The Effectiveness of Augmented Reality-based Arthropod Book in terms of Students' Biology Learning Outcomes

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Abstract

Learning media has a very important function in the learning process. The large number of students who lack interest in learning is influenced by the lack of use of teaching media by teachers, so that students are getting bored with the use of media that is less varied. Based on this view, this study focused on examining the effectiveness of augmented reality-based arthropod book in terms of students' biology learning outcomes. This study aims to determine the biology learning outcomes of students using augmented reality-based Arthropoda book, as well as to determine the effectiveness of the book. This type of research is a field research, in which a research that goes directly to the field. In addition, data were obtained in quantitative methods with the type of pre-experimental design and the One Group Pretest-Posttest design. The results of this study indicate that biology learning process using augmented reality-based Arthropoda book is more effective, which can be seen from the learning outcomes of students increased however the difference is not significant, because the N-Gain Score for pretest and posttest scores reached in the moderate or quite effective category.

Keywords: Augmented Reality, Learning Media, Learning Outcomes.

INTRODUCTION

Education has a very significant function to improve the ability of students. Education is one of the significant aspects in order to produce quality coffers (Risdawati, 2017). The development of science and technology provides various technological advances that enable students to use sophisticated facilities, such as mobile phones, and electronic devices. One of important aspects in teaching and learning process is providing various types of learning media, so that teachers can convey information to students effectively (Faiza, 2018).

Media is a tool that can be used to help communicate a message to others. Media also can help to ensure that messages are received correctly and understood as intended. The media is used by the teacher to make it easier for students to learn in class. One of the main ways to achieve educational goals is by providing effective and appropriate teaching materials (Faizah, 2018).

For this reason, a teacher needs to determine the appropriate learning media so that students' learning outcomes can be achieved with maximum results especially in biology lessons. Despite the fact, students in one class received the same treatment in learning process. To reach

good learning outcomes are by conducting active learning process in order to grow a sense of enthusiasm and a sense of curiosity in students toward the learning materials which can indirectly increase students' learning outcomes (Ratna, 2018).

Augmented reality-based Arthropoda book was specifically designed for biology subjects in the Animalia chapter, Arthropoda subchapter. Based on the results of initial observations in class X MA Daarul Falah 2, the findings indicated that in teaching Biology subjects in class X, the Biology teacher had not used the learning media as a tool in the teaching process, but instead used other learning media, such as textbooks in which is less effective so that students could not reach high students' learning outcomes (Khasanah and Nurmawati (2021). It is assumed that it was caused by the lack of student interest in learning as a cause of the problem of low student learning outcomes in Biology subject, Arthropods subchapter in class X.

According to those views, this study aims to determine the biology learning outcomes of students using augmented reality-based Arthropoda book, as well as to determine the effectiveness of the book.

METHODE

This research is included in a field research, with a quantitative research and experimental method. The research design used in this study was a pre-experimental design with a one-group pre-test-post-test design. In the Pre-Experimental Design approach, there are external variables that can affect the formation of the dependent variable. This condition happens because there is no control variable so that it can affect the dependent variable, where the dependent variable itself is not necessarily influenced by the independent variable (Sugiyono, 2015).

During the effectiveness test was carried out, students were given textbooks in groups. Then the students were directed to use textbooks with treatment of four meetings. After the treatment is carried out, it is continued to measure the effectiveness of the teaching materials.

To find out the effectiveness of the book, there were questions about Arthropods which were validated by three experts. Then, the questions that were declared valid and feasible to use were continued by conducting trials to determine the level of validity and reliability of the questions up to the difficulty of the questions. Instrument trials were carried out on 32 students of 10 grade. After the feasibility of the question instrument was determined, the next step was to find out the effectiveness of teaching materials by testing teaching materials on students as subjects. The subjects used were students of class X IPA MA Daarul Falah 2, Maliku sub-district, Pulang Pisau Regency, Central Kalimantan Province, consisting of 21 students. This research was conducted on 07 June 2022-09 June 2022.

The design of the effectiveness test according to Hake in Meyninda Destiara (2020:75) uses Pretest and Posttest assessments. Data on student test results before and after being given treatment were then analyzed by comparing their

scores using the g factor formula (N-gain).

The increase in student learning outcomes can be calculated using the gain formula as follows:

$$g = \frac{Spostest - Spretest}{S\max - Spretest}$$

description:
g   : Gain value
S posttest: Posttest scores
S pretest : Pretest Score

Table 1. Classification of learning outcomes

g value	Category
G ≥ 0.7	High
0.7 > G ≥ 0.3	Moderate
G < 0.3	Low

RESULTS AND DISCUSSION

The results of the learning outcomes of students are shown in table 2. (With minimum of Standard score = 75)

Based on the learning outcomes of students in the experimental class, it shows that there is a significant increase in learning outcomes with an average score of 41.33 on the pretest results and 78.86 on the posttest results. From the results of this study, it can be assumed that all students reached standard score. In addition, there were six students reached gain scores in the high category and 15 students reached gain scores in the moderate category.

Table 2. Student Learning Outcomes

Name	Pretest resutls	Posttest results	Standard score	g	N-gain
IA 1	40.00	86.67	complete	0.77	High
IA 2	46.67	73.33	complete	0.49	Moderate
IA 3	40.00	73.33	complete	0.55	Moderate
IA 4	50.00	80.00	complete	0.6	Moderate
IA 5	46,67	83,33	complete	0.68	Moderate
IA 6	50.00	83,33	complete	0.66	Moderate
IA 7	43,33	83,33	complete	0.7	High
IA 8	50.00	86,67	complete	0.73	High
IA 9	40.00	76,67	complete	0.61	Moderate
IA 10	36,67	86,67	complete	0.78	High
IA 11	33,33	66,67	complete	0.5	Moderate
IA 12	36,67	76,67	complete	0.63	Moderate
IA 13	50.00	96,67	complete	0.93	High
IA 14	50.00	73,33	complete	0.46	Moderate
IA 15	36,67	83,33	complete	0.73	High
IA 16	30.00	73,33	complete	0.54	Moderate
IA 17	33,33	70.00	complete	0.55	Moderate
IA 18	36,67	66,67	complete	0.47	Moderate
IA 19	36,67	73,33	complete	0.57	Moderate
IA 20	40.00	83,33	complete	0.72	High
IA 21	40.00	80.00	complete	0.67	Moderate
Average	**41.33**	**78.86**		**0.63**	**Moderate**

Based on the calculation of the N-gain score test, it shows that the average value of the N-gain score of 0.63 is included in the quite effective category, which proves that there is a quite high increase in students' understanding of the material during the learning process.

After the differences in pretest and posttest learning outcomes was determined, the effectiveness test was conducted by calculating the N-Gain Score. Based on the results of the calculation of the N-gain score test, it shows that the average N-gain score of 0.63 is included in the quite effective category, with a minimum N-gain score of 0.46 and a maximum of 0.94.

Data obtained in this study indicated that the students' learning outcomes was quite effective which is concluded from the indicators of effectiveness emphasized by Sinambela (2008), namely the achievement of learning completeness, the positive response of students to the learning process, and the teacher's ability to manage learning process. In addition, it can be also affected by components in learning process such as mastery and enthusiasm for learning material, giving fair grades, and good learning outcomes (Hamzah, 2004).

The effectiveness of using Augmented Reality-based learning book can improve student learning outcomes emphasized by Yuliono et al. (2018) on the effectiveness of Augmented Reality learning materials in mastering the concept of the human digestive system. The same result is also described by Setiowati (2019) that

the effectiveness of learning using Augmented Reality-based learning media can improve student learning outcomes. The effectiveness of using textbooks is also confirmed by (Ratna in Rosidin, 2022) where the effectiveness of a book is the level of success of the goal by carrying out students centered learning process.

It can be assumed that from the results of research in which the average learning outcomes of students in biology after being treated using the Augmented Reality-based Arthropod book (posttest) are higher when compared to the average learning outcomes of students before being treated using the book (Pretest).

This increase in learning outcomes is inseparable from the positive influence on the use of Augmented Reality-based Arthropod book. Learning activities can be said to be effective if students have an interest in learning process. Mardhiah (2013) find that use of Augmented Reality in learning can make children more interested to study tough lessons. It helps children to study geometry in early education.

It also can be concluded that the book can makes learning process more interesting. It is proved that students who carry out learning using Augmented Reality-based Arthropod book feels more motivated during the learning process since they used a fun and new learning media. It is this is in line with the research results of Ilmi and Khairunnisa (2021) which proves that the personality of students also determines the effectiveness of the learning media used. Learning

media that suit students' personalities will motivate them more.

CONCLUSION

TBased on the findings on this research, it can be concluded that the use of Augmented Reality-based Arthropod book is quite effective in increasing biology learning outcomes for students in class X IPA MA Daarul Falah 2, which is indicated from the increase in learning outcomes shown by using the calculation of the gain value, that reached on an average of 0.63 moderate category.

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BRIEF PROFILES

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