The Effect of Elaboration Learning Model on Physics Learning Outcomes in High School Students

by

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Abstract

This study aims to determine the significant effect of the elaboration learning model on students' physics learning outcomes on the subject matter of electromagnetic waves in class X semester II SMA Swasta Al Washliyah 3 Medan. The research sample was class X-1, which consisted of 30 people as the experimental class and as the control class, X-2, which consisted of 30 people. As a data collection tool, a test of students' physics learning outcomes was used in the form of multiple-choice as many as 20 questions which were tested for validity and reliability. From the results of the study, the average value of the experimental class was 76.44 with a standard deviation of 11.97 and the control class average was 71.33 with a standard deviation of 11.76. Hypothesis testing is done by using the t-test. From the t-test of the two samples, it was obtained that t_{count} = 1.669 at a significant level = 0.05 and dk = 78 and the value of t_{table} = 1.590. It is obtained that $t_{count} > t_{table}$ or 1,669 > 1,590. The conclusion of this study is that there is a significant effect of the Elaboration Learning Model on physics student learning outcomes on the subject matter of Electromagnetic waves in class X semester II SMA Swasta Al Washliyah 3 Medan 2020/2021 academic year.

Keywords: elaboration, learning model, learning outcomes.

Introduction:

Learning is a system in which a number of components or elements are related to each other. The interaction between teachers and students during the learning process plays an important role in achieving the desired goals (Anderson and Krathwohl, 2001). The possibility of teacher failure in conveying a subject is due to the lack of interaction and communication between students and teachers during the learning process (Am, 2011).

Physics is a branch of science that emphasizes providing direct experience to develop students' competence in understanding physics concepts. To study physics, there are several aspects that must be considered such as representation, construction and cooperation. In physics learning, students need to listen carefully, actively and rewrite important statements or comments expressed by friends and teachers. The factors that cause low student learning outcomes are the lack of teacher ability in using varied learning models (Fathurrohman, 2015).

In the process of learning physics, students tend to feel bored with the teaching given by the teacher. This is due to the lack of teacher ability in managing learning in the classroom particularly in using various models, methods and learning media. As a matter of fact, students in learning become passive recipients of the information. In other words, low student involvement

and activity results in low student interest in studying physics so student learning outcomes are not optimal.

Based on observations from several previous studies on learning models, researchers want to examine the effect of one learning model, namely the elaboration learning model. It is hoped that by using the Elaboration learning model, student learning outcomes in physics can be improved.

From several learning models, the researcher chose one learning model, namely the Elaboration Learning Model. The Elaboration model learning strategy is a strategy that organizes the learning content so that the learning model can improve students' physics learning outcomes (Ngalimun, 2014). Cognitive psychology becomes the theoretical foundation of the Elaboration theory. Two areas support the expertise of the Elaboration theory, namely

i. The theory of the structure of cognitive representations, and
ii. The memory process, namely the mechanism of encoding, storing, and re-disclosing what has been conveyed, and re-disclosing what has been stored in the memory.

According to Istarani (2011), the characteristic of the Elaboration model learning model is that it starts learning from content presented at the general level moving to the detailed level.

Literature Review:

The Nature of Learning and Learning Outcomes:

Learning plays an important role in human life. Many understandings of learning put forward according to experts include:

i. Sardiman (2007) states that learning is a change in behaviour with a series of activities, for example by reading, observing, listening, imitating, and so on.
ii. Perdana and Slameto (2016) also states that learning is an effort made by a person to obtain a new behaviour change as a whole, as a result of his own experience in interaction with his environment

Learning outcomes are the results obtained by individuals after receiving learning in the form of mastery which is usually indicated by values and numbers. Rivai and Sudjana (2009) suggest that learning outcomes are abilities possessed by students after they receive their learning experiences.

Elaboration Learning Model:

Elaboration Learning Model is a learning process that adds ideas based on what has been known previously so that they can be remembered easily. Elaboration theory is a theory of instructional design based on the argument that lessons should be organized from simple material to complex expectations by developing understanding in a more meaningful context so that they develop into integrated ideas.

The elaboration approach develops in line with the growing paradigm shift from teacher-centred learning to student-centred learning as a new need in implementing learning steps. From the mind of Reigeluth (1983) was born a design that aims to assist the selection and sequencing of

materials that can improve the achievement of goals. The proponents of this theory also emphasize the importance of the functions of motivator, analogy, summary, and synthesis that help increase the effectiveness of learning. This theory also pays attention to the complex aspects of cognitive and psychomotor learning. The basic idea is that students need to develop contextual meaning in the order in which knowledge and skills are assimilated. According to Istarani (2011), the elaboration theory serves to show the interrelationships between concepts.

The advantages of the elaboration theory are:

i. There is a systematic sequence of instructions covering the whole so that it is possible to increase motivation and meaningfulness.
ii. Give students the possibility to learn and explore various things and decide the order of the learning process according to their wishes.
iii. Facilitate students in developing the learning process quickly.
iv. Integrating various approach variables according to the theoretical design.

Elaboration theory proposes seven main strategy components that are the following:

i. Elaboration sequence
ii. Learning prerequisite sequence
iii. Summary
iv. Synthesis
v. Analogy
vi. Cognitive strategy, and
vii. Student control.

Elaboration-based learning characteristics:

i. Familiarize students to read and write a variety of things through certain tasks.
ii. Facilitate students to come up with new ideas through assignments.
iii. Give students the opportunity to think, analyze, solve problems and act without fear.
iv. Cooperative.
v. Compete in a healthy manner.
vi. Make a report.

According to Istarani, (2011), there are seven principles developed in the elaboration learning model, namely:

i. Presentation of the content framework, which shows the main parts of the field of study and the main relationships between these parts.
ii. Elaboration in stages, are the parts included in the content framework that will be elaborated in stages.
iii. The most important part is presented first, meaning the Elaboration stage or the considerations used, which is the most important part that will be elaborated first.
iv. Optimal scope of Elaboration, meaning that the depth and breadth of each Elaboration will be carried out optimally.
v. Presentation of the synthesizer in stages, meaning that the synthesizer will be given after each elaboration.

vi. Presentation of the type of synthesizer, meaning that the type of synthesizer will be adjusted to the type of content in the field of study.
vii. The stage of giving a summary, meaning that a summary will be given before each presentation of the synthesizer.

The learning steps based on the Elaboration model according to Wena (2009, p. 29) areas in the following chart:

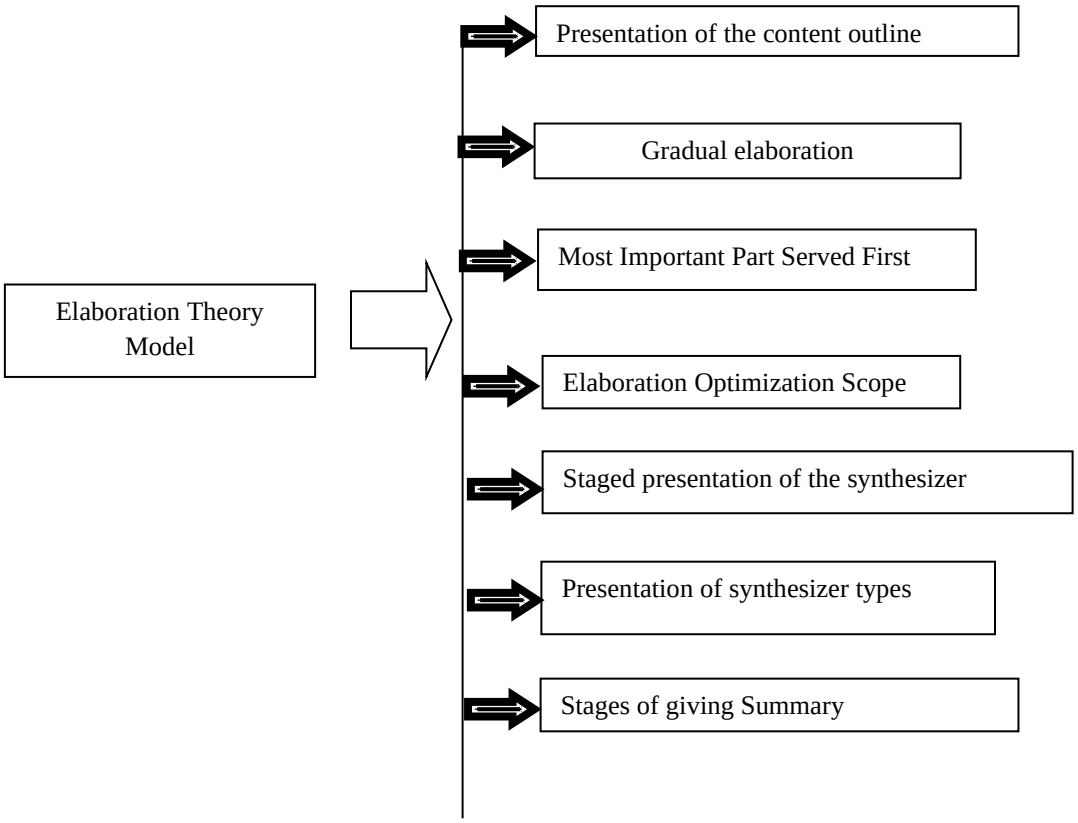

Figure 1: Elaboration Theory Model (Wena, 2009)

Research Design:

This type of research is experimental research. The research design used is a design that processes post-test data (Sugiyono, 2013). This research data is in the form of quantitative data which is useful for finding student learning outcomes in the form of numbers, namely student learning outcomes tests. The steps in this research are:

i. Determine the sample class from the existing population
ii. Give treatment to both classes, in the first class, namely the Elaboration class with the Elaboration learning model, while the conventional class is given treatment with the conventional learning model.
iii. Provide post-test to both classes to determine student learning outcomes on the material that has been taught.

iv. Perform post-test data processing.
v. Summarizing research results.

Population and Research Sample:

The population in this study was all students of class X semester II of SMA Swasta Al Washliyah 3 Medan. It consisted of 2 classes totalling 70 people. Each class consists of 35 people. The research sample is class X-1 and the comparison class is class X-2.

Research result:

Table 1: Data Value of experimental class and control class

Experimental Class				Control Class			
Correct Answers	**Marks**	**Frequency**	**Average**	**Correct Answer**	**Marks**	**Frequency**	**Average**
1	8	1		1	7	2	
2	9	2		2	8	3	
3	10	3		3	9	1	
4	11	4		4	10	4	
5	12	5		5	11	4	
6	13	6	76.44	6	12	6	71.33
7	14	7		7	13	6	
8	15	6		8	14	5	
9	16	6		9	15	3	
10	17	4		10	-	-	
Total		**30**		**Total**		**30**	

From the data above, the experimental class test results found:

Then the average value is

$\bar{X} = \frac{\sum x}{n}$ = 76,44

The standard deviation is: $s = \sqrt{\frac{n(\sum X_{-1}2) - (\sum X1),^2}{n(n-1)}}$ = 11,97

The value of the variance is s^2 = 143, 24

For testing the control class the average value is:

$\bar{X} = \frac{\sum x}{n}$ = 71, 33

The standard deviation is:

$s = \sqrt{\frac{n(\sum X_{-1}2) - (\sum X1),^2}{n(n-1)}}$ = 11, 96

The value of the variance is $s^{2 =}$ 138,39

Normality test 1:

For the normality test from the data above using the Liliefors test, the results for the experimental class (L) = 0.1071 for the control class obtained the results L (L) = 0.1550 at the real level = 0.05, then the value of L_{table} = 0 is obtained,1616

Because L0 (L_{count}) does not exceed L_{table}, so it can be concluded that the pretest data for the experimental class and the control class are normally distributed.

Normality test 2:

To find out whether the data from the two classes has a homogeneous variance or not, the two-variance similarity test is used with the formula:

$$F_{count} = \frac{S_1^{\,2}}{S_2^{\,2}}$$

$S_1^{\,2}$ = biggest variant

$S_2^{\,2}$ = smallest variant

With the test criteria: accept the hypothesis H0 if $F_{(1-\alpha)(n_1-1)} < F_{\frac{1}{2}\alpha(n_1-1,n_2-1)}$

or if $F_{count} < F_{table}$ obtained from distribution list F. The price of F_{count} = 0.88 does not exceed F0.05 = 1.90, it can be concluded that the sample comes from a homogeneous population

Hypothesis Test:

In testing the hypothesis, the t-test is used with the formula:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Where S is the combined variance calculated by the formula:

$$S = \sqrt{\frac{(n_1-1)S_1^{\,2} + (n_2-1)S_2^{\,2}}{n_1 + n_2 - 2}}$$

Experimental class:

$\overline{X}_1$ = 76, 44 s_1^2 = 143, 24 n_1 = 30

Control class:

$\overline{X}_2$ = 71, 33 s_2^2 = 143, 24 n_2 = 30

In testing the hypothesis, a one-party t-test formula is used, with the hypothesis:

H_0: $\mu_1 = \mu_2$ There is no difference in student learning outcomes in the experimental class and the control class, meaning that there is no effect of the Elaboration learning model.
H_a: $\mu_1 \neq \mu_2$: : There are differences in student learning outcomes in the experimental class and the control class, meaning that there is an effect of the Elaboration learning model.

With the test criteria H_o is rejected if $t > t_{1-\alpha}$ and in other things

With s = 11.867 and t = 1.669

Because the value t_{count} is greater than the price t_{table} (1.669 > 1.590) or falls in the acceptance area H_a, H_a is accepted and H_o rejected. Thus, it can be stated that the learning outcomes in the elaboration learning model are better than conventional learning. In other words, there is the effect of the Elaboration learning model on students' physics learning outcomes on the subject matter of Electromagnetic Waves in class X Semester II of Al Washliyah 3 Private High School Medan 2020/2021 academic year.

Discussion:

Learning in the experimental class and control class was given different treatments. In the experimental class, learning is carried out using the elaboration model, while the control class uses a conventional model, namely by explaining lectures and giving examples of questions. From the results of different treatments, the experimental class students' learning outcomes were higher than the control class. This is indicated by the acquisition of the average posttest score in the experimental class of 76.44 with a standard deviation of 11.97. Meanwhile, in the control class, the average posttest score was 71.33 with a standard deviation of 11.76.

Based on the results of the calculation of the difference in the average value of the posttest, experimental class and control class, it was obtained that $t_{count} = 1.669 > t_{table} = 1.590$, then H_0 was rejected and H_a was accepted, so that it was concluded that there was an effect of the Elaboration learning model on students' physics learning outcomes. on the subject matter of Electromagnetic Waves in class X semester II of Al Washliyah 3 Private High School Medan 2020/2021 academic year.

By using the elaboration learning model the teacher can stimulate students' thinking by inviting students to summarize and synthesize the lessons that have been explained by the teacher on the subject matter of Electromagnetic waves in class X semester II of SMA Swasta Al Washliyah 3 Medan 2020/2021 academic year which aims to increase students' experience or knowledge about physics concepts so that learning feels more meaningful because this learning model makes students active in the learning process.

By doing posttest to students at the final meeting where the average value of student learning outcomes in the class that uses the Elaboration learning model is 76.44 with the highest score of 93.33 as many as 4 people and the lowest score of 53.33 as many as 2 people and the lowest score of 53.33 the standard deviation is 11.97. The learning outcomes obtained in this study only used a measuring instrument in the form of a written test in the form of multiple choices.

The research carried out has several weaknesses, including class conditions that are difficult to control because discussion opportunities in the learning process provide opportunities for students to be noisy so that the class is easily chaotic. Another aspect is also about the insufficient time allocation. The researcher has also difficulty when applying the existing phases in the Elaboration learning model because students tend to be passive.

The expectations contained in this model have not all been achieved with good results, while the factors that cause this condition to occur are because students are not familiar with the previous Elaboration model, so it takes time to adjust to students during the learning process. Therefore, in the learning process, students should be taught using a more varied learning model so that students are able to understand physics subject matter effectively and efficiently.

Conclusions and Suggestions:

Based on the research results obtained from data analysis, hypothesis testing and data processing, it can be concluded that the learning outcomes of physics taught using the elaboration learning model have an average score of 76.44 while the learning outcomes of physics taught using the conventional learning model has an average score of 71.33. From the results of the statistical calculation of the t test, it turns out that $t_{count} > t_{table}$ or 1,669 > 1,590.

So, it can be concluded that there is a significant influence from the use of the Elaboration learning model on students' physics learning outcomes on the subject matter of "Electromagnetic waves" in class X even semester of SMA Swasta Al Washliyah 3 Medan 2020/2021 academic year.

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