

# The Effectiveness of Using Figure on Physics Learning Results in Topics of Temperature and Calor

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## ABSTRACT

This study aims to analyze the effect of using concrete teaching tools on physics learning outcomes on the subject of temperature and heat of senior high school students. All the students of grade 11 of the Natural Sciences program at ESG 1 Baucau became the population. The sample of this research was 66 students of grade 11 Trimester I Natural Sciences at the same school. Researchers used experimental methods, tests, observations, questionnaires, and documentation to collect data. The instrument organized by the researcher with a field-test to test validity and reliability. The Alpha Cronbach = 0.66 and KMO = 0.73 shown the instrument are valid and reliable to collect the data. Data analyzed with simple linear regression. The result shows that the correlation coefficient value ( $r$ ) has 72.5%, which means positive and significant impacts. The  $t_{count} = 8.137 > t_{table} = 1.997$ , significant = 0.005. Furthermore, the  $Y = 1,264 + 0.590$  shows a significant impact because the leaning value increased to 0.590. Meanwhile, the  $R^2 = 52.6\%$ . These results proved that the use of concrete teaching tools determines the increase and decrease in the learning outcomes of students. This finding concluded that there was a significant impact of using the concrete teaching tools on physics learning outcomes on the subject of temperature and heat of the grade 11 of students majoring in Natural Sciences in Trimester I ESG 1 Baucau, East Timor. This finding recommended to all the Physics teachers who teach in senior high school and subsequent researchers.

**Keywords:** concrete tools, learning outcomes

## 1. INTRODUCTION

Timor Leste is a newly independent country in Century 21. As a new country, the Timorese Government needs to qualify Human Resources (HR) to build the nation [1]. Here, to get the qualified people to obtain through adequate education curriculum and system. The Constitution of the Democratic Republic of Timor Leste article 59 stated: (1) the Government recognizes and ensures all citizens are entitled to education and culture, and builds an education system general and mandatory basis based on law; (2) all people have the same rights to the opportunity for school and vocational/professional training; (3) the Government recognizes and promotes private schools and collaboration; (4) the Government must ensure that all citizens are based on their ability to obtain a higher education in scientific research and live the arts (Government of Timor-Leste, 2014; Costa et al., 2019). Education is the only way to humanize people [4]. The teaching and training implemented the Constitution mandate and curriculum line.

Education and teaching skill of the teachers are essential steps to developing student knowledge. The

teaching skill expresses in the teaching process. Therefore, each teacher has to own that skill. Skilled teachers encouraged students to develop critical, creative and practical thinking and skill. The consequences of the critical thinking of students can smart however, lack of practical skill. Therefore the teachers teaching capacity have to linear with the education quality (Richardson et al., 2012; Malik, 2013; Solesvik, 2013). Furthermore, the school manager can determine the system of the learning process. Thus achieving the process is an essential step to improve the quality of education and to shape the learning process. Learning becomes a process of behavior-changing and as a result of interactions between the environment and the needs of life. Therefore, the educational process always takes place in a social environment between educators and students relationships and students and other people involved in educational interactions. It can take place in the family, school, and community (Radulescu & Radulescu, 2011; Chowa, Masa, & Tucker, 2013; Liyanage, et al, 2013; Ismail, et.al, 2018).

The low quality of education, especially Physics, is certainly subject to the study of many parties, and the factors that cause the low quality of Physics education.

The problems that cause not only came from external but also internal factors. Those external problems are more difficult to overcome. External factors mean the outsider problems that students face in the learning process such as environments, family, school, and community. Its composing of learning subjects in school level, including the field of physics studies (Alqudah & Alsubhien, 2014). It is one of the basic sciences that play an important role in supporting science and technology (Todt & Luján, 2014; Han & Gurluyer, 2017). It is known that Physics is a part of natural science that is carried out in the field of basic science and a series of processes that are based on scientific attitudes in everyday life.

The teacher teaches the student by using the props to explain the topics about facts, concepts, and principles, through certain procedures to express learning subject more concrete. Without hard tools, it is difficult to achieve the expected goals in an educational institution (Tolan & Deutsch, 2013; Amin, 2013). Teachers used nonmaterial and material tools in educational activities. The nonmaterial tools consist of orders, prohibitions, advice, and so on. While, the material consists of globe, blackboard, limestone, drawings, diagrams, paintings, slides, videos, and so on. The teaching and learning process at ESG 1 Baucau focused on the subject in regards to temperature and heat. It because the students are taught only to understand the contents of the material through the teacher's explanation and exercises but without using a concrete tool that makes students understand well.

In essence, the teaching and learning process is a process of communication between teacher and student. In transferring the knowledge, experience, and ideas of the teacher to students or from students to other students is not easy. This activity is very dependent on the smooth communication interaction between the teacher and students; the lack of fluency of communication has an impact on the message given by the teacher. The teacher has the responsibility to communicate, it to avoid misunderstanding and misconception in the learning process. Effective communication methods become a method to construct knowledge, experience, and ideas. This is the purposes of communication so that the others understand the content of messages.

This method impacts consequences to the teacher the need to understand the process of forming students' conceptions so that teachers can design and implement the learning that advances student knowledge towards a more scientific and reduce various student conceptions.

### **1.1 Figure Tools**

Props are the instrument that facilitated student to achieve the learning goals. While, visuals are teaching media to display in and outside of the classroom (Coon & Mitterer, 2008; Endedijk et al., 2015). Props in the form of concrete objects that can be moved and not be presented in the form of textbooks [17]. Props are tools used to display certain facts, concepts, principles and

procedures to make them concrete (Nenkov et al., 2014). Furthermore, educational tools become factors that intentionally used to achieve educational goals. The educational tool used to plan the learning actions (Ginsberg, 2014; Trickey et al., 2015).

Teaching tools commonly referred to a learning media. The media that teacher used to stimulate the student imagination in regards to the learning subjects. Mentioning teaching tools is a three-dimensional model. It becomes real objects. Model teaching tools make a learning material more understandable to the student. Props help students to know exactly the characteristics of learning objects, and meaning. Therefore, using concrete teaching aids become one method for teachers to explain abstract physics concepts (Haugen, 1994; Lam, 2011; Gurbini, 2015). The benefits of using learning tools are learning with assistive devices for teachers and students to learn. Explanation matter through visualization helps the student to understand better. The teaching aids are two forms of such as real objects and models (Morgan, 2012; Tofade et al., 2015).

Props have six values in the teaching process [27] : (a) explaining the concept, (b) formulating a concept, (c) train students to get new skills, (d) reinforcement of concepts, (e) train students in problem-solving, (f) train students in measurement, (g) encourage students to think critically and analytically. Existing two sides of using props in teaching and learning process are advantage and disadvantage. Advantage of using the concrete teaching tools was to foster, to clarify, to teach and to activate student in learning. Disadvantages in using the props are: requiring more teachers, needing materials and spent more time. Furthermore, using tools are more clearly in expressing the educational idea (Carlson & Lambie, 2012; Goulding & Syed-Khuzzan, 2014). The role of teaching tools mentioned[30] as follows: (a) to make education more effective by increasing student enthusiasm, (b) to facilitate student individuals, (c) to faster learning immediately corresponds in and outside of the classroom (d) to enable teaching more systematic [31]. Physics is a collection of scientific products from the process of studying natural phenomena. Physics learning is essentially a product and process as the application of knowledge (Heilbronner, 2013). Furthermore, efforts to study physics are not only related to formulas, numbers, and operations, but physics is also related with ideas and abstract concepts [33]. Studying physics is essentially a high mental activity to understand the meaning of structures, relationships, symbols, and concepts to real situations to express changes in behavior. It to create an harmony based on the natural law (Maftei, 2011; Panagiotakopoulos, 2013; Kuhn & Müller, 2014; Clark, et al., 2015). Furthermore, one of the changing behavior is expressed in learning outcome.

Learning achievement was the result of the learning process though an evaluation in a certain period. Learning achievement appeared in the behavioral, cognitive, psychomotor and affective changing (Houle, 2013; Burdick-will, 2013; Tao & Hong, 2014; Carolan & Wasserman, 2015; Durso et al., 2016;

Alotaibi, 2017). Furthermore it expresses though symbols, numbers, letters and sentences (Kalenkoski & Pablonia, 2017; Costa et al., 2019). Based on the above description, it can be concluding learning outcome is the result of student ability in a particular field of study through test. At this research, the learning achievement is the students at ESG 1 Baucau achievement expressed in the form of scores in regarding Physics subjects.

**2. RESEARCH METHODS**

This research was conducted at ESG 1 Baucau Vila Distrito Baucau, for 10 days starting on February 4-13 at I Trimester in 2019. The study population was all ESG students in grade 2 with Trimester I Natural Sciences at ESG 1 Baucau totaling 193 with a sample of 66 students. Based on the calculation results obtained a sample of 65.87 or rounded 66 students [40]. Researchers used experimental methods (quantitative framework) tests, observations, questionnaires and documentation at this research. This study has two variables such as using figures as independent variables and physics learning outcomes become the dependent variable (Hanson et al., 2005; Molina-Azorin, 2016).

The researcher organized an instrument of the using figure. It composes of 10 items. These items as result of field-test to obtain the points of validity and reliability. The SPSS 21 for Windows used to analyze the trial data. The results showed r positive results and r count > r table, then the validity with a significance value < 0.05. Furthermore, the points of Alpha Cronbach is 0.66 and KMO = 0.73. It showed that instrument is valid to collect the data. This research conducted at the same high school but in different classes. The researcher used Linear simples regression analysis to analyze the data (Caro, 2011; Da Costa, et al., 2017).

**3. RESEARCH RESULT**

Analysis of the influence of the use of concrete teaching aids on learning outcomes of Class II Natural Science I students in ESG 1 Baucau using the calculation of the determinant matrix method. The results of the t-test its comparing the probability of tcount with the level of significance (0.05). It can see in the table below:

**Table 1 Uji t for both classes under investigation**

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.264	.342		3.702	.000
Variable X	.590	.072	.713	8.137	.000

a. Dependent Variable: Variable Y

The results of the regression analysis showed that the degree of freedom  $df = n-k-1 = 65$  at the 95% confidence level with a probability value of  $8.137 > t\text{-table} = 1.997$  at the error rate (5%) so that  $H_0$  was rejected and  $H_a$  accepted. This fact means that the use of concrete teaching aids has a significant effect on student learning outcomes because the value of t-count for the use of concrete teaching aids = 8.137 on a table with  $df$  65 and a significance level of 0.05 is obtained by 1,997, because t-count > t table then  $H_0$  is rejected and accept  $H_a$ .

Based on the above analysis, it was formulated that  $Y = 1,264 + 0.590X$ . Interpretation of the regression line

coefficient shows that if the variable constant learning outcomes = 1.264 if the variable use of concrete props increased one by one, then the learning outcomes variable has a positive impact of 0.590. The coefficient implemented to discover the impacts of the independent on the dependent variable. If the correlation coefficient approaches 1 then the relationship is very strong and unidirectional. If the correlation coefficient is close to (-1) means the relationship is strong and in the opposite direction, whereas if the value of the correlation coefficient is 0 then the relationship is weak.

**Table 2 Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.725a	.526	.518	1.584	1.930

a. Predictors: (Constant), Learning Environment

b. Dependent Variable: Learning Motivation

Based on the analysis results obtained the correlation coefficient= 0.725. This value shows a positive, strong and direct effect. This fact indicates that if academic achievement increase because of using e concrete

teaching aids, It will increase the student learning outcomes and vice versa. The coefficient of determination  $R^2 = 0.526$  the use of concrete teaching aids determines the graph of student learning outcomes

in ESG 01 Baucau. Meanwhile, 47.4% is caused by other factors.

#### 4. DISCUSSION

The results of simple linear regression analysis showed that the use of concrete teaching aids had a significant effect on student learning outcomes in ESG 01 Baucau, by 52.6% while the remaining 47.4% influenced by other factors. The results showed that the t-test (t-test) the use of concrete teaching aids significantly affected the learning outcomes of students with a t-count of  $8.019 > t\text{-table of } 1.997$ . The  $t\text{-test}$  results appear in  $t\text{-count}$  ( $8,137 > t\text{-table}$  ( $1,997$ ), then the alternative hypothesis ( $H_a$ ) is accepted and  $H_o$  was rejected. This fact proves that there is a positive and significant influence between the use of figure and student learning outcomes. The learning outcome is the result of the student increase when used the figure in teaching and explaining the temperature and heat. This means the correlation coefficient between the uses of Figure with student learning outcomes of 8,137.

This finding can be generalized for schools and even schools of the same level throughout the country. If the use of concrete teaching aids is improved then student-learning outcomes will increase as well or vice versa. So, to teach the concepts of temperature and heat to students based on the theory and practice. However, it is necessary to make a simple and concrete teaching tool used by the teacher in order to make the lesson enjoyable so that it can improve learning outcomes.

#### 5. CONCLUSION

Based on the results of the analysis and discussion above, it can conclude that there is a positive and significant influence between the uses of the figure on the learning outcomes of Class II students of Natural Sciences in trimester I at ESG 01 Baucau. This fact appears in the correlation coefficient = 0.725. Furthermore, the results of the hypothesis test obtained  $t\text{-count} = 8.137 > t\text{-table} = 1.997$  with a significant value = 0.005. Simple linear regression equation  $Y = 1,264 + 0.590 \cdot X$ . Value = 52.6%. Then 52.6% of the factors using concrete teaching aids affect the ups and downs of student learning outcomes. The results of this study were suggested to the Government of Timor Leste especially the Ministry of Education require the use of physical teaching aids in ESG schools throughout Timor Leste. Furthermore, it is recommended to the physics teachers to use concrete teaching aids in delivering physics lessons. The next researcher is recommended to continue the research by using other material.

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