



## Profile of Primary Students' Conceptual Change about Water Dissolving Various Substances

Ita Rosita<sup>1</sup>, Andi Suhandi<sup>2</sup>, Wahyu Sopandi<sup>3</sup>

Pendidikan Dasar, Sekolah Pascasarjana Universitas Pendidikan Indonesia, Bandung, Indonesia

✉<sup>1</sup>itarosita@student.upi.edu · ✉<sup>2</sup>andi\_sh@upi.edu ✉<sup>3</sup>wsopandi@upi.edu

**Abstract.** Prior observation of the research indicated that many misconceptions occurred in the learning process in elementary school. Therefore this study aims to determine the change profile of students' conceptions of water dissolving various kinds of substances. The strategy used is the learning strategy Predict Observe Explain (POE) which consists of three stages, namely predicting, observing, and explaining. The research method used was the pre-experimental method with the research design of one group pretest-posttest. The subjects in this study were fifth grade students in one of the elementary schools in Bandung Regency. Based on the data obtained from the pretest sheet, the prediction sheet and post-test sheet, it was found that there was a change in conception in students who had attended the study using the POE strategy. This can be seen from the reduced number of students with the category of answers to misconceptions significantly and the other side there is an increase in students with the category of understanding answers. For this reason, researchers provide recommendations to use the POE strategy as a solution to improve the existence of misconceptions.

**Keywords:** Conception Changes, Misconception, Poe Strategy

**INTRODUCTION** ~ The increasingly severe nature of the natural damage indicates a growing public concern. One of the concerns to be stopped is the habit of the community polluting water with garbage or waste. This is due to the lack of knowledge regarding the causes and effects of polluted water on the surrounding environment. As one of the efforts in the field of education, the natural sciences studied by students in schools must have a focus on natural studies and the processes that are in them. This is because there are three nature of IPA, namely IPA as a product, IPA as a process, and IPA as an attitude (Yuliaratiningsih, Widodo A., Wuryastuti S. 2010).

Science lessons in elementary schools are important lessons that encourage students to have a scientific attitude that must be grown early. Unfortunately, exact sciences

including science are considered scary and difficult by most students. This causes a big problem in learning science, namely the difficulty of understanding the concepts that must be learned. Difficulties in understanding the concepts learned result in erroneous understandings or often called misconceptions.

This misconception occurs because students' initial understanding built through experience in their environment is not the same as the actual scientific truth. Understanding, according to Joul (2005), is a product of conceptual formation derived from the need to make sense of objects or real events. Understanding concepts is not only needed by students when learning takes place but in every stage of life. According to Suparno, misconception refers to concepts that are not by scientific understanding or understanding received



## ICEE-2

by experts in that field (Paul Suparno, 2013). Misconception can hinder the process of learning science so it needs to be minimized by applying the conceptual change process (Dahar, 2011).

Misconceptions can be corrected through learning that supports direct interaction with learning media, interactions between students and teachers, and students and students. One learning that is deemed suitable for increasing understanding of concepts is the POE learning model (Predict, Observe, and Explain). POE is a learning technique that was introduced and developed by White and Gunstone. This learning technique is based on constructivism teaching theory which assumes that the activities of making predictions, observations, and explaining the results of observations, will form students' cognitive structures well (Warsono & Hariyanto, 2012).

According to Wah Liew (2004), the benefits of the POE learning model are as follows: 1) The POE Learning Model can be used to explore initial ideas held by students; 2) Generating discussions both between students and students and between students and teachers; 3) Providing motivation to students to investigate concepts that are not yet understood; and 4) arousing students' curiosity about a problem. Khathanvy and Yuenyong C. (2009), In a journal entitled "The Grade 1 Student's Mental Model of Force and Motion Through Predict-Observe-Explain (POE) Strategy", concluded that the POE learning

strategy is a strategy that can provide new knowledge to students significantly and can increase student participation to be more active and creative so that they can significantly improve learning achievement.

Based on some of the explanations above, it can be interpreted that POE learning is a learning model that involves students actively and creatively through the process of prediction, observation and explain with the guidance of the teacher in constructing students' new information as an effort to improve student participation in the learning process. The POE learning model involves students in predicting a phenomenon so that they are accustomed to making predictions that are appropriate to their learning experience. The POE learning model is also an efficient model for creating student discussion about the concept of natural science because, in the learning process, students are required to make predictions, find out through observation, and explain. Students are facilitated to find their answers to questions or problems without help from other parties, especially the teacher. The point is that the teacher is as much as possible able to refrain from providing information before students predict and find out for themselves evidence of the truth or error of their predictions. The activities of students who are actively involved in learning by observing and explaining the results of observations is one way for students to understand the concept of development to solve problems in daily life that will be faced by these students.



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POE learning is also one of the learning strategies which consists of three main concepts that must be carried out in Science Learning, namely predicting or so-called Predict, observing or observing the so-called Observe, and the last is explaining or called Explain. The ability of POE (prediction, observation, explanation) can investigate students' ideas and their ways of applying knowledge to actual conditions (practicum). Learning by using the POE model is by the characteristics of elementary school students that are happy to play, move, work in groups, and feel or do/demonstrate something directly.

On this occasion, this ability is trained to develop an understanding of the concept of water to dissolve various substances associated with natural phenomena, namely water pollution. This is motivated by the lack of student awareness about environmental cleanliness. One of the causes of this phenomenon is because the understanding of concepts in water material dissolving various substances is still lacking. This is considered very important because of the abundant water conditions in our country. If not maintained, it is not impossible that water will be polluted and cannot be used anymore. So as an effort to preserve it, it is necessary to equip students to have a

concern to maintain the cleanliness of river water, seawater, and water that is in the ground. (Wahyu Sopandi, 2009).

## METHOD

The study was conducted using a pre-experimental research method to determine changes in students' conception of the concept of water to dissolve various substances using POE strategies. This method was chosen because it is one of the research activities that is felt to be able to describe the initial and final concepts and changes that exist in students. This method is also carried out as an effort to improve students' understanding of water dissolving various substances. Through the method implemented this time, it is hoped that the teacher can find out the errors in each of the concepts learned so that the students can know what needs to be improved and how to make these improvements in subsequent learning.

The research design in this study is one group pretest-posttest. The study was conducted by giving a pretest before starting the learning, then treatment with the POE model was given. After the learning treatment was given, the posttest was conducted. An overview of the design of this study can be seen in the following figure,

### One-Group Pretest-Posttest Design

O1 X O2

Keterangan:

O1: Pretest on experiment class

O2: Posttest on experiment class

X : POE strategy



The population taken in this study was the population score conceptual change in grade V students. The sample used in this study amounted to 32 students. This research was conducted in class V in one of the elementary schools in Bandung Regency. The data collection technique used was in the form of tests. The test was carried out using pretest and posttest tests. Besides, prediction tests were also carried out. To know the concept of student understanding and identify students' misconceptions about water dissolving various substances, the tests conducted at the pre-test and post-test stages were carried out with a four-tier diagnostic test. According to Gurel, et al. (2015), Techniques to identify misconceptions in the field of education

can be done in several ways, namely interviews, open-ended tests, multiple-choice tests, and multiple tier tests. On the occasion of this study, researchers used multiple tier tests. One of the multiple-tier tests is a four-tier test diagnostic test that contains multiple choices at the first level, confidence in the first answer at the second level, reasons for choosing the first answer at the third level, and confidence in the answer at the third level at the fourth level. To make it easier to see the description of students' conceptions, grouping of answers was done. This grouping can be seen in the category table developed by Haki Pesman and Ali Erylmaz in Ismiara Indah Ismail (2015) in the form of a category table for students' understanding answers as follows,

**Table 1** Answer categories

No.	Categories	Answer Combination				
		Answer	Confidence Rating	Reason	Confidence Rating	
1	Misconception	True	Sure	Wrong	Sure	
2		True	Not Sure	Wrong	Sure	
3		Wrong	Sure	Wrong	Sure	
4		Wrong	Not Sure	Wrong	Sure	
5	Do not understand the concept	True	Sure	True	Not Sure	
6		True	Sure	Wrong	Not Sure	
7		True	Not Sure	True	Sure	
8		True	Not Sure	True	Not Sure	
9		True	Not Sure	Wrong	Not Sure	
10		Wrong	Sure	True	Not Sure	
11		Wrong	Sure	Wrong	Not Sure	
12		Wrong	Not Sure	True	Not Sure	
13		Wrong	Not Sure	Wrong	Not Sure	
14		Error	Wrong	Sure	True	Sure
15			Wrong	Not Sure	True	Sure
16	Understand	True	Sure	True	Sure	

## RESULTS AND DISCUSSION

The research that had been done was by giving a pretest, then the learning process

was carried out using the POE model with the help of Natural Science KIT, and ended with a posttest. The results of a series of

**ICEE-2**

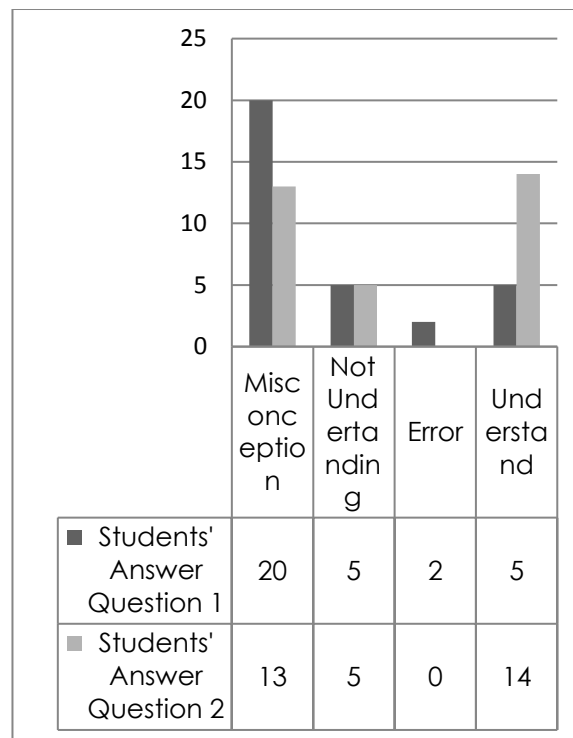
treatments in this study can show 1) students' initial conceptual understanding ability, 2) students' predictive ability, 3) students' final conceptual understanding ability, and 4) profile change in students' conception understanding.

**Profile of students' initial conceptions**

Based on the research that had been done about learning in water material dissolving

various substances, a profile of students' conceptions was produced which will be discussed in the tables below. Table 1 is an overview of students' conceptions of the pretest test results. Before starting learning with the POE strategy the teacher gave a test to find out students' understanding of the concept of water material dissolving various substances. Here are the results of the pretest:

**Figure 1** Pretest Chart



In the pretest results chart above, it was found out in the first question that 20 students answered with the misconception answer category, 5 students answered with the category of understanding questions, 2 students answered with the error answer category, and 5 students answered with the understanding answer category. In the second problem, 13 students answered in the category of misconceptions, 5 students who answered in the category of answers

did not understand the concept, none of the students answered in the category of error answers, and 14 students answered in the categories of answers. These results illustrate that students' understanding of initial concepts in water material dissolving various substances was still dominated by misconceptions.

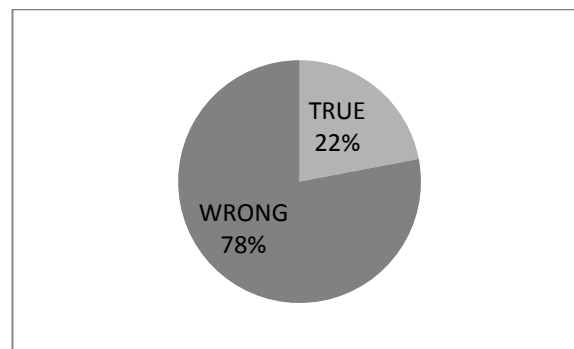
**Student Prediction Profile**

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After the pretest, students were asked to make predictions about the water material dissolving various substances. Predictions were made to find out the students' conceptions and explore the initial ideas that students had because each student must have their understanding based on

observations and investigations they do (Kampourakis & Zogza, 2009). By learning, students can connect new ideas and experiences with what they already have (Liang & Gabel, 2005). According to the prediction test results, the following is an overview of students' understanding:

Prediction Test



From the diagram above, we can see the students' predictive ability about water dissolving various substances in which 78% of students answered incorrectly, and 22% of students answered correctly. This diagram illustrates that students' predictive abilities were still very low. After being given a prediction test, students then made observations on the water experiment that the teacher had distinguished. This is in line with the POE learning process, namely Observe. Students conducted experiments and observed each process. In the process, students discussed the course of the experiment or the findings during the experimental process. After finishing

observations, students explained the results of observations that had been made. Students and teachers discussed the results of observations made together.

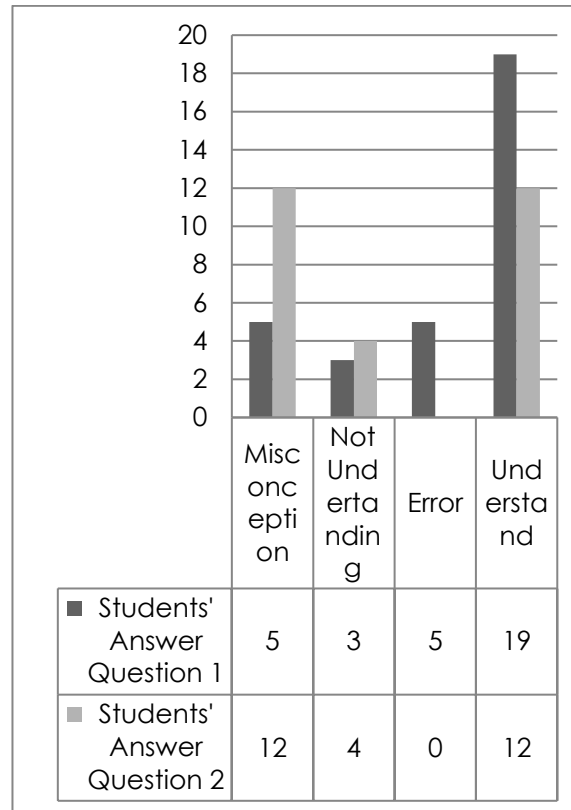
### Profile of Student Final Conception

After observations and explanations were over, the teacher reconfirmed the students' understanding by giving a post-test. This was done to find out whether there is a change in the direction that builds or constructs the student's understanding so that the learning strategy that was carried out namely POE becomes successful. The results of the posttest that had been done can be seen in Table 2 below:

Figure 2 Posttest Chart



ICEE-2



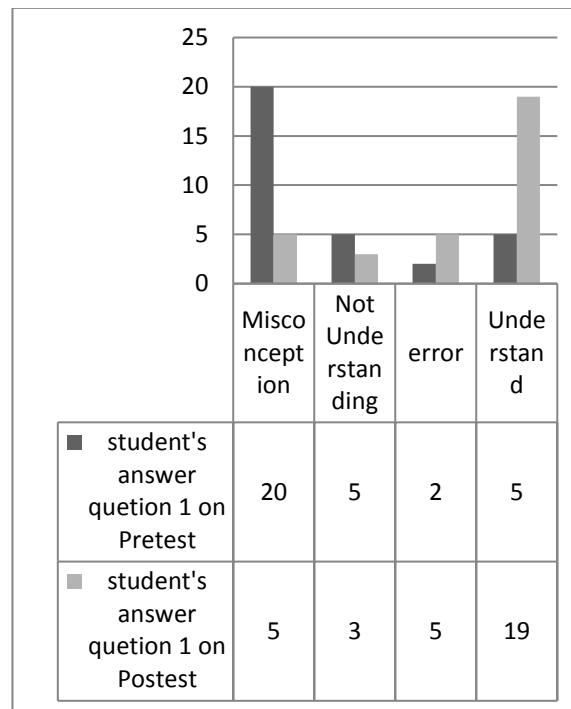
The pretest results chart above informs that in the first question, 5 students answered with the misconception answers category, 2 students answered with the category of answers not understanding the concept, 5 students answered with the error answer category, and 19 students answered with the understanding answers category. In the second problem, 12 students answered with the misconception answer category, 4 students answered with the category of answers not understanding the concept, none of the students who answered with the error answer category, and 12 students who answered with the understanding answers category. These results illustrate that the understanding of the students' final concepts in water material dissolving various substances changed. This change can be seen from the dominance of moving from

students who experienced misconceptions to students who understood.

### Profile of Student Understanding Conception Change

The change in conception occurred because students tried to understand the concept in an exciting new way using the POE strategy with the help of KIT. In general, learning was done conventionally without experimenting. The impact of learning like this that sometimes equips students with something they already know without explaining why it occurs scientifically will cause misconceptions or alternative conceptions at the next level or concept of science (Gustafson & Mahaffy, 2012). More clearly, the profile of changes in the conception of students who had done learning with KIT-assisted POE strategies can be seen in the following table:

**Figure 3** Conception Change Chart



The chart above is an illustration of changes in students' conceptions before and after learning with the POE strategy. This can be seen from the results of the pretest and posttest. In the table above it can be seen that misconceptions were reduced from 20 students to 5 students, a significant decrease in the number. For the category of answers not understanding the concept, there was a decrease from 5 students to 3 students. Furthermore, the error category increased from 2 students to 5 students. Also, for the category of students who understood, there was a significant increase in the number of 5 students at the time of the pretest to 19 students at the time of the posttest. In general, these results show a significant change in a good direction. This indicates that the use of POE strategies in learning with water material dissolving various substances succeeded in improving the conception of students who were in the category of misconception or did not

understand the concept. Thus, a change in conception can occur in the direction of improvement.

### CONCLUSION

The results of this study inform that learning with POE strategies can improve the existence of misconceptions. This can be seen from the profile of the change in the understanding of the final concept that had decreased in the category of misconception answers from 20 students to 5 students. On the other hand, there was an increase in the understanding category from 5 students to 19 students. This concept change shows the success of POE learning. The results of the concept change towards a better understanding after learning with this POE strategy are expected to be a guide in further learning. More than that, students are expected to be able to understand the basic concepts of learning





## ICEE-2

about water to dissolve various substances. After that, students can apply in daily life by maintaining the cleanliness of the water around them so they are not polluted, then by inviting every community to jointly preserve nature, especially water cleanliness.

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**ICEE-2**

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