

p-ISSN: 2527-7637

e-ISSN: 2549-2209

JPPIPA (Jurnal Penelitian Pendidikan IPA)



Jurnal Penelitian Pendidikan IPA
Fakultas Keguruan dan Ilmu Pendidikan, UPI (FKIP) Universitas Pajadjaran Bandung
dengan Partisipasi Terpadu IPA Indonesia (PTPI)



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JPPIPA (JURNAL PENELITIAN PENDIDIKAN IPA)
p-ISSN : 2527-7537 e-ISSN : 2549-2209

Mailing Address and Contact:
C12 Building, 1st floor, Science Department
Faculty of Math. and Nat. Sci.
Universitas Negeri Surabaya
Jl. Ketintang, Surabaya 60231

Homepage: <https://journal.unesa.ac.id/index.php/jppipa>

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Vol 5, No 1 (2020): Juni 2020

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AUGMENTED REALITY BASED LEARNING MEDIA IN FOTOSYNTHESIS MATERIAL

Kharisma Eka Putri¹, Frans Aditia Wiguna²

¹Primary School Teacher Education Study Program, Faculty of Teacher Training and Education, Universitas Nusantara PGRI Kediri, Indonesia

² Primary School Teacher Education Study Program, Faculty of Teacher Training and Education, Universitas Nusantara PGRI Kediri, Indonesia

Abstract

This article contains the results of the design of learning media development based on Augmented Reality (AR) by bringing up virtual objects that use pointer markers. The purpose of this study is to obtain a design of learning media application on material of Photosynthesis based on Augmented Reality. Test this media using a usability measurement tool to measure success and obtain input from users. The results obtained from the design of learning media applications on photosynthetic material based on Augmented Reality are making it easy for users to use real interactions with the percentage of usability obtained by 91.25% and positive responses in the form of user input to interaction techniques in the Augmented Reality media so that input can used to improve the next media development.

Keywords: Augmented Reality 1, photosynthesis 2, usability 3

INTRODUCTION

In the era of industrial revolution 4.0, learning to higher education to be expected always to involve Information Technology in lecturing activity potentially to provide enormous benefit as a meaningful learning experience so that it can understand the correct concepts, in the future when students plunge as teacher teacher can embed the correct concepts to students. Teacher's task especially teacher Elementary school (SD) teacher is to instill basic concepts, so that student student do not misunderstand concepts, if student Elementary school students experience misconceptions, they will carry over to the next level of education or even to the highest level of education. As one of the newest development in the IT field, is the technology Augmented Reality (AR). Augmented Reality Technology can create an added workspace condition by preparing a content from the virtual space into the actual space that is where humans perform activities according (Kustiawan, 2009). Various Augmented Reality applications have been developed, namely in the fields of architecture, health, entertainment an even including education. The field education researches have believed that Augmented Reality learning media is one alternative to obtain real and comprehensive knowledge. So as to minimize concept errors that might occur to students in understanding the actual concepts.

According to Mustakim (2017) Augmented Reality is an application that can merge the real world (real) with the world that is not real (virtual), in the form of 2D or 3D which is projected into a real environment at the same time. Augmented Reality is the placement of virtual objects in the actual world in order to obtain a more real impression from users and media. Figure1. The following is an example of the Augmented Reality application in showing virtual plant objects above markers.



Figure 1. Example Augmented Reality Application in Showing Plant Objects.
Source: Research Document

Plants are the source of life in this earth. Because, plants are the only producers in the food chain. Plants are called producers because they can carry out photosynthetic reactions. According to George (2006), photosynthesis is a process that forms complex food molecules and has high energy from some of the more serene components by plants that have leafy or chlorophyll green matter and other autotrophic organism and require light energy. Meanwhile, according to the language that is often used photosynthesis reaction is a reaction that changes carbon dioxide and water through the help of sunlight and occurs in chlorophyll which in turn will produce carbohydrates (glucose) and oxygen.

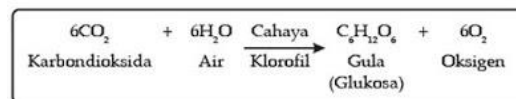


Figure 2. Photosynthesis Reaction

We know for ourselves that the source of the life for living things, especially human is oxygen and carbohydrates. The reaction occurs in chlorophyll, chlorophyll is located in plants in the part that produces leaf green matter, to understand the occurrence of photosynthetic reactions, we need an appropriate learning media so students can understand and not just imagine. One of the media that can be facilitates students in understanding the simple occurrence of the photosynthesis in chlorophyll by using Augmented Reality. Augmented Reality media, the students can know the process of simple photosynthesis in real.

The purpose of this study was to obtain a learning media application design on photosynthetic material based on Augmented Reality, with the percentage of usability or responses in the form of user input to interaction techniques in the Augmented Reality media used to improve the media I subsequent developments.

METHOD

Research Design

The Method used in this research is experimental research. Experimental namely the media is designed with the framework of Augmented Reality Technology which is then created and tested. The testing phase in this learning media uses the usability method. According to Kustiawan (2009), usability is used as a measure of success and to get some input from users. Meanwhile, according to Nielsen in Nurhandayani (2013), usability is a qualitative

analysis that can be used to determine user convenience in running learning media. And usability is a quality attribute that is used to know how the user interface is used (Arista, 2016). So in this article, researchers only measure convenience and obtain input from users in using Augmented Reality learning media designs on photosynthetic material.

Research Objectives

Test carried out using a sample of ten (10) users. Users are drawn from people working in the world of education, all of which have never operated on Augmented Reality-based learning media.

Data Collection Technique

Data collection technique is to use a questionnaire. The questionnaire model used is in the form of a rating scale or better known as the Likert model. According to Retnawati (2015), a questionnaire using a Likert scale will present statements followed by choices. The choice can be frequency (always, often, rarely and never) or in the form of agreement (strongly agree, agree, neutral disagree and strongly disagree). The choice of scale answer is assessed by tiered with a range of scores between 1 until 4.

Table 1. Likert Scale

No.	Symbol	Explanation	Score
1	SA	Strongly Agree	4
2	A	Agree	3
3	D	Disagree	2
4	SD	Strongly Disagree	1

(Riduwan, 2009:88)

After obtaining the average score, then usability measurement is obtained by calculating the percentage of answers to the responses using the formula below

$$\text{Percentage} = \frac{\text{test result score}}{\text{highest score}} \times 100\%$$

(Budiman, 2019)

After that the percentage results are compared with the score interpretation criteria table which can be seen in the following table:

Table 2. Score Interpretation Guidelines after conversion

Number (in %)	Classification
0 – 20	Not Very Good
21 – 40	Not Good
41 – 60	Enough
61 – 80	Good
81 – 100	Very Good

(Perwitasari, 2018)

RESULT AND DISCUSSION

The trial of this study consisted of several analyzed of aspects of user performance on the tasks to run. Activity and user input to get improvements. Trials were conducted in three stages and each stage analyzed aspect of the media. The intended stages are outlined in the following table:

Table 3. Test Result

Item	Testing Phase	Description	Score
Introduction to the AR Environment	Initial introduction	Introducing users to become familiar with AR media.	3,6
Use of Menu and Material Facilities	The use of the transfer from one menu to the menu of learning objective s.	The extent to which the ease and understanding of the user in carrying out the learning objectives menu function..	3,6
	Use in moving from menu one to the help menu.	The extent to which the ease and understanding of the user in carrying out the instructions menu function..	3,8
	The use of the transfer from one menu to the start menu.	The extent to which the ease and understanding of the user in carrying out the menu function starts.	3,6
		The extent to which the ease and understanding of the user in carrying out the function menu of the subject matter.	3,8
		To what extent are the user's convenience and	3,8

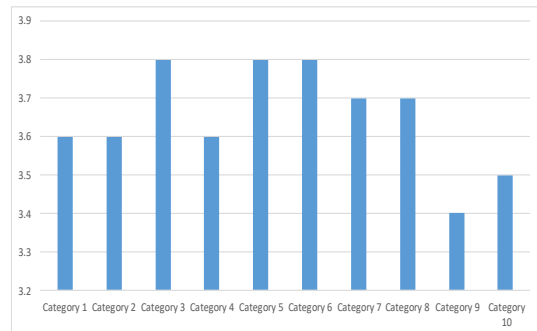
		understanding in performing AR menu functions.	
		The extent of the user's ease and understanding in carrying out the Quiz menu function.	3,7
		The extent to which the ease and understanding of the user in carrying out the supporting information menu function.	3,7
	Use in moving from menu one to the download marker menu.	The extent to which the ease and understanding of the user in carrying out the download marker menu function	3,4
Final Test	General effects	Impact on media use of AR applications.	3,5
Average			3,65

From ten (10), the user who filled out the questionnaire, most gave an average value of 3,65 out of a maximum value of 4,00.

$$\text{Percentage of Usability} = \frac{3,65}{4} \times 100\% = 91,25\%$$

In the trial, the user notes the difficulty and ease of operating the media. The assessment is carried out after the user has successfully carried out the evaluation phase and obtained positive responses from the media that have been tested. The ease of the method of media interaction does not require a long time to get used to running the media that has been made.

Figure 3. Test Result Diagram



The percentage of usability obtained 91.25% is including very good interpretation criteria, which means that it can be concluded that the percentage of usability obtained is very good and makes it easy for users to use Augmented Reality instructional media designs on photosynthesis material. This is in accordance with the results of research conducted (Fenty, 2014), which states that Smart learning media is easy to use and increases interest in learning

The result of the questionnaire in this study contained user responses to measure the ease of operating the media, beside when using media users also had the opportunity to gain new experiences in using Augmented Reality-based learning media. This Augmented reality-based learning media can be said to be new, so in the operation of this media the user needs to be accompanied and given training first. Problems found trial with the usability method can be used as recommendations which can later be utilized to improve further research and development.

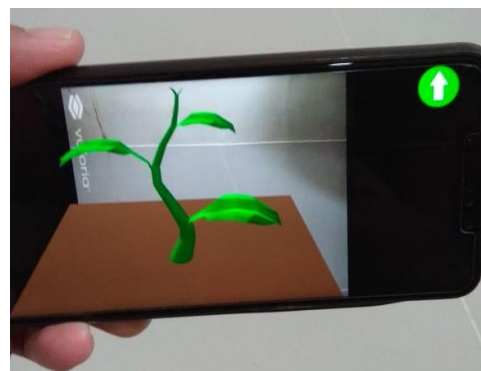


Figure 4. Object in menu
Source: Research Document

The picture above is an example of the user when trying to interact in moving objects in the photosynthesis reaction menu.

CONCLUSIONS AND SUGGESTIONS

Conclusions

From discussion mentioned it can be concluded that the design of instructional media applications on Augmented Reality Photosynthesis material makes it easy for users to use real interactions with a percentage of usability 91, 25% and positive responses in the form of user input to interaction techniques in Augmented Reality media can be used to improve media in the next development.

Suggestions

From the trials that have been conducted, it's necessary to have trials that are more focused on more specific aspects in order to obtain an in-depth analysis related to the design of augmented reality learning media.

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