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APPLICATION OF AUGMENTED REALITY IN HERBAL PLANT LEARNING MEDIA

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Abstract

The advancement of technology has brought many good changes technological advances in the health sector. Augmented reality is a small example of technological progress. Augmented reality can be combined with the health sector to provide information. It is often said that disease is caused by drugs that contain hazardous chemicals. This research introduces that you can learn about herbal plants along with information and recipes on how to process them in one application by utilizing augmented reality technology, namely technology that combines three-dimensional graphics with the natural world in real time with the help of a smartphone camera. Device. With augmented reality, the information displayed will be more interactive for users. Using the MDLC method makes the design of this application more mature. By using this application, it shows 3D plants and brief plant information that matches the identified image. Augmented reality can provide new methods for information media. The result of developing this application is a learning medium that is very easy to use and has many benefits for the general public to avoid dangerous drugs and learn more about herbal plants. Testing this application also obtained satisfactory results using the black box testing method to determine respondents using a questionnaire and on the nose using a Likert scale, which received a score of 85%. This application can also run optimally on several different Android operating systems.

Keywords: augmented reality, Health, unity 3D, blender, herbal plants, mobile technology.

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1. INTRODUCTION

Technology is increasingly developing technological developments are now, and technology has begun to enter the health sector. In the health sector, advances in augmented reality technology can give rise to innovations regarding introducing herbal plants. Herbal plants can reduce the use of drugs containing chemicals in the community. BPOM broadcasts public warnings concerning traditional medicines containing medicinal chemicals [1]. However, people are less aware that consuming drugs containing BKO (Medicinal Chemicals) continuously can cause side effects over a long period [2]. People can switch from using medicines that contain BKO (Medicinal Chemicals) to drugs made from herbal plants. Many people do not understand what herbal medicinal plants are and how to use them.

In this modern era, people don't know about the benefits we can get from medicinal plants for health,

and this is because people are more familiar with chemical medicines, either because of recommendations from doctors who more often give prescriptions to buy drugs. Chemical treatments in pharmacies or because they are easy to get in the nearest shops or stalls, which makes people less aware of the unique advantages that medicinal plants have compared to the chemical medicines they usually consume. When people buy pills, they don't know what the medication prescribed by the doctor contains [3]. However, one of the challenges in using medicinal plants is the difficulty in recognizing different types of medicinal plants and how to manage them properly to get the benefits of these plants [4]. In modern times, there is a need for innovation regarding herbal plants using augmented reality technology.

Augmented Reality (AR) can be defined as a technology that can combine 2-dimensional or 3-dimensional virtual objects into a concrete environment and then display or project them in real-

time [5]. Augmented reality itself can help show a thing clearly and realistically.

Many things make people less aware of what herbal medicinal plants are and how to process them to get good benefits properly. From the information that has been explained, it can be seen that innovation is the primary key so that people understand and are interested in learning about these her [13] plants. which convinced researchers to carry out research with the title "Application of augmented reality in learning herbal plants based on Android." In implementing this application, it has been tested on informatics students to collect test results using an assessment in the form of a questionnaire.

2. RESEARCH METHOD

The research methodology contains the researcher's steps to conduct the research [6]. The method used in developing this system uses the Multimedia Development Life Cycle (MDLC) methodology. The MDLC method is used because it has structured stages and makes it easier to establish media applications such as VR [7]. To carry out the MDLC method, there are six stages: concept, design, material collection, assembly, testing, and distribution [8], MDLC method in Figure 1.

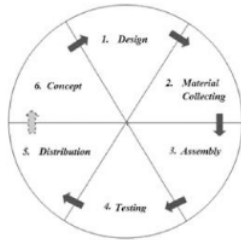


Figure 1 MDLC Research Methodology

2.1 Concept

The concept stage is the stage where you create a concept from the set of building an application, starting from determining who the application users are (audience identification), the purpose of the application, the media, and choosing the specifications [9]. The purpose and end use of the program influence the multimedia theme as a reflection of the organization's identity that wants information to reach the user [10]. At the concept stage, this research aims to serve as a medium for learning innovative herbal plants to make it easier for the public to find information about herbal plants using an augmented reality application with the Android system.

2.2 Design

Design is the stage of making specifications regarding program architecture, style, appearance, and material requirements for the program [11]. Design is carried out to create a more specific design regarding the architectural flow of the application system. In the

design, hardware is needed to support the creation of augmented reality applications. The devices required are in Table 1.

Table 1 Examples of devices used

Hardware	Software
laptops 1	Application 1
	Application 2
Minimum ram	
Minimum	
Operation system	

2.3 Material collecting

The stage in which data is collected, as well as the material and archiving of all materials that will be utilized in the application process [12]. Data collection was obtained from observations and interviews with teachers, as well as collecting materials consisting of images, photos, animations, videos, and audio [13]. The method used to contain material is observation and interviews. The data was obtained by observing the Indonesian herbal medicinal plant garden and conducting interviews with informatics students and industrial engineering students—data collection in Table 2.

Table 2 Example data collection questions

Question	Person 1	Person 2
Question 1	Statement 1	Statement 2
Question 2	Statement 3	Statement 4
Question 3	Statement 5	Statement 6

2.4 Assembly

The assembly stage is the stage of creating the entire multimedia material. The application to be made is based on the design stage, such as a storyboard. This stage usually uses authoring software [14]. At the 3D model stage, the shape of a herbal plant object is built using Blender software in making augmented reality applications using Unity software. To make the 3D model shape, adjust the original shape and original of the object. For the 3D model size, change the smartphone resolution for creating the 3D model.

2.5 Testing

Testing is carried out after completing the assembly stage by running the application or program and seeing whether there are errors [15]. For testing, the black box method is used. Black box testing focuses on the function requirements of the software [16]. Black box testing in Table 3.

Table 3 Example of Black Box results

No	Testing	Action	Expected results	Test results
1	Testing 1	No Action	statement	Results
2	Testing 2	Action	statement	Results
3	Testing 3	Action	statement	Results
4	Testing 4	Action	statement	Results
5	Testing 5	Action	statement	Results
6	Testing 6	Action	statement	Results
7	Testing 7	Action	statement	Results
8	Testing 8	Action	statement	Results

After carrying out the black box test, carry out a compatibility test. The compatibility test is a device test that determines whether the application can work on different devices and information systems [17]. Compatibility testing is in Table 4.

Table 4 Example of a compatibility test

Device name	Version android	Results
Phone 1	No version	Results
Phone 2	No version	Results
Phone 3	No version	Results

Data collection was obtained using the questionnaire method. The data obtained in the questionnaire was then processed into information. This questionnaire involved ten students from the Yogyakarta University of Technology.

To process data from 10 students, This scale is applied in research and is most often used for research in the form of surveys, including descriptive survey research. The creator of the Likert scale is the Likert Rensis from the United States [18], a Likert scale was used. The Likert scale is a psychometric scale commonly used in questionnaires and is the scale most widely used in research in the form of surveys [19]. The characteristic of this scale that differentiates it from other rankings is that the choices for each question from the instrument used are in the form of options that have a gradation from very positive to very harmful, such as strongly agree, agree, unsure, disagree, and strongly disagree [20]. So, the respondents were measured using a Likert scale using point assessments through questions. Likert scale score assessment in Table 5.

Table 5 example of a Likert scale score

Point	Information.
Point 5	Strongly agree.
Point 4	Agree.
Point 3	Doubtful.
Point 2	disagree.
Point 1	Strongly disagree.

The results of the media feasibility test by augmented reality application users obtained data. The list of questions for the questionnaire is in Table 6.

Table 6 Example questionnaire

N	Question	Sa	A	D	Da	Sd
1	Question 1		A	D		
2	Question 2	Sa				
3	Question 3			D	Da	Sd
4	Question 4	Sa				
5	Question 5	Sa				
6	Question 6			D	Da	
7	Question 7	Sa				

8	Question 8	Sa				
9	Question 9	Sa				
10	Question 10	Sa				
11	Question 11		A	D		
Amount		Result s	Result s	Result s	Result s	Result s

To calculate the average satisfaction presentation of a system that can use a Likert scale formula that sums the results of the maximum score of each answer chosen, for an explanation of the formula as Equation $\sum \text{observation score} = (\text{numbers} \times \text{Sa score}) + (\text{numbers} \times \text{A score}) + (\text{numbers} \times \text{D score}) + (\text{numbers} \times \text{Da score}) + (\text{numbers} \times \text{Sd score})$. Meanwhile, to calculate the feasibility of using the formula as Equation 2. Percentage of Eligibility = $(\text{observation score} \div \text{expected score}) \times 100\%$ [21].

The expected initial score was 550 (100%), based on the criteria in the feasibility table, the value obtained was still included in the very feasible percentage group, namely 81%-100%. We are giving the eligibility percentage in Table 7.

Table 6 Eligibility percentage

Eligibility percentage	Information
0% - 20%	Not worth it
21% - 40%	Not feasible
41% - 60%	Decent enough
61% - 80%	Worthy
81% - 100%	Very worthy

2.6 Distribution

The developed product was stored on a Moodle-based LMS [22]. The final stage is where the finished application has been converted into an application form and is ready to be used or duplicated for publication [23]. Installed on an Android smartphone using the application file format and are prepared to use by users [12].

3. RESULT AND DISCUSSION

At this stage, the results and discussion of the research results by applying the Multimedia Development Life Cycle (MDLC) method to obtain data that will be processed through several stages. I will explain the data in this section.

3.1 Concept

At the concept stage, we will develop this application to provide an experience of introducing herbal plants using an application that displays a 3D effect, and the 3D image is as actual as the original image. Users who use this application can be from various groups, and this application can attract the interest of many People use this application.

3.2 Design

At the design stage, designing a system for developing applications is very important. Requires

several devices to support application creation, the system architecture that will run on an Android smartphone with a minimum of Android version 7.0. This is done to help maximize application use, and application creation also requires sufficient devices, such as a laptop, so that application creation can be maximized. List of devices used in Table 1

Hardware	Software
laptops Asus	Blender 3.4
Ram 16 GB	Unity Hub 3.1.2
Windows 11 64bit	

3.3 Material collecting

In this research, data collection used the observation method and questionnaire method. The reason this method is very effective. The researcher visited the herbal plant cultivation site directly to find out what the condition of herbal plant management was so that later, he could find out what innovations should be implemented to collect data using a questionnaire. The researcher asked several questions about herbal plants as information. Technology students and electrical engineering students at Yogyakarta Technology University. The results of the questionnaire will be displayed in the following table 7.

Question	Informatics	electro
Do you know herbal plants?	Understand	Understand
Do you know how to process herbal plants?	Do not understand	Do not understand
How do you respond to learning about conventional herbal plants?	Less attractive	Less attractive

3.4 Assembly

At the assembly stage, all aspects that support the creation of a display for the user are given great attention, from the scene of creating 3D objects using the Blender application and creating applications using Unity to building the interface with great attention so that users can use this application quickly and conveniently—understanding the user interface design as attractive as possible so that users are interested in using this application.

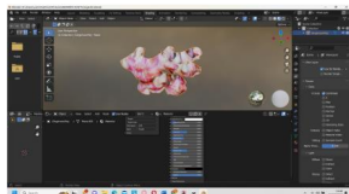


Figure 2 Create 3D objects in a blender.

In Figure 2, 3d creation using the blender application, the mode using cubes first, then shaping to resemble red ginger, then adding red color to make it more similar. Add a motif to make it look more like red ginger in the real world.



Figure 3 Creating augmented reality applications using unity

In Figure 3, after making the 3D object, continue making the application using Unity, making the augmented reality application using the Unity application with the Vuforia database and the Unity application is very suitable for use in creating augmented reality applications because Unity can produce 3D objects when the application is ready. With several scenes, several buttons make using the application smoother.

3.5 Testing

At the testing stage, the application that has been built and is in application form will be tested, and this is done to find out whether the application is suitable for use or not. The application will also carry out tests using several different smartphones. This is done to determine whether this application can run smoothly or not. After the application is declared safe and suitable for use, it will be continued by conducting a feasibility test using the Likert scale method. This is done to find out whether the application is ideal for dissemination or not by calculating the results from respondents. The first black box test was conducted to determine how this application could run whether all the features worked. The black box test can be seen in Table 8.

No	Testing	Action	Expected results	Test results
1	Main menu display.		The main menu scene appears and moves to the interface scene.	In accordance.
2	Hint button.	Touch.	The scene moves to the application instructions scene.	in accordance
3	Exit button.	Touch.	The application will automatically exit.	in accordance

4	Start button.	Touch.	We will move to the catalog scene.	in accordance
5	Catalog.		In the catalog, there are several options.	in accordance
6	Visualization of herbal plants.	Touch.	Selecting in the catalog will then move to a scene displaying 3D objects.	in accordance
7	Information button.	Touch.	We will move to the information scene.	in accordance
8	Recipe button.	Touch.	I will move to the recipe scene.	in accordance

After the testing phase with the black box has been completed, you will find that when you run the application, you will find that the application can be used smoothly, the features available in the application can all function optimally without the slightest problem, all the buttons are successful, the output display is also flourishing. so If you feel safe, everything will be completed by carrying out a compatibility test. Compatibility tests are carried out to determine whether the application can run on other smartphones. The following tests are in Table 9.

Table 9 Compatibility test

Device name	Version android	Results
Xiaomi note 9	Android 10	Good
Realme 8	Android 11	Good
Oppo reno 10	Android 13	Good

After carrying out the compatibility test in Table 9, the results obtained were quite good. The application can run optimally on three smartphones, and all features and user interface can be appropriately adjusted after a compatibility test, continuing with Likert scale calculations to determine whether an application is suitable. Respondents need the Likert scale calculation to test the application. Respondents will assess the results of trying the application and the Likert scale rating in Table 10 assessment.

Table 10 Likert scale assessment

Ans. category.	Information.
Point 5	Strongly agree.
Point 4	Agree.
Point 3	Doubtful.
Point 2	disagree.
Point 1	Strongly disagree.

In the next stage, respondents will have several questions to give a score. Questions including whether the application provides innovations, the application work system, and the appearance of the application will all value as determined. The questions will be in Table 11.

Table 11 Question

No	Pertanyaan	Sa	A	D	Da	Sd
1	Attractive appearance					
2	The text is readable and clearly	10	5			
3	attractive color			5	4	1
4	It can be used easily	10				
5	Easy application usage information	10				
6	Attractive button design			4	6	
7	The 3D image is clear	10				
8	All buttons work	10				
9	Loading screen time is interesting	10				
10	The application is suitable as a learning medium	10				
11	Herbal plant information menu		4	6		
Amount		70	9	20	10	1

The results were obtained from respondents to determine the final results of application testing using calculations on a Likert scale. The count begins by calculating to get the highest score on the Likert scale with strongly agree = five multiplied by the number of questions asked to the respondent, so $5 \times 11 = 55$. The value obtained from the maximum value is to find the expected score by multiplying the results of the very agree with the number of respondents, so $55 \times 10 = 550$, so it can sing the augmented reality application Liker scale as follows:

The average score obtained = 467
 Eligibility percentage = (average / mean expected score) x 100%
 Eligibility percentage = $(467 / 550) \times 100\%$
 Eligibility percentage = 85%.

The results of the feasibility calculation percentage from the data obtained from respondents were 85%, and the expected initial score was 550 (100%). A consequence of 85% is said to be feasible or not based on the feasibility percentage in Table 12.

Table 12 Eligibility percentage

Eligibility percentage	Information
0% - 20%	Not worth it
21% - 40%	Not feasible
41% - 60%	Decent enough
61% - 80%	Worthy
81% - 100%	Very worthy

The results obtained from calculations with a Likert scale of 85% are satisfactory. This score is very worthy. From these results, the application is suitable for publication and can be used by the wider community.

3.6 Distribution

In the final stage, there is distribution. At this stage, the augmented reality application has been successfully tested and obtained satisfactory results. The application is published via platforms such as the Play Store and will use social media to promote this application.

4. CONCLUSION

The final results of this research show that the innovation of introducing herbal plants using the augmented reality application is very effective. The general public, who initially did not understand herbal plants, can provide a breakthrough for media introduction. This research also obtained satisfactory results because. When the application uses several application methods, it can run smoothly. The final result is that the feasibility of the application gets a score of 85%, which is quite a large number. This number makes the application very suitable for distribution so that the general public can use the application. Augmented reality herbal plants.

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P/V You have used the passive voice in this sentence. Depending upon what you wish to emphasize in the sentence, you may want to revise it using the active voice.



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Dup. You have typed two **identical words** in a row. You may need to delete one of them.



Proofread This part of the sentence contains a grammatical error or misspelled word that makes your meaning unclear.



Article Error You may need to use an article before this word.



Missing "," You may need to place a comma after this word.



Proper Noun If this word is a proper noun, you need to capitalize it.



Prep. You may be using the wrong preposition.



Article Error You may need to use an article before this word.



Missing "," You may need to place a comma after this word.



Word Error Did you type "**the**" instead of "**they**," or have you left out a word?



Run-on This sentence may be a run-on sentence. Proofread it to see if it contains too many independent clauses or contains independent clauses that have been combined without conjunctions or punctuation. Look at the "Writer's Handbook" for advice about correcting run-on sentences.



P/V You have used the passive voice in this sentence. Depending upon what you wish to emphasize in the sentence, you may want to revise it using the active voice.



Article Error You may need to use an article before this word. Consider using the article **the**.



Missing "," You may need to place a comma after this word.



Article Error You may need to remove this article.



Article Error You may need to use an article before this word.