THE INFLUENCE OF THE APPLICATION OF THE DISCOVERY LEARNING MODEL USING THE AUGMENTED REALITY (AR) SENSE SYSTEM ON THE ABILITY TO UNDERSTAND CONCEPTS AND ATTITUDES TO LEARNERS' LEARNING MEDIA

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Abstract

The sensory system topic is still considered difficult by students. Therefore, the appropriate learning model is needed to make the student easier to understand the content. Research on the effect of the application of discovery learning models using the Augmented Reality (AR) sensory system aims to determine the effect of this media on students understanding of the sensory system material and their attitudes toward the learning media. The method used in this research is the experimental method. The population is all students of grade 11th of MAN 2 Banda Aceh, and the sample is a total sampling (n=129 students). The parameters of this research are conceptual understanding which is measured by cognitive tests and students' attitudes measured by questionnaires. The increase in concept understanding is analyzed with an independent t-test. The results showed that $t_{count} > t_{table}$ (3.38 > 1.99), that indicated a significant increase of students understanding. While the attitude analysis showed that students' attitude is in good category (75.38%) and very good category (24.62%). Furthermore, the application of AR in sensory system learning could be used by teachers to improve students cognitive understanding and attitude.

Keywords: Discovery Learning, Augmented Reality, Concept Understanding, Attitude

1. INTRODUCTION

Biology is a compulsory subject studied at the high school level, especially in the Science major. Sensory system material is one of the materials in biology lessons; this material is one of the essential materials and must be understood by students. So far, the obstacles in the biology learning process, based on the results of initial observations made through interviews with researchers and teachers in the field of biology studies, were obtained information that students have difficulty understanding the material presented and tend not to care, are less active in learning activities, rarely submit opinions and questions about learning material. In addition, understanding the concept is an essential aspect of learning.

The results of observations and direct interviews conducted by researchers with teachers and students at MAN 2 Banda Aceh City show that there are still students with low biological scores and below the Minimum Completeness Criteria (MCC 75), especially in sensory system material. The learning process so far has not actively involved students; the material is presented in an informative manner, meaning that students only listen to the information provided by the subject teacher, causing the concepts or material being taught to not leave an imprint on their memory so that the material is quickly forgotten.

Conceptual understanding has a vital role in the teaching and learning process. One way for students to easily understand the concept is to involve students actively in learning. Such learning can improve students' thinking skills in understanding a concept and solving problems with the skills and knowledge they already have (Tendrita et al., 2016).

One effort that can be made to overcome this and to increase conceptual understanding is to improve the learning system, namely by using the Discovery Learning model; this learning model is discovery learning where students are directly involved in education they look for solutions to problems in the material. So that way, students don't just listen but are also involved in the learning process.

Exciting and creative media will increase students' interest in learning. Students' creativity will also develop through the high originality of educators in preparing exciting teaching materials. Augmented Reality (AR) is a technology that combines two-dimensional or three-dimensional virtual objects into a natural environment or projects these virtual objects in real-time (Andriyadi, 2011). There are three principles of augmented reality. First, AR is a combination of the natural and virtual worlds. AR runs interactively in real-time, and there is integration between objects in three dimensions: virtual objects that are integrated into the real world (Azuma, 2001).

Several studies on Discovery Learning have been conducted (Rosarina et al., 2016; Ali and Setiani., 2018; Kusumawati, 2022; Kholidah, 2016; Ritonga, 2017; Handoko et al., 2016; Kristin, 2016; Rosdiana et al., 2017; Rahayu & Agustina, 2019; Zaenol, 2019; Mubarok and Sulistyo, 2014; Prasetyo and Abduh, 2021; Salmi, 2019; Yuliana, 2018). The results of these studies only reveal learning outcomes using the Discovery Learning model. While studies that examine using the Discovery Learning model using Augmented Reality media to see students' understanding of concepts have yet to be carried out. Therefore this research was conducted,

2. RESEARCH METHODS

This study used an experimental method with a pretest-posttest control group design (Arikunto, 2010). The subjects of this study were 129 students divided into an experiment class of 65 students and a control class of 64 students randomly selected. The research occurred in June 2022 at a high school in Banda Aceh, Aceh, Indonesia. The parameters measured were conceptual understanding, obtained through the pretest and posttest, totaling 50 questions, and attitudes towards students' learning media. Concept understanding data were analyzed by independent sample t-test analysis, and attitudes towards learning media were tested by analyzing the percentage of a questionnaire using 16 statements.

Table-1. Pretest Posttest Control Group Design

Sample	Group	Pretest	Treatment	Posttest
Random	A (Experiment)	O1	X	O2
Random	B (Control)	O3	-	O4

Source: (Arikunto, 2010)

Information :

A = Experiment Class

B = Control Class

X = Learning treatment using discovery learning models and Augmented Reality media.

O1 and O3 = Giving pre-test

O2 and O4 = Provision of the post-test

3. DATA AND ANALYSIS

The students' conceptual understanding data was tested by independent sample t-test analysis using SPSS. A questionnaire percentage analysis tested attitudes toward student learning media (Sugiyono, 2014).

4. RESULTS AND DISCUSSION

4.1 Understanding of Student Concepts

Initial ability data on the learning outcomes of control and experimental class students is presented in Figure 1. The results of the pretest mean difference test between the control and experimental classes did not show a significant difference. However, after learning (treated), the average posttest score significantly differs from the pretest score.
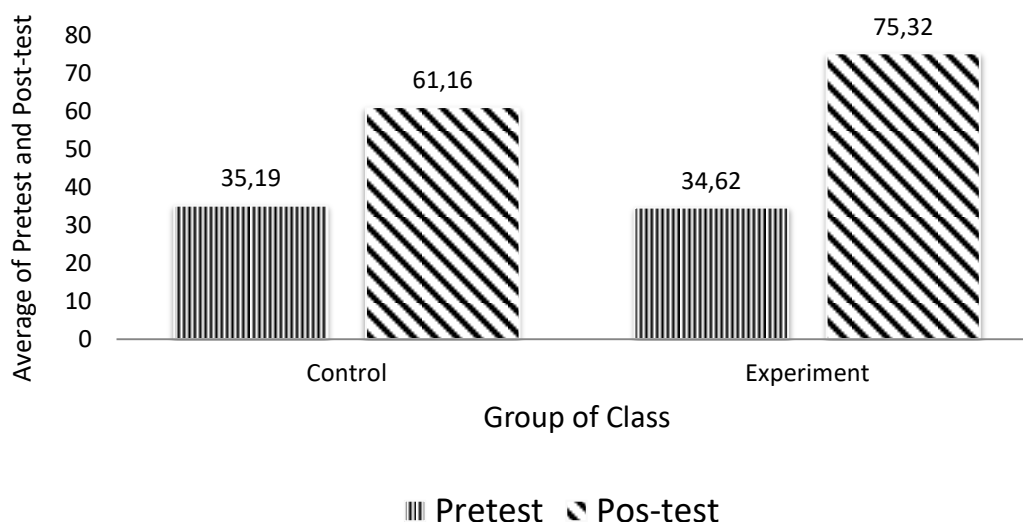
Figure 1. Pretest and Post-test Average Scores

The data in Figure 1 shows that the ability to understand concepts before treatment was not significantly different between the experimental and control classes, with a pretest score difference of 0.57. While the final ability of students has a significant difference compared to the initial ability; namely, the control class has a difference of 25.97, and the experimental class has a difference of 40.7. Thus it can be believed that learning the Discovery Learning model using Augmented Reality affects students' conceptual understanding of sensory system material.

Table 1: Test the average pre-test scores for understanding the concept of the control class and the experimental class.

Class	Pretest Average	Normality *)	Homogeneity **)	Significance
Experiment	34,62	Abnormal Sigs: 0.00	Homogeneous Sigs: 0.419	Not different The Mann-Whitney t-test Sig (2 directions): 0.928
Control	35,19	Abnormal Sigs: 0.00		

Note: *Kolmogrof – Smirnov test, if Sig. > 0.05 (normal)

　　**Levene's test, if Sig. > 0.05 (Homogeneous)

Table 2: Test the average N-Gain score for understanding the concept of the control class and the experimental class

Class	Average N-Gains	Normality *)	Homogeneity **)	Significance ***)
Experiment	75,15	Normal	Homogeneous	Significant

		Sigs: 0.07	Sig: 0.884	t-test
Control	64,63	Normal Sigs: 0.2		Sig (2-tailed): 0.01

Description: *Kolmogorov – Smirnov test, if p > 0.05 (normal)

      **Levene's test, if Sig. > 0.05 (Homogeneous)

      ***t-test, if Sig. < 0.05 (Significant)

The results of the analysis of data analysis (Table 2) show that there is a significant n-gain difference between the experimental class and the control class (Sig. 0.01). There is a significant difference in n-gain. It is believed that the application of the Discovery Learning learning model by using Augmented Reality learning media has an impact on improving student learning outcomes.

Harjono's research (2010) also revealed that the discovery learning model's application increased students' competence as indicated by cognitive, affective, and psychomotor aspects during learning. These results are reasonable because students are taught with a discovery learning model that allows them to find meaning for themselves and learn concepts in a language they understand. Thus a teacher in the discovery learning model can provide students with more independent learning.

4.2 Attitudes Toward Learning Media

Attitudes towards learning media can be seen after distributing questionnaires completed by each student in the experimental class after teaching activities using Augmented Reality media. Based on the results of the attitude data toward learning media, students in the experimental class showed a good category.
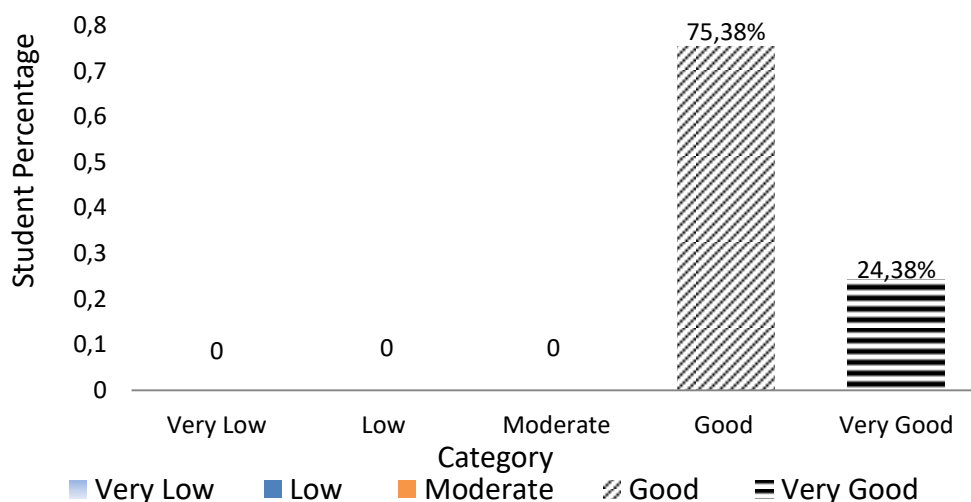

Figure 2 Value of Attitudes towards Learning Media

Figure 2 shows that 49 people (75.38%) are in the good category, while 16 people (24.62%) are in the very good category. With the help of Augmented Reality (AR) learning media, students can understand the subject matter about the sensory system well. Through Augmented Reality media, students can see parts of the sensory system. Not just imagining or just visiting the structure of the sensory system on the outside, but being able to distinguish thdetailsts of the design of the sensory system well.

Learning to use media does increase students' interest in learning. Slameto (2003) states that high interest and motivation greatly influence learning. If the learning material is not in students' interests, students will not study well. However, if the learning material is in students' interests, their interest in learning will also be high.

This media is beneficial for students because it makes students more active in the learning process, and students can easily understand the material provided. Students' activeness in the learning process can help improve their understanding of concepts in the material being taught. The results of this study are to the theory in previous research by (Halidi et al., 2015), stating that Augmented Reality (AR) learning media can

be accepted by students and is considered capable of being used properly in classroom learning. It has good sustainability for use in the future according to to use in the scope of knowledge.

5. CONCLUSION

The research results show that there is a difference in increasing the ability to understand students' concepts by applying the Discovery Learning model using Augmented Reality (AR) sensory systems. Attitudes toward learning media after applying the Discovery Learning model using Augmented Reality (AR) sensory systems are in a suitable category.

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