The Role of POE Oriented Science Learning to Correct Misconception about Temperature Effect on Water Desity in Elementary Education

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Abstract. Literacy ability is a fundamental thing that must be possessed by students in facing the global era to be able to meet the needs of life in various situations. Science literacy is the ability to understand science, communicate science, and apply the ability of science to solve problems. To improve the ability of scientific literacy in addition to requiring student motivation, teachers also need to consider learning strategies that are appropriate to the conditions and potential of students which in the learning process focuses on providing direct experience and the application of the nature of science. The science learning study oriented Predict, Observe, Explain (POE) aims to correct misconceptions in science subjects with the material the influence of temperature on the density of water in elementary education. One effort to improve science misconceptions is to change teacher centered learning into student centered learning. One learning strategy that actively involves students while still raising science characteristics is that students are able to develop the knowledge they have by using the POE (Predict-Obiserve-Explain) learning model which is expected to improve science misconceptions with temperature material that can affect the density of water in elementary education.

Keywords: POE, Misconception, science, Effect of temperature, density of water.

INTRODUCTION ~ Science learning is a field of science that studies about nature which is oriented not only to products or results, but also emphasizes the process of how a concept can be formed, so that in studying science students relate to how to systematically find out about nature. Studying science is not only the mastery of a collection of knowledge in the form of facts, concepts, or principles, but also a process of discovery. Science learning is learning that consists of products, processes, and attitudes as a reference or boundary for knowing the extent of student competence in science learning, each teacher determines a standard of values. This is intended so that teachers know the extent to which students understand learning.

The understanding of concepts as outlined in various theories and also formulas makes it difficult for students to understand the material. Moreover, conventional teaching methods are still widely applied by most teachers making students reluctant to learn independently.

Suparno (2013) explains lectures (conventional) that without giving students the opportunity to ask questions and also express their ideas, often continue and accumulate misconceptions, especially for students who are less able. Students do not have a vehicle to check whether the concepts they get are correct or not. They also don't have the chance to straighten out when they are wrong, because they are not given the opportunity. Therefore

misconceptions often occur in learning science in elementary schools.

The POE (Predict-Observe-Explain) model is a learning strategy that teaches students by making predictions of an event based on their own conceptions, then observing the events clearly, and finally explaining their observations and explaining the discrepancies of their predictions with circumstances in fact. This learning strategy provides an opportunity for students to express their initial abilities related to material, so that the teacher also knows and can provide follow-up if there are misconceptions on students. This POE strategy also requires students to be active, so that at the end of learning they will not experience misconceptions and will have a common concept in learning. Learning using POE strategies can increase students' valuable opportunities in criticizing ideas, expressing opinions and supporting conceptual understanding that is obtained correctly (Ayhan, 2013). The weakness of conventional learning compared to learning with POE strategy is the absence of preconception excavation activities and concept correction according to Rina et al (2013).

From the science material about the effect of temperature on the density of water studied, students often only get information and are required to be able to imagine material that is often unable to be imagined. Most teachers only emphasize the ability to remember to know the ability of students. Learning that is still based on rote theory and not based on experience makes it difficult for students to improve learning outcomes cognitively, affective and psychomotor.

METHOD

This experimental research uses a Pre experimental research design. In this research design, there are 1 group: The population in this study is all students in grade IV SDN Halimun 1, amounting to 25 students.

Descriptive statistical analysis is a statistic that is used to analyze by describing or describing data that has been collected as it is without intending to make conclusions applicable to the public or generalization. Descriptive statistical analysis aims to determine the level of mastery of the material through the depiction of the characteristics of the distribution of the value of the achievement of natural science learning outcomes of students who are taught with POE learning models. Demonstration will make a science enthusiastic and work more knowledge about basic concepts. The advantage of demonstration can guide students to think because they can focus attention in a concrete event and can make students ask questions about key key concepts found in experiments, so students are asked to make guesses about what will happen according to Amri and Syarifuddin (2018).

In this group learning is applied with the POE strategy. In this study, students were

given four tests, namely pretest to find out the student's initial knowledge, a prediction test used to find out whether students have a science misconception on material temperature can affect density. After giving treatment, then given back the results of prediction tests to find out whether with the help of POE strategies can change students' misconceptions. Then finally given a posttest to find out whether learning with POE strategies can change students' misconceptions. After the learning activities are completed the test is given in the form of a misconception diagnostic test. The data obtained were analyzed based on the analysis of students' misconception scores and based on the analysis of items per test item.

RESULT AND DISCUSSION

The three main steps of the POE learning model according to Indrawati and Setiawan (2009), the three tasks of students in the POE learning model are: (1) Predict: at this stage students are asked to guess what happens to a phenomenon that will be studied; (2) Observe: at this stage the teacher carries out the activity, shows the process or demonstration and students are asked to record and observe what is happening and match it to their expectations; (3) Explain: at this stage, the teacher asks students to submit hypotheses about why they happened as they do and explain the difference between the predictions they make and the results of their observations. Students will find understanding as a true concept,

but if the allegations are incorrect or incorrect, students will be assisted by the teacher in providing explanations and students will also be assisted to change their guesses, and correct false assumptions that students can try directly so students experience changes the concept of a concept that has not been right to be a true concept.

This study aims to identify scientific misconceptions about the effect of temperature on the density of water and its causes using a five-tier diagnostic test. A five-tier diagnostic test is a development of a four-level diagnostic test. The development contained in the added level of student confidence in choosing answers and reasons. The first level is a multiple choice question with three deceivers and one answer key that students must choose. The second level is the level of student confidence in choosing answers. The third level is the reason students answer questions, in the form of four choices of reasons that have been provided and one reason is open. The fourth level is the level of student confidence in choosing reasons. The fifth level is a picture of the results of the answers given by students, whether in accordance with the answers given by students or not. (Amin, et all 2016).

Student conception categories are based on answers to five-tier diagnostic tests, namely:

Misconception (M), Not Understanding Concepts (TUC), Understanding Concepts (UC), Partial Understanding (PU), Not Answering (NA). Based on the data processing carried out, obtained information about misconceptions that occur in teaching materials Temperature can affect the density of water and weaknesses of the concept as the cause of the misconception. Student misconceptions are identified by analyzing the level of confidence of students' answers in answering the five-tier diagnostic test instruments in the second and fourth tiers, while the causes of misconceptions are identified from students' choices in answering reasons at the first and third tiers, the fifth tier is a picture to make sure the students' explanations are appropriate as it should be.

Based on the results of observational analysis of changes in science misconceptions on the material Effect of Temperature on Density of Water obtained results in table 1.
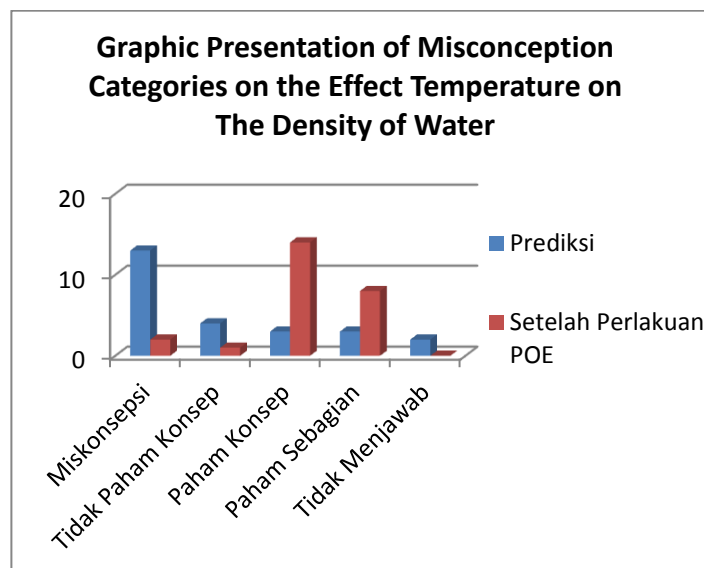

Table 1. Graphic resentation of misconception categories on the effect of temperature on the density of water

Based on graphic image 1, it can be seen that students experience several categories of misconceptions and can be compared with prediction tests and tests after treatment (after conducting experiments directly about the effect of temperature on the density of water) is on the prediction test (before treatment) students are generally located in the misconception category that is more than 12 students, while in the test after treatment, only 2 students were included in the misconception category. And in the Prediction Test category Understanding the concept there are only 3 students while in the test after treatment, there are 14 students who understand the concept. Then in the No Answering Categorization,

the prediction test contained 2 students who did not answer several questions, but in the test after treatment, all students answered the test. Based on research that has been done during the learning process with the Predict Observe Explain (POE) model, data obtained indicate that the model can change students' misconceptions on natural science subjects on the effect of temperature on the density of water.

Misconceptions that occur are also seen in the learning process in class. Students who experience misconceptions assume that the hot water in bottle B which has a container below mixed with food coloring will rise to the top and cold water in bottle A will drop down due to the influence of food coloring that has been mixed in hot water so that the water in bottle B becomes lighter compared to water in bottle A. This assumption of students is caused by students' understanding and logic thinking which is not quite right in analyzing the effect of temperature on the density of water. So this is the reason why students experience misconceptions. The correct concept is that hot water in bottle B has lighter molecules than cold water with heavier molecules, so hot water that has been mixed with dyes will go up and cold water heavier will go down.

The results of the study did not deviate from some of the existing supporting studies. The results of Liew's research (1995) in the Australian Science Teacher Journal with the title 'A *Predict-Observe-Explain*

Teaching Squence for Learning about Students Understanding of Heat and Expansion of Liquids', From the data obtained it was concluded that the POE created an opportunity for some students to reconstruct the wrong conception as a result of the mismatch or the difference between the allegations and the observations. Learning with POE strategies also gives a deeper impression to students so that the concepts conveyed can be more memorable than conventional learning.

POE strategy learning specifically involves students in a situation where students must provide allegations of the concept or situation so that students' preconceptions can be known. Thus, if there is a misconception, the teacher can find treatment in accordance with the situation of students and students can investigate and find out the truth of the treatment given / indicated by the teacher so that there will be conflict in students against predictions that students have and observations that students have seen live. Students will change the concept from the untrue to the right if it continues to be given proper action and direction.

The learning strategy is in accordance with the second step formulated by Berg as a way to overcome misconceptions, namely designing learning experiences that depart from preconceptions and smoothing out parts that are already good and correcting incorrect parts of concepts where the main principle of misconception

correction is that students are given a learning experience that shows conflict between their concept with real events.

Before the demonstration is done the teacher directs the students to give allegations on the results of the demonstration, this activity is carried out to explore students' preconceptions. The process of excavating preconceptions is considered important as one way to overcome misconceptions. In this study the POE strategy was implemented through a demonstration method. Furthermore students compare the allegations with the results of the demonstration, the teacher gives the opportunity to the students to express the results of the comparison through question and answer and class discussions.

The results of the analysis found that the POE strategy is effective in improving students 'misconceptions, but in this study there are still some students who have misconceptions and lack of understanding of concepts, this happens because it is very difficult to change and correct students' misconceptions that have been embedded in their minds, it is easier to direct students who don't know the concept rather than changing students' misconceptions.

CONCLUSION

Based on data analysis and the results of the identification of the science conception category of students on the material influence of temperature on the

density of water, obtained 2 students included in the category of misconception, 1 student included in the category did not understand the concept, 14 students understood the concept, 8 students understood partially, and 0 students don't answer. Based on the research that has been done, the POE strategy can be used to correct science misconceptions on the subject of the effect of temperature on the density of water for grade IV students of SDN Halimun 1 Bandung.

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