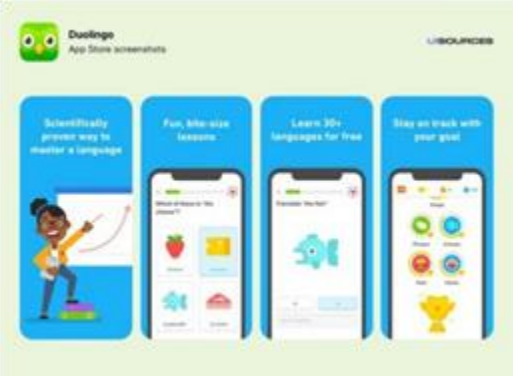

Fig 3. Duolingo Education Application

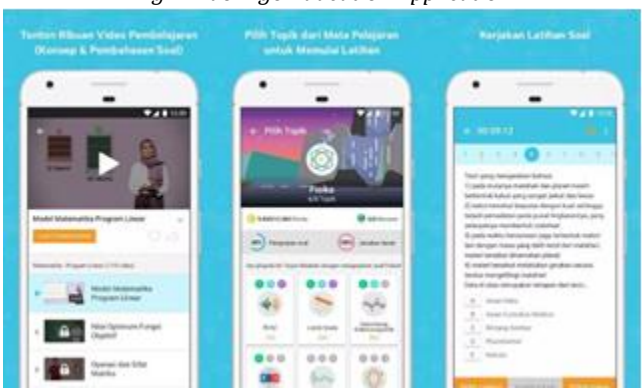

Fig 4. Ruangguru Education Application

1.1.2.2 General Guidelines for Indonesian Spelling (PUEBI)

According to Ariyanti (2019), General Guidelines for Indonesian Spelling (PUEBI) are descriptions of the sounds of a language (words, phrases, sentences, and others) with rules that must be followed by language users for regularity and uniformity of form, especially in terms of writing. In language, especially writing, users must pay attention to the use of letters, writing words, and the use of punctuation marks. From the explanation above, it can be concluded that PUEBI is a rule in a language that must be used by it's users for uniformity in language.

PUEBI (General Guidelines for Indonesian Spelling) consists of:

- Pemakaian Huruf (Use of Letters)
  1. Huruf Abjad (Alphabet Letters)
  2. Huruf Vokal (Vowel)
  3. Huruf Konsonan (Consonant Letters)
  4. Huruf Diftong (Diphthong Letters)
  5. Gabungan Huruf Konsonan (Combination of Consonants)
  6. Huruf Kapital (Capital Letters)
  7. Huruf Miring (Italic Letters)
  8. Huruf Tebal (Bold Letters)
- Penulisan Kata (Writing Words)
  1. Kata Dasar (Basic Words)
  2. Kata Berimbuhan (Affix Word)
  3. Bentuk Ulang (Reshape)
  4. Gabungan Kata (Word Combination)
  5. Pemenggalan Kata (Word Fragment)

6. Kata Depan (Preposition)
7. Partikel (Particle)
8. Singkatan dan Akronim (Abbreviations and Acronyms)
9. Angka dan Bilangan (Number)
10. Kata Ganti (Pronouns)
11. Kata Sandang (Article)

- Pemakaian Tanda Baca (Use of Punctuation Marks)
  1. Tanda Titik (.) (Full Stop/Period)
  2. Tanda Koma (,) (Comma)
  3. Tanda Titik Koma (;) (Semicolon)
  4. Tanda Titik Dua (:) (Colon)
  5. Tanda Hubung (-) (Hyphen)
  6. Tanda Pisah (—) (Dash)
  7. Tanda Tanya (?) (Question Mark)
  8. Tanda Seru (!) (Exclamation Mark)
  9. Tanda Elipsis (…) (Ellipsis Mark)
  10. Tanda Petik ("…") (Double Quotation Mark)
  11. Tanda Petik Tunggal ('…') (Single Quotation Mark)
  12. Tanda Kurung ((…)) (Round Bracket)
  13. Tanda Kurung Siku ([…]) (Square Bracket)
  14. Tanda Garis Miring (/) (Slash)
  15. Tanda Penyingkat (') (Apostrophe)
- Penulisan Unsur Serapan (Writing Absorption Element)

2. Research Methods

2.1 Materials and Research Tools

Materials and research tools used are as follows:

a. Hardware
   1. ASUS X550VX Laptop (8GB RAM)
   2. Xiaomi Redmi Note 4 (4GB RAM)

b. Software
   1. Unity 2019
   2. Vuforia Augmented Reality SDK
   3. CorelDRAW X7
   4. Blender
   5. Visual Studio 2019
   6. Figma

c. Operating System
   1. Windows 10 64-bit
   2. Android 7.0 Nougat

2.2 Data Collection

The data collection technique used is as follows:

1. Questionnaire

The questionnaire was carried out by submitting a list of questions to the respondents who were asked by the researcher, which after being filled in, were sent back to the researcher. Questionnaire testing was conducted to determine the feasibility level of the application. Questionnaires were distributed to a number of students, college students, employees, and others.

2. Interview

Interviews were conducted to find out more in-depth information by asking questions directly to the respondent. Interviews were conducted to find problems and potentials that could be researched, as well as to find out the responses of respondents to the applications being developed. Interviews were conducted with a number of students, college students, employees, and others.

2.3 Research Procedure

The research procedure uses a development model with the Software Development Life Cycle Waterfall method. The stages are as follows:

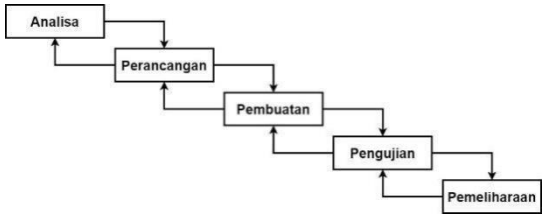

Fig 5. SDLC Waterfall Stages

1. Analysis Stage

   In the analysis stage, communication is needed to understand application user expectations and application limitations. Information can be collected through in-person interviews, discussions, or questionnaires. The information is analyzed to obtain the required data.

2. Design Stage

   At the design stage, the developer makes an application design which includes the application system flow design to be developed, the features of the application to be developed, and the application interface design to be developed.

3. Development Stage

   At the development stage, developers develop applications based on designs that have been made before. Developers develop applications using Unity and Vuforia Augmented Reality SDK software to display 3D objects using augmented reality.

4. Testing Stage

   In the testing phase, the developer tests the application in several ways, such as running the application on several devices and testing all the application features, and repairing if an error occurs in the application. In the final stage of testing, the developer perform testing with the Black Box method and questionnaire testing.

5. Maintenance Stage

   At the maintenance stage, applications that have been developed will be carried out maintenance, such as fixing bugs that have not been found before.

3. Result and Discussion

3.1 Problem Identification

The problem identification of this research is as follows:

1. A person's lack of interest, motivation, and access to learning Indonesian spelling according to PUEBI.
2. The learning media used still uses supporting textbooks from schools.
3. Everyone actively uses a smartphone that is used in daily life.

3.2 Problem Solving

The problem-solving of this research is as follows:

1. Learning motivation can be increased by using fun learning media such as applications or games.
2. Learning motivation can be increased by using fun learning media such as gamification in the form of quiz game applications and augmented reality technology.
3. The current generation is very active in using technology and quickly obtaining information through digital media, so learning media is needed that utilizes technology.

3.3 System Design

In system design, the researcher describes the system design to be built using flowcharts and use case diagrams.

a. Flowchart

On the Menu Utama (Main Menu), there are 3 buttons, namely: the Menu Mulai (Start Menu) button to enter the learning material, quizzes, and text & AR; the Menu Info (Info Menu) button to enter the information section about the application, information about the developer, and how to use the application; and the Keluar (Exit) button to exit the application. The following is the application flowchart:

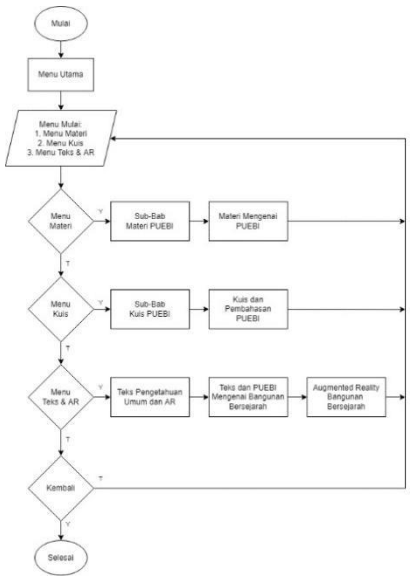

Fig 6. Menu Mulai (Start Menu) Flowchart

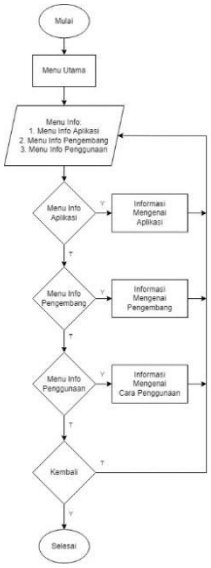

Fig 7. Menu Info (Info Menu) Flowchart

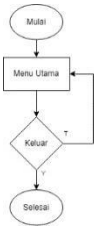

Fig 8. Keluar (Exit) Flowchart

b. Use Case Diagram

In the application, users can do 4 main things, namely: reading learning material about PUEBI, working on quizzes and discussions about PUEBI, reading general knowledge texts and discussing PUEBI, and viewing 3D objects using augmented reality.

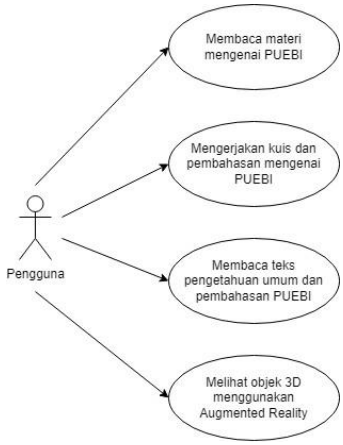

Fig 9. Use Case Diagram

3.4 Product Specifications

The product specifications developed are as follows:

Table 3. Application Specifications

Specifications	Description
Operating system	Android
Minimum version	Android 5.0 Lollipop
Minimum RAM	1 GB
Permissions	Camera
Application size	76 MB
Install	121 MB
Screen resolution	1920x1080 pixels, 16:9 aspect ratio

3.5 User Interface

The user interface section displays the page views contained in the application being developed.

1. Interface Splash Screen

When the "Swanify" application is run, a Splash Screen display will appear from the application, the Splash Screen display application has a blue background with the words "Swanify" as the name of the application. Here is the Splash Screen display:

Fig 10. Display Splash Screen

2. Menu Utama (Main Menu) Interface

After the Splash Screen, the Menu Utama (Main Menu) page will appear. On the Menu Utama (Main Menu) page, there are 3 buttons, namely: the Menu Mulai (Start Menu) button to enter the learning materials, quizzes, and text & AR; the Menu Info (Info Menu) button to enter the information section about the application, information about the developer, and Cara Penggunaan (How to Use) the application; and the Keluar (Exit) button to exit the application. Here is how the Menu Utama (Main Menu) page looks:

Fig 11. Display of the Menu Utama (Main Menu) Page

3. Menu Mulai (Start Menu) Interface

On the Menu Mulai (Start Menu) page, there are 4 buttons, namely: Menu Materi (Learning Material Menu) button to enter the Indonesian spelling writing learning material section; Menu Kuis (Quiz Menu) button to enter the question and discussion section of the Indonesian spelling writing quiz; Menu Teks & AR (Menu Teks & AR (Text & AR Menu)) button to enter general knowledge text section, discussion of PUEBI and Augmented Reality features; and Kembali (Back) button to return to the Menu Utama (Main Menu) page. Here is what the Menu Mulai (Start Menu) page looks like:

Fig 12. Display of the Menu Mulai (Start Menu) Page

4. Menu Materi (Learning Material Menu) Interface

On the Menu Materi (Learning Material Menu) page, there are 10 buttons namely: Materi Huruf Kapital (Capital Letters Learning Material) button, Materi Huruf Miring (Italic Letters Learning Material) button, Materi Huruf Tebal (Bold Letters Learning Material) button, Materi Kata Depan (Preposition Learning Material) button, Materi Partikel (Particle Learning Material) button, Materi Kata Ganti (Pronoun Learning Material) button, Materi Tanda Titik (Full Stop/Period Learning Material) button, Materi Tanda Koma (Comma Learning Material) button, Materi Tanda Hubung (Hyphen Learning Material), and the Kembali (Back) button to return to the Menu Mulai (Start Menu) page. The following is the display of the Menu Materi (Learning Material Menu) page:

Fig 13. Display of the Menu Materi (Learning Material Menu) Page

There is learning material, the yellow button is to return to the learning material that was previously explained and the green button is to continue to the learning material that will be explained next.

Fig 14. Learning Material Page Display

5. Menu Materi (Learning Material Menu) Interface

On the Menu Kuis (Quiz Menu) page, there are 10 buttons, namely: Kuis Huruf Kapital (Capital Letters Quiz) button, Kuis Huruf Miring (Italic Letters Quiz) button, Kuis Huruf Tebal (Bold Letters Quiz) button, Kuis Kata Depan (Preposition Quiz) button, Kuis Partikel (Particle Quiz) button, Kuis Kata Ganti (Pronoun Quiz) button, Kuis Tanda Titik (Full Stop/Period Quiz) button, Kuis Tanda Koma (Comma Quiz) button, Kuis Tanda Hubung (Hyphen Quiz), and the Kembali (Back) button to return to the Menu Mulai (Start Menu) page.Here is what the Menu Kuis (Quiz Menu) page looks like:

Fig 15. Display of the Menu Kuis (Quiz Menu) Page

There are quiz questions and discussions according to PUEBI, question position numbers and quiz discussions being worked on, 2 or 4 options for answering quiz questions, and scores obtained from answering quiz questions.

Fig 16. Display of Quiz Question Page

Fig 17. Display of the Quiz Discussion Page

Fig 18. Display of the Quiz Score Page

6. Menu Teks & AR (Text & AR Menu) Interface

On the Menu Teks & AR (Text & AR Menu) page, there are 4 buttons, namely: the Teks & AR Piramida Mesir (Egyptian Pyramids Text & AR) button to enter the text section and the Egyptian Pyramids augmented reality. Teks & AR Menara Eiffel (Eiffel Tower Text & AR) button to enter the text section and Eiffel Tower augmented reality. Teks & AR Koloseum (Colosseum Text & AR) button to enter the text and augmented reality sections of the Colosseum. And the Kembali (Back) button to return to the Menu Mulai (Start Menu) page. Here's what the Menu Teks & AR (Text & AR Menu) page looks like:

Fig 19. Display of Menu Teks & AR (Text & AR Menu) Page

There is a general knowledge text about historical buildings, a discussion of PUEBI from the text, and an AR button to enter the AR feature which displays 3D objects from the text.

Fig 20. Display of General Knowledge Text Page

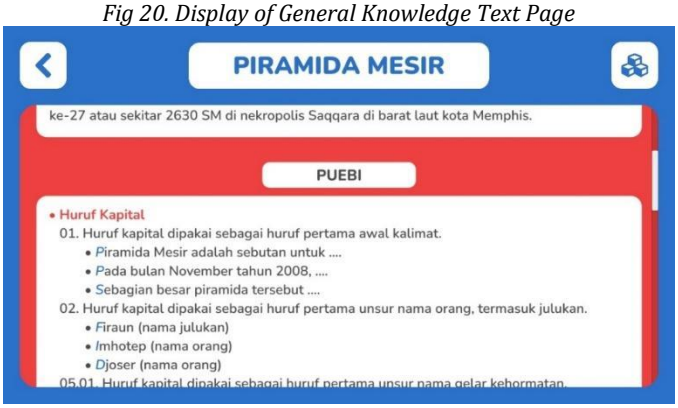

Fig 21. Display of the PUEBI Discussion Text Page

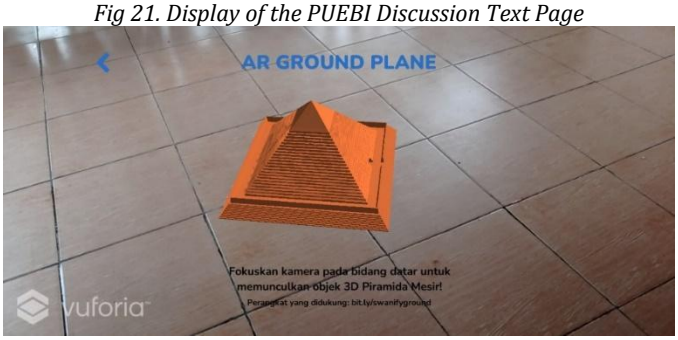

Fig 22. Augmented Reality Page Display

7. Menu Info (Info Menu) Interface

On the Menu Info (Info Menu), there are 4 buttons, namely: the Tentang Aplikasi (About Application) button to enter the information section about the application. Tentang Pengembang (About Developer) button to enter the information section about the developer. Cara Penggunaan (How to Use) button to enter the information section on how to use the application. And the Kembali (Back) button to return to the Menu Utama (Main Menu) page. Here is the Menu Info (Info Menu) view:

Fig 23. Menu Info (Info Menu) Page Display

Fig 24. Display of the Info Tentang Aplikasi (About Application) page

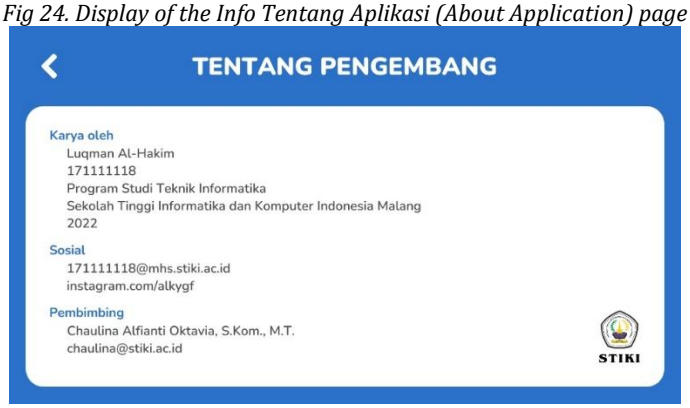

Fig 25. Display of the Info Tentang Pengembang (About Developer) page

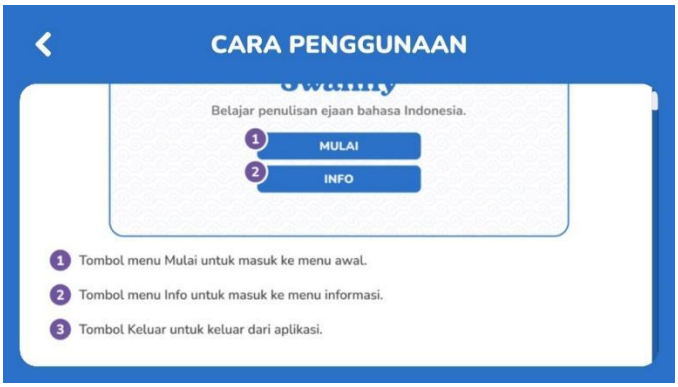

Fig 26. Display of the Info Cara Penggunaan (How to Use) Page

3.6 Application Testing

Black Box testing is used to test the input and output of applications that have been developed. The following table tests were performed:

Table 4. Black Box Testing

No	Page	Testing	Result
1	Splash Screen	Pages can be displayed	Successfully
2	Menu Utama (Main Menu)	Pages can appear and buttons can work	Successfully
3	Menu Mulai (Start Menu)	Pages can appear and buttons can work	Successfully
4	Menu Materi (Learning Material Menu)	Pages can appear and buttons can work	Successfully
5	PUEBI Learning Material	Pages can appear, buttons can work, and audio can play	Successfully
6	Menu Kuis (Quiz Menu)	Pages can appear and buttons can work	Successfully
7	PUEBI Quiz	Pages can appear, buttons can work, and audio can play	Successfully
8	Menu Teks & AR (Text & AR Menu)	Pages can appear and buttons can work	Successfully
9	General Knowledge Text	Pages can appear, buttons can work, and audio can play	Successfully
10	Augmented Reality	Pages can appear, buttons can work, and AR Objects can appear	Successfully
11	Menu Info (Info Menu)	Pages can appear and buttons can work	Successfully
12	Info Tentang Aplikasi (About Application)	Pages can appear and buttons can work	Successfully
13	Info Tentang Pengembang (About Developer)	Pages can appear and buttons can work	Successfully

3.7 Questionnaire Testing

Testing through a questionnaire is used to find out whether the application can run properly and provide benefits for users in learning Indonesian spelling writing. The number of respondents to test the application on the questionnaire was 30 people. The following are the results of the questionnaire:

1. Does the learning material help to understand Indonesian spelling writing

To the question "Does the learning material in the application help you to better understand Indonesian spelling writing?", 73.3% of 30 respondents answered "Strongly Agree" and 26.7% answered "Agree". Here's the graph:

Fig 27. Questionnaire Graph 1

2. Do the quiz questions and discussion help to understand Indonesian spelling writing

On the question "Do the quiz questions and discussions on the application help you to better understand Indonesian spelling writing?", 63.3% of 30 respondents answered "Strongly Agree" and 36.7% answered "Agree". Here's the graph:

Fig 28. Questionnaire Graph 2

3. Does the Augmented Reality feature help visualize objects

On the question "Can the Augmented Reality feature in the application help you to visualize objects discussed in the text?", 60% of 30 respondents answered "Strongly Agree", 30% answered "Agree", and 10% answered "Disagree". Here's the graph:

Fig 29. Questionnaire Graph 3

4. Conclusions

4.1 Conclusions

Based on the results of the research that has been conducted by researcher, it can be concluded:

1. This research has succeeded in developing an educational mobile application for writing letters, words, and punctuation marks according to PUEBI.
2. This research has succeeded in developing an application with the Augmented Reality feature using the Markerless Ground Plane method, with a minimum Android version 5.0 (Lollipop) to run the application.
3. This research has succeeded in developing educational application that can increase user understanding of Indonesian spelling writing according to PUEBI. Based on the results of testing the questionnaire from 30 respondents, more than 70% answered "Agree" that the application can help to better understand Indonesian spelling writing.

4.2 Suggestions

The following are suggestions that the researcher wants to convey to those who will develop research results in the future, namely:

1. In future research, it is hoped that the letters, words, and punctuation marks sub-chapters can be added according to PUEBI so that the learning material and quiz sub-chapters are more complete.
2. In future research, it is expected that graphic images (animations/comics) can be added to the learning material so that the presentation of the learning material becomes more interesting.
3. In future research, it is expected that different quiz game models can be added to quizzes so that the quiz models become varied.
4. In future research, it is hoped that the application can be developed on the iOS operating system so that users are not limited to Android users.

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