

# C7\_Kusmiyati

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# Inquiry Learning Model to Improve Student Cognitive Learning Outcomes in Temperature and Heat

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**Abstract:** This study aims to describe the effectiveness of the inquiry learning model to improve students' cognitive learning outcomes at the temperature and heat of class XI from one public school (SMAN 1 Gerung). This type of research is a quasi experiment with the basic pattern "The One Group Pretest-Posttest Design" and descriptive method. The research instrument used was the observation sheet applying the learning model and test the learning outcomes in the cognitive domain (C1 to C6). Assessment of learning implementation using a scale of 1 to 4. Student learning outcomes are said to be complete if 80% of students obtain a minimum value of 75. The results of this study indicate that: the implementation of learning increased from the criteria both in the first meeting to rise to be very good criteria at the fourth meeting. Student cognitive learning outcomes increased from 43 in the pre-test to 78 in the post-test, with classical completeness of 84%. The conclusion of this study is inquiry learning effectively improves students' cognitive learning outcomes in temperature and heat.

**Keywords:** inquiry learning; cognitive; temperature; heat

## Introduction

Physics is a part of science that focuses its study on the matter, energy, and the relationship between the two Gunawan, et al., (2015). The High School National Examination Results report shows that the test scores for Physics subjects at the national level are in category C with an average score of 67.43, at the provincial level West Nusa Tenggara is also in category C with an average value of 58,95, and at the level of West Lombok Regency, even the physics test scores are in category C with an average score of 63.03. The percentage of mastery of matter in Physics in West Lombok Regency for Tested Capabilities namely Heat and Thermodynamics is 59.74. The value for the indicator that is determining the variation of a substance, changing the heat / black principle in problem solving is 66.62 (Puspendik, 2015). The low

test scores are influenced by the level of mastery of physics material by students in high school.

The physics learning process is still done conventionally, where when learning takes place it is still teacher-centered (Febriani, et al., 2019). Other problems that can be found at the time of physics learning at school are that teachers pay less attention to aspects of learning styles of students. This can affect the learning outcomes of students because there are special characteristics that distinguish each other learners based on their learning style (Nurmayani, et al., 2016). A good teacher is expected to be able to master various learning models and methods and be able to compile innovative learning media so that they can facilitate students in achieving learning goals. The selection of models, methods, and learning media depends on various factors such as the characteristics of the learning material, characteristics of students, facilities and infrastructure, mastery / experience of the

teacher. Physics as a branch of science requires a learning process that involves students directly in finding concepts (Hikmawati, et al., 2018).

Learning models that can improve student learning outcomes in the cognitive, affective, and psychomotor domains are inquiry learning models. Inquiry learning can be used to train students' critical thinking skills. Inquiry learning students will be actively involved in learning both physically and mentally (hands on activity) through experimenting with activities, observing, asking, analyzing data, and making conclusions. Student centered inquiry learning has been shown to improve students' critical thinking skills. Critical thinking skills of the students to continue to develop should be to trained critical thinking skill continuously adjusted with the characteristics of learning that one of them using inquiry learning (Suryanti, et al., 2018).

Education were different from those with inquiry-based learning only. The difference is found between the average obtained in each group and the learning activities that have been done. The students who have high problem-solving skills are able to scientifically literate and make correct problem-solving procedures that affect the scientific literacy of students. It is resulted that students are able to make scientific decisions to solve the problems appropriately. This study is recommended for further researchers who wish to explore more in-depth problem-solving skills and scientific literacy of students on inquiry-based learning for the work and energy topic (Yuliati, et al., 2018). Guided inquiry model is effective to improve students' science process skills seen from the improvement of students' test results (Hidayah, 2018). The precise inquiry method is used as an alternative to effective learning methods for the application of the scientific approach to the 2013 curriculum at the level of Senior High School with various students' learning modalities, in addition, Inquiry with kinesthetic modalities has the best effect in tackling student learning outcomes (Ariani, 2018). This study aims to apply the inquiry learning model to improve students' cognitive learning outcomes in temperature and heat.

## Method

The research method used in this research is quasi experiment, with the basic pattern "The One Group Pretest-Posttest Design" and descriptive method (Arikunto, 2006). Subjects in this study are the students of grade XI of Senior High School 1 Gerung in the academic year 2018/2019. Learning material taught using the inquiry learning model as much as 4 meetings is temperature and heat.

The instrument used for this study is the observation sheet applying the inquiry learning model and learning outcomes tests on the cognitive domain (C1 to C6). Assessment of learning implementation uses a scale of 1 to 4, namely score 1 if not done at all, score 2 if done, but not completed, score 3 if done, but not right, and score 4 if done, appropriate, and systematic (Ministry of Education and Culture. 2013). Criteria for observing the implementation of learning are shown in Table 1.

Table 1. Criteria for implementing learning

No.	Score	Criteria
1	3.50-4.00	Very good
2	3.00-3.49	Good
3	2.00-2.99	Less good
4	1.00-1.99	Not good

Student learning outcomes are said to be complete if 80% of students obtain a minimum score of 75. Scores for improving learning outcomes in the cognitive domain are obtained through the difference between the final test scores and the initial test.

## Result and Discussion

The stages of the inquiry learning model used in this study consisted of six stages, namely identification and formulation of the problem, hypothesis formulation, data collection, data interpretation, development of conclusions, and repetition (Jufri, 2010). The results of observations on the implementation of learning for four meetings are shown in Table 2.

Table 2. Criteria for implementing inquiry learning models

No	Meeting	Average score	Criteria
1	First	3.00	Good
2	Second	3.33	Good
3	Third	3.50	Very good
4	Fourth	3.67	Very good

Based on Table 2 it can be said that the implementation of learning increased from the criteria both in the first meeting to rise to be a very good criterion at the fourth meeting. This shows a better quality of learning. The approach of inquiry-based science issues is expected to help students grow their skills aspect in particular practical skills since they conduct investigations through practicum activities. Practical skills in science learning are related to the skills possessed by the students to be able to discover the concept of science through observation, experiment, or investigation. The inquiry-based science issues approach puts teachers as problem providers by involving science issues (Hastuti, et al., 2018). Inquiry experiences can provide valuable opportunities for students to improve their understanding of both science content and scientific

practices (Edelson, et al., 1999). Increasing the opportunity for students to be involved in inquiry-based activities can improve engagement with content and assist in the development of analysis and critical thinking skills (Smallhorn, et al., 2015). Inquiry-based learning/teaching having the potential to improve student interest in school science (Potvin, et al., 2017).

Students are expected to master 2 basic competencies after the application of inquiry learning. First, students can analyze the effect of heat and heat transfer which includes the thermal characteristics of a material, capacity, and heat conductivity in everyday life. Second, students can plan and conduct experiments on the thermal characteristics of a material, especially related to the capacity and conductivity of heat, along with the presentation of results and physical meaning. Learning material for "Temperature and Heat" consists of: Temperature and expansion; The relation of heat to the temperature of the object and its form; Black Principle; Heat transfer by conduction, convection, and radiation (Ministry of Education and Culture. 2016). The cognitive learning outcomes of students before and after learning using the inquiry learning model are shown in Figure 1.

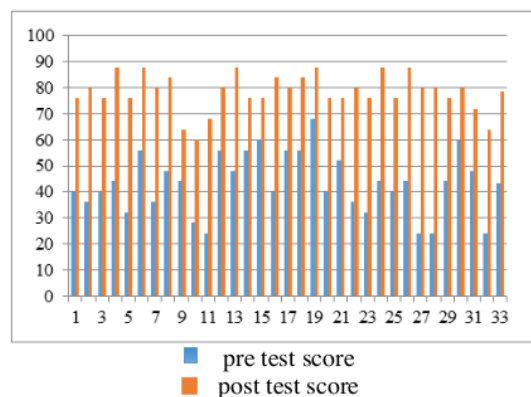


Figure 1. Student cognitive learning outcomes

Based on Figure 1 it can be said that there was an increase in cognitive learning outcomes of students before and after learning using inquiry learning models. The average value of students in the pre-test is 43, while the average value of students in the post test is 78. Thus an increase in the average value of students is 35 points. From the results of data analysis, it was found that the scores of all students in the pre-test were below 75 so that classical completeness was 0%, whereas in the post-test there were 27 students obtaining values above 75 so that classical completeness was 84%. Guided inquiry-based learning are effective to improve students' science literacy skills in senior high school (Suduca, et al., 2015). Inquiry based science education proved to be

stimulating for students' motivation, pupils' application of research skills, construction of meaning and acquiring scientific knowledge (Aulia, et al., 2018).

## Conclusion

Based on the results of the study it can be concluded that the inquiry learning model is effective for improving students' cognitive learning outcomes in temperature and heat.

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