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The Comparison of Multi Representation Based Module and Text Books on Black Principle Material in Physics Learning Reviewed from Student Retention

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ABSTRACT

Retention was one of internal factors that influenced learning success. The low level of student retention needed tobe a concern of teachers and educational institutions. This study aimed to determine the differences in student retention abilities from the retest results between experimental class who were taught using a multi-representation based module and the control class students who were taught using textbooks on Black principle material. The approach used in this research was a quantitative approach with a quasi-experimental method. Data collection was done by tests using multiple choice questions. Purposive sampling used to select the samples, the sample in this study were 22 students of class XI MIA I as a control class and 22 students of class XI MIA II as an experimental class. Based on the results of data analysis, the retention score of the two classes in an interval of one week was excellent, but the experimental class students achieved higher score than the control class students with a difference of 4.42%. Hypothesis test results obtained t_{count} (1.71) > t_{table} (1.68), mean reject H_o and accept H_a, which means that the retention score of experimental class students was better than the retention score of control class students.

Keyword: Multi representation-based module, textbooks, student retention.

INTRODUCTION

To create a qualified nation, eduation quality is one of crusial aspect needed to be considered. According to Setiyawan (2016: 51), education is a dynamic matter, so it does not rule out the possibility of a better changes to accommodate the advance of science and technology. Good learning is not only transfering knowledge from educators to students, but also allowing students to build their own knowledge, for example by making meaning, impression and looking for clarity.

Sometimes, the abstract characteristics of physics require students to master and manage changes between different representations simultaneously to understand the material. In learning science, many types of representations can be raised. These types include:verbal, visual or picture representations, graphics and mathematics, this is also called

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multirepresentation (Pratiwi, 2017: 2). Representation is a configuration (form or arrangement) that describe, explain, represent, or symbolize a matter. In learning physics, for example Black principle material, if the material is presented in various representations, then they are more easily understood by students, not only explained verbally but also using pictures or graphics such as Ghaderi's statement (2014: 522) stated using entertaining animations improved student idiom retention.

Purwanti. (2017) based on his research on mastery of Kinematics concept in class X high school students using multi representation revealed that the mastery of concepts had increased to moderate category. Fatmala. (2017) stated that contextual learning modules based on multi representations on Newton's Principle of Gravity material have been proven to be effectively used as teaching materials; with product effectiveness testing the N-gain value is 0.53 (moderate). Azizah research (2017) on the development of contextual-based learning modules accompanied by multi-representations on the subject of Heat in SMP, it can be concluded that: (1) the logical validity of this module is considered valid. The module usage validity is categorized very valid; (2) this module is able to improve the ability of multi-representation with a high category N-Gain score; (3) contextual based learning modules accompanied by multi-representation get positive responses.

The results of previous studies indicate that the module as one of the multi-representation based teaching materials effectively used in learning improve students' mastery of concept. Masrinur (2017) states that as one of the printed teaching materials, the module is learning package that deals with a unit of learning material. By using module, students can identify their learning abilities. Generally, students in learn in school using textbooks, but in textbooks not all material is explained in multi representations. Textbooks are one of the main sources of learning in the learning process as well as instructional media and one of the strategies to improve the quality of education (Rafika, 2015: 193). According to Yusriati (2018), textbooks are one of the main learning resources in the learning process for teachers and students.

In learning physics it takes a complete understanding of the concept not only memorization, so students able to solve a problem well. If students do not have a good understanding on the concept, it will be difficult for students to solve physics problems well. Retention is the ability of students to recall material that has been learned (Khairunnisak 2018: 7). Based on previous research results learning using multi-representation based teaching materials make students understand the material better so and it can improve student retention abilities. Hikmawati (2017: 60) asserts that understanding the material well help in remembering the material longer.

Problem of Research

The low of student retention is marked by the difficulty of students in remembering subject matter so that problems will arise because the the slow learning process, this will have an impact on the low learning outcomes. Simanihuruk (2017: 193) states that student learning

outcomes are influenced by several factors both from external and internal students. Some external factors can be in the form of learning models used by teachers, class atmosphere and facilities provided. While the internal factors is students' interest in subjects, motivation, retention.

Based on interviews with teachers at senior high school 1 Kuala school that learning on the following material is hampered or difficult to be mastered by students because the they have forgotten the previous material. It can be concluded that the level of student retention needs to be increased for effectiveness in learning.

Research Focus

In this study, Modules are used as teaching materials based on multi representations, containing an explanation of the physics principles of Black with various representations (visual, pictures, graphics, mathematics), this can lead to a high impression in learning and students are more familiar with the concepts conveyed by the teacher especially on the Black principle. As Tampubolon in Hikmawati (2017: 60) asserts that understanding the material well can help in remembering material longer.

METHODOLOGY OF RESEARCH

General Background of Research

This research conducted at senior high school 1 Kuala, Jalan Nasional Ujong Patihah Village, Kuala District, Nagan Raya Regency. This research was conducted in 2018/2019 academic year, starting on April 11 - April 25, 2019. Data were collected using multiple choice questions, namely the initial test (pre-test), the final test (post-test) and retest in an interval of seven days (retest).

Sample of Research

The sample in this research was 22 XI MIA 1 students of state high school 1 Kuala, who were designated as the control class, and 22 XI MIA 2 students from state high school 1 Kuala, as the experimental class. According to Arikunto (2010: 117) "Samples are part of the population (part or representative of the population under study). The sample selection is done by purposive sampling. Sugiyono (2018: 124) stated that "Purposive sampling is a data source sampling technique with certain considerations".

Instrument and Procedures

This research instrument uses objective test instruments in the form of multiple choice totaling 10 questions with five answer choices, namely: a, b, c, d, and e. One of the test objectives stated by experts is to determine the progress of student learning after participating in learning activities within a certain period (Yusrizal 2016: 92). This instrument measures the aspects of understanding (C2), application (C3) and analysis (C4). Before the instrument is used, validity test was done.

In this study, the test conducted is a test of learning outcomes which include pretest, posttest and retest, retest (repeat method), this method shows the repetition of the same measurements to the same respondent, the same situation, at different times (Margono, 2009: 184) and (Sugiyono 2018: 354). Pretest is done to find out the students' early learning outcomes, posttest is to find out the learning outcomes of students after learning. Retention tests are carried out after the posttest within an interval of seven days or a week to determine the state of students' memories of the material that has been studied using the same test questions.

Data Analysis

The strength of retention is determined by the following formula:

$$R = \frac{r}{p} \times 100\%$$

Calculation results obtained then interpreted to determine the state of student retention using the following criteria:

Table 1 Retention Criteria

Number	Score	Retention Criteria
1	≥80%	Veri Good
2	70% - 79%	Good
3	60% - 69%	Enough
4	50% -59%	Less
5	≤49%	Very Less

(source: Eliyanti, 2018:55).

T test is used to test hypotheses, to determine the difference in average score between two samples from the experimental class and the control class (Usman: 2006). In this study a statistical test t was conducted to determine the comparison of student retention between the control class and the experimental class after learning the use of multi-representation based modules with textbooks. To be able to analyze sample data, normality and homogeneity must be tested first. To test the hypothesis using the t-test statistical formula, with a significant level of 5% (0.05), a one-party test, namely the right-side test. The right hand test is used when we assume "more". For example we assume the average value of physics class I_2 students is better than class I_1 (Hamid, 2013: 116).

RESULTS OF RESEARCH

1. Control Class Retention Test Result

The results of the control class retention tests that were taught based on the textbooks can be seen in Figure 1. By using the formula, the students' retention score of R = 89.04% is obtained. Based on the retention criteria table, the retention value of the control class obtained is in the excellent criteria.

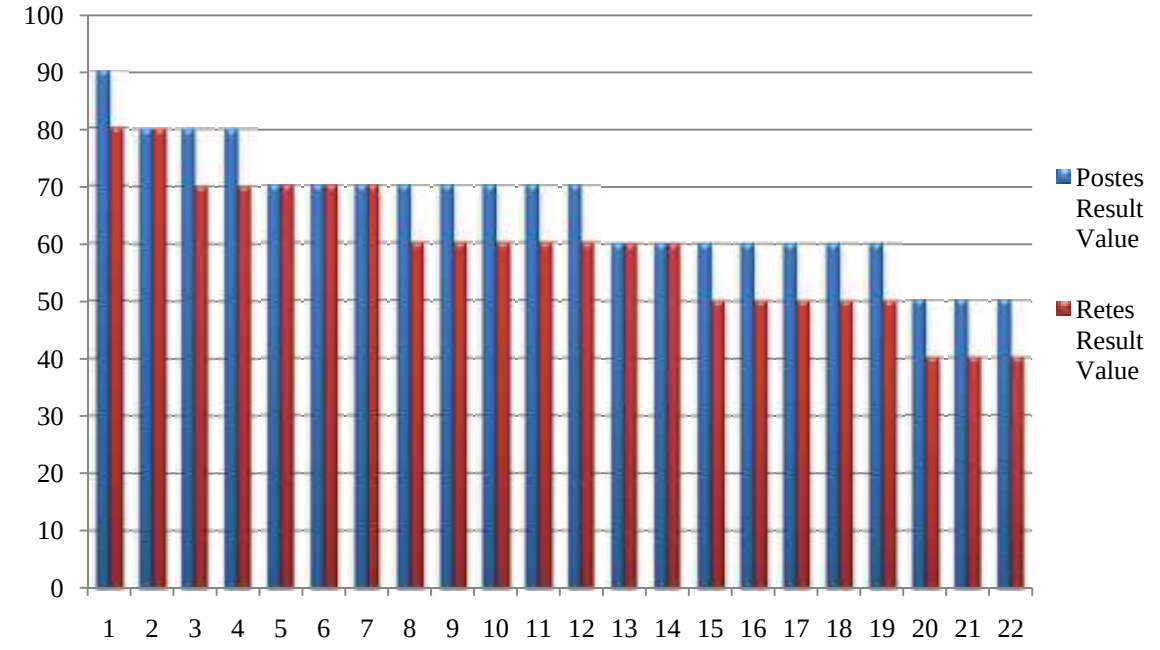

Figure 1. Diagram of Control Class Retention Test Results

According to Figure 1, It can be seen that there is a decrease in student learning outcomes caused by the weakening of memory or student retention. The number of posttest scores in the control class of 22 students was 1460 and the total retest value was 1300, so there was a decrease in learning outcomes of the control class students by 160.

2. Experiment Class Retention Test Results

The results of the retention test of the experimental class taught by using a multi-representation based module can be seen in Figure 2. By using the formula, the student retention score is R = 93.46%. Based on the retention criteria table, the experimental class retention value obtained is in the excellent criteria.

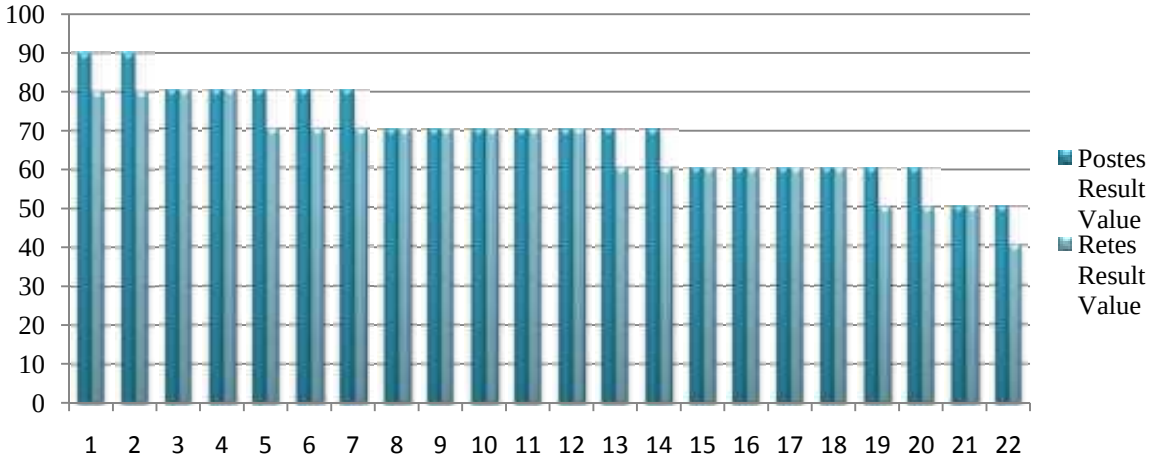

Figure 2. Experiment Class Retention Test Diagram

According to Figure 2, it can be seen that there is a decrease in student learning outcomes caused by the weakening of memory or student retention. The number of post-test scores in the experimental class of 22 students was 1530 and the total retest score was 1430, then there was a decrease in the learning outcomes of the control class students by 100.

3. Combined Retention Test Results for Both Classes can be seen in Figure 3:

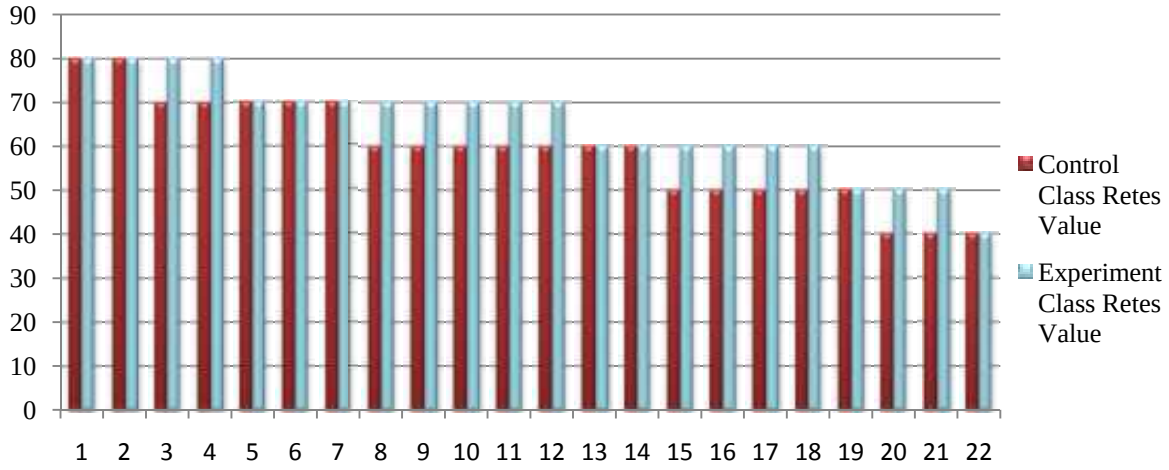

Figure 3. Diagram of Combined Retention Test Results for Both Classes

The results of retention calculation of two classes were in excellent categories. However, the retention value of the experimental class is higher than the control class with a difference of 4.42%, this showed there is a better alter for the retention of students who are taught by using a multi-representation based module. These results are consistent with Verlina's research (2018: 91) that there is a significant influence in the use of multi-representation based contextual modules on learning Newton's principle of Gravity.

Data obtained using t-test with a significance level of 5% with degrees of freedom dk=42, obtained T_{count} of 1.71 while T_{table} of 1.68. This shows that the T_{count} is greater than T_{table}, reject H_o and accept H_a, which means the retention score of the experimental class students is better than the retention score of the control class students.

The difference in retention test results between the two classes is due to differences in teaching materials used during learning, especially on the principle physics of Black. Control class students who are taught with textbooks, rely on explanations from the teacher about the concept, because the textbooks are less varied in the representations used. Whereas students who are taught with multi-representation based modules, after hearing the explanations from the teacher, they re-read the module with more representations available and read the representations are easier to understand so their retention abilities are better.

CONCLUSIONS

Student retention taught using multi-representation based modules scored 93.46% while students taught using textbooks scored 89.04%, the difference between those two classes was 4.42%. This showed that there are significant differences in learning by using multi-representation based modules on Black principle. Based on the hypothesis test using the t-test obtained $T_{Count} > T_{table}$ (1.71> 1.68), then H_a is accepted. From the results obtained, it can be concluded that there is a better alter in learning using a multi-representation based module on student retention abilities at state high school 1 Kuala on the Black principle.

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