EDUMASPUL
JURNAL PENDIDIKAN
Vol. 6 – No. 2, year (2022), page 1839-1849
| ISSN 2548-8201 (Print) | 2580-0469) (Online) |

Development of English Learning Media for Elementary School Students Assisted Augmented Reality Technology Based Android

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Receive:18/09/2022	***Accepted: 28/09/2022***	***Published: 01/10/2022***

Abstract

Textbook-based English learning media are still widely used in the learning process so as to make the learning atmosphere less attractive for students. The purpose of this study is to determine the results of testing, validity and practicality of English learning media for elementary school students with the help of Android-based Augmented Reality Technology so that later it can be used and utilized as one of the English learning media because the application does not only display words words but also displays animation which is an imitation of the object in 3 dimensions that can be make the elementary school students interested. The method used is the RnD method using the Multimedia Development Life Cycle (MDLC) model. The instruments used are AR Product Testing Test Observation Sheet, Validity and Practicality Questionnaire Sheet. The results showed that at the blackbox testing stage, 23 markers can display 3D objects and sound well and clearly, markers can be displayed up to a height of 1 meter with a slope of 0°-60°, but at height of 1.25 meters with a slope of 0°-30 °, the specifications of the installed mobile device are a minimum of Android 7 OS and can function properly the minimum RAM required is 2GB, the average validity of augmented reality as an English learning media for elementary school students Android-based from material experts is 90 with a very valid category and media experts of 85 with a very valid category, and the practicality of augmented reality as an English learning media for elementary school students Android-based is at an average score of 88 with a very practical category and shows a positive response from students.

Keywords: Augmented Reality, Learning Media, English, Elementary School

Abstrak

Media belajar Bahasa inggris berbasis buku teks masih banyak digunakan dalam proses pembelajaran sehingga membuat suasana pembelajaran kurang menarik bagi siswa. Tujuan penelitian ini adalah untuk mengetahui Hasil Uji testing, Validitas dan Praktikalitas Media Pembelajaran Bahasa Inggris untuk siswa sekolah dasar dengan berbantuan Teknologi Augmented Reality berbasis Android sehingga nanti nya dapat di gunakan dan dimanfaatkan sebagai salah satu media pembelajaran Bahasa Inggris karena aplikasi tidak hanya menampilkan kata-kata tetapi juga menampilkan animasi yang merupakan tiruan dari benda yang dimaksud dalam 3 dimensi yang tentu nya akan menimbulkan ketertarikan pada siswa sekolah dasar. Metode yang digunakan adalah Metode RnD dengan menggunakan model Multimedia Development Life Cycle (MDLC). Adapun instrument yang digunakan yaitu Lembar Observasi Uji Testing Produk AR, Lembar Angket Validitas dan Praktikalitas. Hasil penelitian menunjukkan padai tahapan blackbox testing 23 marker dapat menampilkan objek 3D dan suara dengan baik dan jelas, marker dapat ditampilkan sampai ketinggian 1 meter dengan derajat kemiringan 0°- 60°, namun di ketinggian 1,25 meter dengan derajat kemiringan 0°- 30°, spesifikasi perangkat mobile yang terpasang adalah minimum OS android 7 dan dapat berfungsi dengan baik minimum RAM yang dibutuhkan adalah 2GB, Validitas rata-rata augmented reality sebagai media pembelajaran bahasa inggris untuk siswa sekolah dasar berbasis android dari ahli materi adalah 90 dengan kategori sangat valid dan ahli media sebesar 85 dengan kategori sangat valid, dan Praktikalitas dari augmented reality sebagai media pembelajaran bahasa inggris untuk siswa sekolah dasar berbasis android berada pada skor rata-rata 88 dengan kategori sangat praktis dan menunjukkan respon positif dari para siswa.

Kata Kunci: Augmented Reality, Media Pembelajaran, Bahasa Inggris, Sekolah Dasar

Introduction

The progress of the world of technology today is certainly inseparable from the influence of the development of an increasingly modern era. This makes everything much easier and more practical due to the fast development of the world of technology. With the fast advancement of technology, of course in education world, technology is no longer a foreign thing and can be used as a learning media, In general, learning media are everything in the student's environment that can stimulate them to learn**.**

One of the subjects that need learning media is English. The existence of English as a universal language or the main language of instruction throughout the world makes this language an important language in Indonesian education. English continues to

provide benefits in a large scope, one of which is in the world of education.[1] Learning English in elementary school has its own challenges, where textbook-based English learning media are still widely used in the learning process so as to make the learning atmosphere less attractive for students. This causes the transfer of knowledge to be hampered.

Based on the results of interviews of researchers with English teachers in elementary schools, they are less enthusiastic about learning English using book media, because it is less interesting. Based on these problems, we need a learning media using Augmented Reality Technology.

Augmented Reality (AR) is a term for an environment that combines the real world with a virtual world created by a computer so that the boundary between the two becomes very thin. [2] Suryawinata stated that Augmented Reality is a combination of the virtual world and reality created by computers. [3] This application can help children in learning English through pictures and sounds that feel real [4] and an alternative for children's learning that makes children more interested, active, and responsive to problems. [5] Then, it contains 3D objects, descriptions, sentences and sounds from objects that run on the android platform that can help children learn English through pictures that feel real.[6]

The Augmented Reality learning media application is very easy to use, practical, useful, and effective in supporting teaching and learning activities . [7] Attractive interface design makes students as users feel happy and interested when using it. [8] Therefore, it will be very useful if developing technology is used in the world of education, both formal and informal so that the world of education is increasingly demanded to be more effective and fun. [9] In Augmented Reality there are three characteristics that form the basis of the system, including a combination of the real and virtual worlds, interactions that run in real time, and the last characteristic is 6 object forms in the form of 3-dimensional or 3D models. [10]

The existence of Augmented Reality-based technology makes researchers motivated to conduct a study entitled “Development of English Learning Media for Elementary School Assisted Augmented Reality Technology Based Android”.

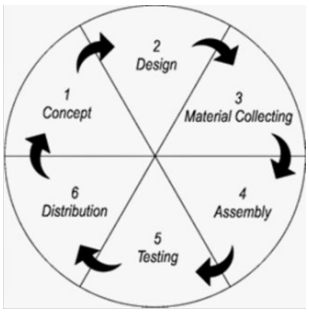
Method

a. Types of Research

This type of research is development research (R&D) using the Multimedia Development Life Cycle (MDLC) method. The steps are as follows:

1. Concept
2. Design
3. Material collecting
4. Assembly
5. Testing
6. Distribution

The scheme regarding the stages of the MDLC is as follows:



Picture 1. *MDLC Scheme*

b. Time and Place of Research

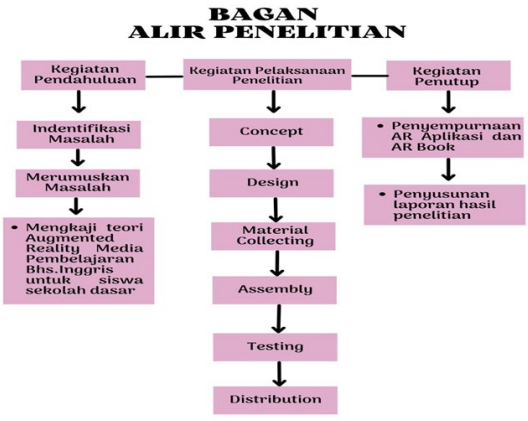
The research was carried out on June 23-September 3, 2022, at SDN 08 Marisa, Pohuwato Regency, Gorontalo Province.

c. Subject of Research

The subject of the research were elementary school students at grade V.

d. Procedure of Research

This research was carried out in 3 (three) stages, namely initial activities, research implementation activities, and final research activities. Can be seen in the image below:



Picture 2. Research Flow Chart

e. Instrument of Research

The instruments used in this research are:

1. The Observation sheet of Augmented Reality Product Testing.
   a. Testing Marker
   b. Testing mobile camera specification
   c. Testing distance and angle camera

2. Validity Questionnaire, a validity questionnaire sheet will be given to 2 media experts and 2 English learning experts.
3. Practicality Questionnaire, a practicality questionnaire sheet is given to test subjects in a small group of elementary school students.

f. Technique of Collecting Data

The Technique of Collecting Data used in this research are:

1. Interview to obtain data.
2. Data about testing tests are collected through observation sheets.
3. The validity of the AR instrument of English learning media for elementary school students that was developed was collected from the validity sheet by Augmented Reality media experts and English learning.
4. Data on the practicality of the AR instrument of English learning media for elementary school students that was developed were collected from practical sheets from elementary school students.

g. Technique of Analysis Data

The data analysis technique used in this study is the analysis of the data from the product feasibility assessment and the practicality of augmented reality English learning media for elementary school students analyzed descriptively, with the formula:

$$Percentage = \frac{\Sigma Each\ Item}{Maximum\ Score}\ x\ 100\%$$

As for determining the level of product validity and revision, as shown in the following table:

Table 1. *Product validity and revision rate*

No	Criteria	Validity/Practicality Rate
1	0-20	Not Valid/Not Practice
2	20-40	Less Valid/Less Practice
3	40-60	Fair Valid/Fair Practice
4	60-80	Valid/Practice
5	80-100	Very Valid/Very Practice

Based on the table above, it is expected that the augmented reality instrument of English learning media for elementary school students that is developed at the minimum level of eligibility criteria is valid/practical or very valid/very practical.

Result and Discussion

Development of English Learning Media for Elementary Schools Assisted Augmented Reality Based Android, obtained the following research:

1. Concept Result

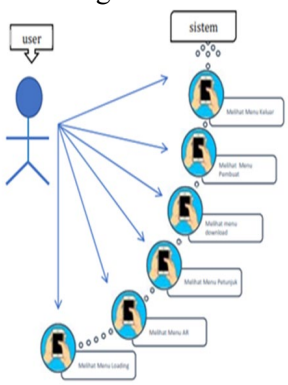
The first stage in this research is:

a. Augmented Reality Concept

Analysis of the augmented reality concept system that will be used:

1) System Needs

The running system is a description of how a system is used. The proposed system can be seen in the image below:



Picture 3. *Proposed System*

2) Functional Needs

This functional requirement consists of several main functions that are interrelated and support each other, including:

a) Users who use this English learning media application, by using android (devices) and using AR books as markers that have been prepared.
b) This educational media can be shared (shared) with other androids.

3)Non-Functional Needs

Non-functional requirements in question are requirements that are not directly related to the features in the system. Like:

a) Specification requirements, the requirements made require android specifications with a minimum OS (operating system) android 7.0
b) Hardware requirements, in the form of: PC AMD Ryzen 5 2600 Six-Core Processor, CPU, 3.4 Ghz; FD, and android devices
c) Software requirements, in the form of:

Unity windows operating system 2019.4.18fi (64-bit); sketchup 2018; android software development (SDK); Java development kit (JDK); Vuvoria SDK, Corel Draw X7

b. English Learning
Analysis of Learning Indicators for English Subjects, including:
1) Able to repeat nouns spoken aloud
2) Able to repeat nouns that are spoken correctly
3) Able to perform movements according to the instructions heard
4) Expressing the speech act of asking an object

We chose to focus on vocabulary material because the 3D concept is very suitable to be made into Augmented Reality. In this case, the vocabulary they will learn is related to things they often encounter in their circles, such as the names of fruits, animals and school things.

2. *Design Result*

The design stage in this research consists of:

a. System Model Design
The activity diagram below describes the application design workflow with a running system.

b. Interface Model Design
1) Loading Menu Interface Model Design.
2) Main Menu Interface Model Design
3) Start AR Menu Interface Model Design
4) Instruction Menu Interface Model Design
5) Maker AR Menu Interface Model Design

c. Marker Book Desain
1) The initial page design consists of a cover and a foreword
2) Glossy cover design, B5 paper size, landscape orientation page layout, and the title of the book is written on the cover, the writing team.
3) Material Desain: Chapter I: Fruits, Chapter II: Animals, and Chapter III: School Things

3. *Material Collecting Result*

At this stage the researcher collects marker material by designing animated images, namely images of fruit, animals and school things. Taking objects for objects that are often found in schools, the researchers did it at SDN 08 Marisa. Taking objects using the Samsung A3 Handphone Camera. Colleting Material in SDN 08 Marisa:

a. Permission to entering SDN 08 Marisa on July 12, 2022.

b. Desain Images Result for Fruits, Animals, and School Things Object.

4. *Assembly Result*

The results of the assembly based on the design stage, the product of this research is a product of developing English learning media in the form of an android-based application, whose interface is as follows:

a. Augmented Reality Application
1) Loading Menu

Picture 4. *Loading Menu*

2) Main Menu
On the augmented reality start page displays the text of the application name, and several buttons, namely the augmented reality start button, marker button, profile maker button, instruction button and exit button. The image below is the main menu:

Picture 5. *Main Menu*

3) Start Menu
On the start page, augmented reality displays a camera where the camera is directed to an application marker that has been entered into vuforia engine which will display 3-dimensional objects of fruit, animals, school things, and several other buttons, namely the voice play button (listening to the English pronunciation from the 3D marker that appears), the back button, the pause button, and the review button.

4) Download Menu
The download menu page is a page that leads to a download link that contains an

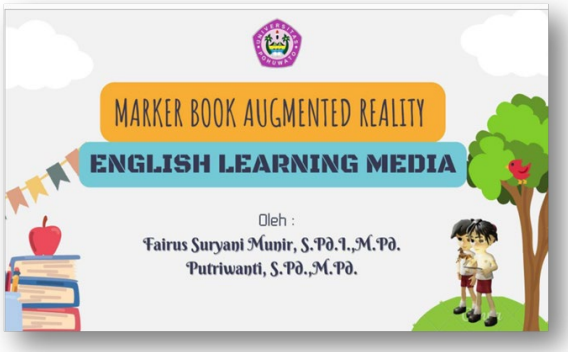
augmented reality marker book with a google drive download format.

5) Instruction Menu
The instructions menu page or symbolized by the (?) button on the main menu is a display that contains how to use augmented reality applications and a back button to return to the main menu.

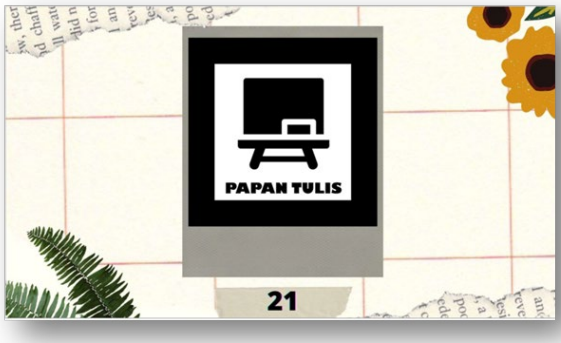
6) AR Developer Menu
The AR developer menu page or symbolized (i) on the main menu contains the name of the team involved in developing English learning media for elementary school students by producing this AR application product, and the back menu button to return to the main menu.

b. Augmented Reality Marker Book

The augmented reality marker book consists of a cover page, an introduction page, instruction page, a table of contents page, and a material page.



Picture 6. *Marker Book*



Picture 7. *Content Page*

5. *Testing Result*

At this stage the testing method with Black Box testing of the application/program is run and seen whether there are errors or not, whether it is according to the design or not. The following are the results of testing augmented reality learning media products.

a. Testing Marker Result

Table 2. *Testing Marker Result*

No	Marker	Description	Result		
			3D	Text	Voice
1.	Strawberry	Strawberry fruit marker is used to display strawberry AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
2.	Watermellon	Watermellon fruit marker is used to display watermellon AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
3.	Pineapple	Pineapple fruit marker is used to display pinepple AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
4.	Orange	Orange fruit marker is used to display orange AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
5.	Apple	Apple fruit marker is used to display Apple AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
6.	Avocado	Avocado fruit marker is used to display avocado AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
7.	Banana	Banana fruit	Displayed	3D objects	Suitable

		marker is used to display banana AR in English	success fully	with appropriate text	with the text narration
8.	Grape	Grape fruit marker is used to display Grape AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
9.	Mouse	MouseAnimal marker is used to display mouse AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
10.	Cow	Cow animal marker is used to display cow AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
11.	Cat	Cat animal marker is used to display Cat AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
12.	Turtle	Turtle animal marker is used to display turtle AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
13.	Duck	Duck animal marker is used to display Duck AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
14.	Bird	Bird animal marker is used to display bird AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
15.	Chicken	Chicken animal marker is used to display Chicken AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
16.	Dog	Dog animal marker is used to display Dog AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
17.	Bag	Bag marker is used to display Bag AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
18.	Shoes	Shoes marker is used to display Shoes AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
19.	Pen	Pen marker is used to display Pen AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
20.	Pencil	Pencilmarker is used to display Pencil AR in English	Displayed successfully	3D objects with appropriate text	Suitable with the text narration
21.	Whiteboard	White board	Displayed	3D objects	Suitable

		marker is used to display White board AR in English	success fully	with approp riate text	with the text narrat ion
2 2.	Chair	Chair marker is used to display Chair AR in English	Display ed success fully	3D objects with approp riate text	Suita ble with the text narrat ion
2 3.	Book	Book marker is used to display Book AR in English	Display ed success fully	3D objects with approp riate text	Suita ble with the text narrat ion
2 4.	Table	Table marker is used to display Table AR in English	Display ed success fully	3D objects with approp riate text	Suita ble with the text narrat ion

b. Distance and Angle Testing Result

The results of testing the distance and camera angle are carried out to see the degree of slope and height of how many meters the marker can still be seen clearly. Here are the results of the camera testing.

Table 3. *Distance and Angle Testing Result*

Distance between camera and marker	**Tilt of Angle**			**Description**
In Meters (m)	0º	30º	60º	
1,5	-	-	-	Unable to display
1,25	√	√	-	Successfully displayed
1	√	√	√	Successfully displayed
0,5	√	√	√	Successfully displayed
0,25	√	√	√	Successfully displayed

c. Mobile Device Specification Testing Result

Testing on mobile device specifications carried out on several brands of Handphone that are often used, to see if the application can run on the handphone by looking at the RAM specifications of the front and rear cameras, and the OS. Here are the test results.

Table 4. *Specification Mobile Testing Result*

No	Types of Mobile	Moble Specification	Description
1.	Samsung Galaxy A31	▪ RAM 6 GB ▪ Front camera : 20 MP ▪ Rear camera : 48 MP (main camera) ▪ CPU : Okta-core (2 GHz, 1.7 GHz) ▪ OS : Android 10	Applications installed and well operating
2.	Vivo Y17	• RAM 4 GB • Front camera : 20 MP • Rear camera : 13 MP, 8MP, 2MP • CPU : Octa-core 2.3GHz • OS : Android 9.0	Applications installed and well operating
3.	Samsung Galaxy A10	• RAM 2 GB • Front camera : 5.0 MP • Rear camera:	Applications installed and well operating

		13.0 MP • CPU : Octa-core 1.GHz, 1.35GHz • OS : Android 9.0	
4.	Xiaomi Redmi Note 11	• RAM 6 GB • Front camera : 13 MP • Rear camera : 50 MP • CPU : Octa-core 2.4 GHz • OS : Android 11	Applications installed and well operating
5.	Iphone SE 2	• Kapasitas : 64 GB • Front camera : 7 MP • Rear camera : 12 MP • CPU : 6 • OS: iOS 15	Application not installed
6.	Samsung J7 Pro	• RAM 3 GB • Front camera : 13 MP • Rear camera : 13 MP • CPU : Octa-core 1.6 GHz • OS : Android 7.1	Applications installed and well operating
7.	Samsung Galaxy Tab A6 S Pen	• Ram 3 GB • Front camera : 2 MP • Rear camera : 8 MP • CPU : Octa-core (4x1.6 GHz Cortex-A53 & 4x1.0 GHz Cortex-A53) • OS : Android 6.0 (Marshmallow)	Application not installed

The results of this application design are then applied in the form of an Android-based application, then testing is carried out, namely black box testing to see if everything goes as planned. In the test results of testing the 24 marker that were made clearly caught by the camera, the markers consist of Fruits, Animals, and School Things.

Testing distance and camera testing, we saw markers at heights ranging from 0.25 m to 1.5 m, the result is that the marker can be seen and caught on camera clearly only up to a height of 1.25 meters and a tilt of 0°, 30°, and 60°, at a height of 1.5 the marker is no longer legible in applications with a tilt of 0°, 30°, or with 60°.

Test on android mobile specifications was tested on 7 cellphones consisting of several cellphone brands such as Samsung, Vivo, Xiomi and Iphone with minimum specification is Android 7 can well operating and RAM minimum that need is 2 GB. It was found that the HP brand that is not installed is Iphone SE 2 and the Samsung Galaxy Tab A6 S Pen.

Therefore, this application as a whole from the black box testing test has all gone well and is in accordance with the proposed interface design.

d. Validation and Practicality Result

Validation was carried out by 4 validators, two material experts, namely a lecturer in English Education at Pohuwato University and an elementary school teacher whose expertise was marked by their having obtained an educator certificate, and two media experts, namely a lecturer in the UNCP Palopo Informatics Engineering Study Program and a lecturer in the

Information Systems Study Program at Palopo University. The results of the validation of the material experts can be seen in the following table.

Table 5. *Material Expert Validation Result*

No	Aspect	Indicator	Validator		Description
			V1	V2	
1.	Learning Design	Purpose	75	100	Very Valid
		Learning Emphasis	75	100	Very Valid
		Flexibility	100	100	Very Valid
		AR Book and app compatibility	100	100	Very Valid
		Grammar	100	100	Very Valid
2.	Material	Content	75	87	Very Valid
		Material Continuitas	75	100	Very Valid
		Material completeness	75	100	Very Valid
3.	Benefit	AR Introduction	75	83	Valid
		Resolve Tool Limitations	75	75	Valid
		Function for teacher	100	100	Very Valid
		Function for students	100	100	Very Valid
	Average		**85**	**95**	**Very Valid**
	Validator Score Average		**90**		**Very Valid**

Based on table 5, it can be concluded that the average validation result by material experts is 90 with a very valid category. Furthermore, the results of the media expert validation are as follows:

Table 6. *Media Expert Validation Result*

No	Aspect	Indicator	Validator		Description
			V1	V2	
1.	Software	File size	75	100	Very Valid
		Smooth Operation	87	87	Very Valid
		Ease of Operation	87	75	Very Valid
		Instructions for use	100	75	Very Valid
		Interactive	75	75	Valid
2.	Design	Display Design	100	100	Very Valid
		Text	75	75	Valid
		Picture and Sound Quality	83	75	Valid
	Average		**85**	**85**	**Very Valid**
	Validator Score Average		**85**		**Very Valid**

Based on table 6, it can be concluded that the average validation result by media experts is 85 with the Very Valid category. Furthermore, the augmented reality application was tested on a limited group of 10 elementary school students at SDN 08 Marisa.

This Augmented Reality Learning Media is validated by two media experts and 2 material experts. In the material experts, the indicators observed were learning design, material and benefits. From the results of processed data obtained a score of 90 on the very valid category. There are several things that the validator notes, namely in learning the use of Augmented Reality Media can attract students' interest in understanding the basics of English material, but it is hoped that in the future, the vocabulary provided in applications and books is more varied and increasingly so that students can also increase their vocabulary.

In the validator of learning media experts, the indicators that become their assessment are Software and Design. From the two validators obtained an average score of 85 validation results with a very valid category. Suggestions from the validators are expected to continue the development of this learning media so that the application can run perfectly.

Table 7. *Practicality Result*

No	Aspect	Indicator	Score	Interpretation
1.	Learning Design	Material Suitability	87	Very Practice
		Interactive	90	Very Practice
		Flexibility	85	Very Practice
2.	Media Display	Grammar	90	Very Practice
		Display Design	92	Very Practice
		Text and Sound	90	Very Practice
		Picture Quality	89	Very Practice
		Navigation Tool	85	Very Practice
		Instruction for use	85	Very Practice
3.	Software	Smooth Operation	83	Very Practice
		Ease of running AR	90	Very Practice
4.	Material	Content	95	Very Practice
		Increase Motivation	90	Very Practice
Score			**1151**	
Average			**88**	**Very Practice**

Based on table 07, it can be concluded that the average practicality result is 88 with a very practical category.

The limited group trial was conducted by collecting 5th grade elementary school students. The average score obtained from 10 students was 88 with a very practical category. Some of the students' notes and comments are as follows:

a) The application made is very helpful in learning English, because it makes us very enthusiastic and excited in learning English because the learning media is very interesting and easy to use.
b) The media is very good and interesting for us as elementary school students so it will not make us bored on studying.
c) The images and material displayed are very clear and the sound in the application is easy for us to imitate.
d) This learning application makes learning fun so we hope that this application can also be used by all of elementary schools.
e) This application is free of charge and is used offline so it is very good for us to use it anywhere.

Based on the results of testing, validity, and practicality, this AR learning media product is the final product, and can be used as a media for learning English in elementary schools.

6. Distribution Result

The Augmented Reality product/application that will be used as an English Language Learning Media for elementary school students will later be distributed at SDN 08 Marisa which is the place where the research is being carried out. Application storage will be on google- drive, students will be able to download it via the link.

Conclusion

Based on the results of research and discussion, the conclusions in this study are as follows:

The product produced in this study is augmented reality as an English learning media that based android for elementary school students who have gone through the black box testing stage, 23 markers can display 3D objects and sound well and clearly, markers can be displayed up to a height of 1 meter with a slope of 0 - 60◦, but at an altitude of 1.25 meters with a tilt of 0◦-30◦, the specifications of mobile devices that can be installed are a minimum of Android 7 OS and can function properly. The minimum RAM required is 2GB.

The average validity of augmented reality as an English learning media that based android for elementary school students from material experts is 90 with a very valid category and 85 media experts with a very valid category. Suggestions from the validators are expected to continue the development of this

learning media so that the application can run perfectly.

The practicality of augmented reality as an English learning media that based android for elementary school students is at an average score of 88 with a very practical category and shows a positive response from students.

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