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IMPLEMENTATION OF CONFLICT COGNITIVE STRATEGIES IN SCIENCE LEARNING WITH STRUCTURED INQUIRY MODELS TO REDUCE MISCONCEPTIONS ABOUT PRESSURE MATERIAL

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Abstract

This study aims to describe the reduction of misconceptions about pressure material with conflict cognitive strategies in science learning with structured inquiry models. This study uses a pre-experimental method with One-Group Pretest-Posttest Design. The target of this study was students of VIII-A and VIII-K SMPN 19 Surabaya in the second semester of the school year 2019-2020. The results showed that the percentage of class VIII-A misconceptions was 49.67% and class VIII-K was 60.67%. After learning, the percentage of class VIII-A misconceptions was 3.67% and class VIII-K was 4.33%. From the results of the pretest and posttest, the percentage of misconceptions decreased, with the percentage of class VIII-A decreasing by 46.00% and class VIII-K by 56.33%. The largest shift percentage was from misconceptions to understand the concepts after learning. The effectiveness of learning shown from the results of the N-Gain score, and the results of the N-gain score obtained by 0.938 for class VIII-A and 0.937 for class VIII-K, and both of the classes classified in the high category. Based on the results it can be concluded that the strategy of conflict cognitive in learning science with structured inquiry models can reduce student's misconceptions about pressure material

Keywords: Strategy of conflict cognitive, misconception, structured inquiry

INTRODUCTION

Physics is one part of science, which is in the prosses of learning and understand the concepts of physics required to contact directly with what you want to know (Supamo, 2007). The best way to learn concept is by constructing their own concepts that will be studied (Muakhirin, 2014). Inline with the theory of Jean Piaget which states that the learning process will occur if there is an activity of the individual interact with the social and the physical environment, interact directly can develop knowledge (Rashidin, 2011).

Students do not enter the learning without knowledge but have the initial concept derived from previous learning or from experience. However, the initial concept that was created is not necessarily correct, because the interpretation of the concept of every individual is different. The possibility of the concept which is formed will be incorrect (Berg, 1991). Incorrect concept can lead to misconceptions (Nakiboglu, 2003). Misconception is the mismatch of understanding of the concept of who owned the learners with the concept that is recognized by the experts (Maulana, 2010).

Trials conducted on the students of SMPN 19 Surabaya, 9th-grade students who have acquired learning about the pressure. students are still having misconceptions. 18,18% of the pressure of solid substance, 66.67% on the hydrostatic pressure, 21.21% on the law of Archimedes and 24.24% about the law of Pascal.

The fact of the misconception that is difficult to repair. Reduce is most proper for the fact of misconceptions, students will be able to cope with the easy concept, but if the concept is difficult the misconceptions will re-appear (Berg, 1991). How to overcome misconceptions is to confront students directly with the issues that cause an imbalance of knowledge (Arief, 2011). Students are faced with a conflict situation, so that students realize the fallacy of the concept and do the repair the proper understanding (Bertiec, 2013).

Conflict cognitive will create a discrepancy between what is understood with the fact that occur in the environment (Lee, 2003). Strategy of conflict cognitive is a learning activity that involves students actively, creating an imbalance that brought on dissatisfaction with the concepts that already exist and ultimately delivers on the

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readiness to accept the new right concept (Ramlan, 2014). Teaching Strategies to change the concept of basing conflict cognitive as follows ; (1) Revealing the concept of early students explicitly, (2) discuss and evaluate the initial concept, (3) creates a conflict conceptually against the concept of beginning, (4) encourage and lead students to restructure the understanding of the concept (Suparno, 2013).

In improving the understanding of the concept grounded in the curriculum 2013, science learning emphasizing the learning that provides direct experience with conducting an investigation or does the skills of inquiry such as collecting and analyzing a problem (Banchi, 2008). One of the inquiry learning models can be used for students who need guidance in every stage of the inquiry or have a little experience in the inquiry that is Structured inquiry. Structured inquiry encourages learners to do the investigation to find the answers and the teacher gives the topic, the question guide, and provides the necessary information (Llewellyn, 2013). The syntax of structured inquiry models consists of 5 phases ; phase 1 presents a question or problem, phase 2 formulate a hypothesis, the phase 3 experiment to obtain information, phase 4 communicate the results of the experiment, and phase 5 make a conclusion (Zulfiani, 2015).

Based on these statements, then the linkages between the Structured inquiry and conflict cognitive have equally confronted the students directly with the problem, find the true concept and achieve a balance of science to reorganize the initial knowledge that is not yet right. So the learning structured inquiry models appropriate to be combined with strategy of conflict cognitive as an effort to reduce the problem of misconceptions.

To solve the problem of misconceptions is necessary to do the identification of misconceptions before and after learning. identification of misconceptions with doing a diagnostic test that serves to determine the misconceptions, show how the misconception is based on the errors made students (Law, 2010). The four-tier diagnostic test is the identification test of misconceptions with four levels. The advantages of this test that can distinguish the level of confidence answers as well as the level of confidence the reasons, determine the material that requires more emphasis as well as plan learning which is better to reduce misconceptions (Fariyani, 2015).

Based on the explanation above the researcher is interested to do the observation by using the strategy of conflict cognitive in science learning with structured inquiry models to reduce the student's misconceptions about pressure material.

METHOD

The method of this study is Pre-Experimental with One Group Pretest-Posttest Design.

Table 1 Experiment Design

Pre-test	Treatment	*Post-test*
O_1	X	O_2

(Sugiyono, 2018)

The target of this study was students of class VIII-A and VIII-K SMPN 19 Surabaya. This reserch, there are replication class and experiment class.

Table 2 Replication Class Design

Class	*Pre-test*	Treatment	*Post-test*
A	O_1	X	O_2
K	O_1	X	O_2

The result of the pretest posttest with four-tier diagnostic test models were analyzed to determine the percentage of misconceptions, understand the concepts, and do not understand the concepts. Next analyze data of the score of N-gain through the normality Test, to determine the distribution of data is normal or not. Test of homogeneity, to determine the similarity of the variant sample. Paired t-test to test the difference in the average of the results of pretest and posttest (Sugiyono, 2016).

RESULT AND DISCUSSION

Learning with the strategy of conflict cognitive was held for four meetings. The learning activities by the learning device that has been prepared previously. The first meeting was about pressure of solid substance, the second meeting about hydrostatic pressure, the third meeting was about law of Archimedes, and the fourth meeting was about law of Pascal. Each activity is given a worksheet of students, that has been adjusted with the syntax of structured inquiry models, then combined with strategy of conflict cognitive.

Before learning the students do a pretest to determine the initial concept. In addition to find out if students have misconceptions, understand the concept, or don't understand the concept. The results of the pretest indicated on the diagram chart below :

Figure 1 Diagram of Class VIII-A Pretest Results

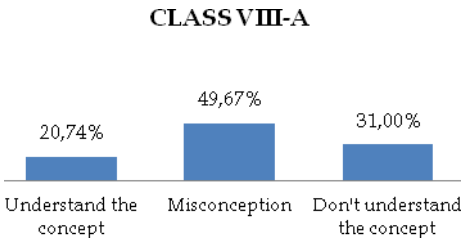
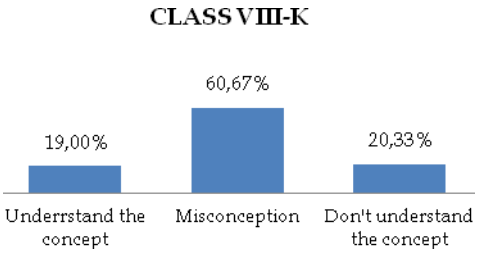


Figure 2 Diagram of Class VIII-K Pretest Results



Based on the pretest results, students had misconceptions before learning. Showed by percentage of class A misconceptions was 49.67% and K class was 60.67%. It means more students who have misconceptions about pressure material compared with students who understand the concept amounted to only 20,74% and

don't understand the concept only 31,00% for the class VIII-A and for class VIII-K 19.00% understand the concept, 20,33% don't understand the concept.

After doing the test, the learning was performed with the strategy of conflict cognitive combined into the phase of structured inquiry syntax. In phase 1 of structured Inquiry, present a question or problem, combined with the strategy of conflict cognitive (1) revealing the concept of early students explicitly. Students are presented with a problem that is indicated by the phenomenon and the students give the answer and reason about what is known. This case emphasizes the strategy of conflict cognitive in revealing the initial concept owned by the students through the student's answers.

Phase 2 structured inquiry is to formulate hypotheses. In this phase combined with the strategy of conflict cognitive (2), discuss and evaluate the initial concept. A temporary answer or hypothesis learners to be evaluated to determine if possible the existence of difference of opinion.

Phase 3 structured inquiry, conduct experiments to obtain information. Experimental activities combined with strategy of conflict cognitive (3) creates a conflict conceptually against the concept of the beginning. If there is a discrepancy in the results of the experiment with the hypothesis, there would be conflicts or the occurrence of conflict situations in the students and there is an imbalance of understanding. The process of science learning emphasizes the learning that provides direct experience to develop competencies in-depth understanding of nature around scientifically (Setiawati,2013). So that the experiment activities can create the experience of student learning directly because the students participating and trying to find answers through experiments.

The last phase of the structured inquiry, making conclusions, combined with a strategy of conflict cognitive (4) encourage and lead students to restructure the understanding of the concept. In making conclusions, teachers help and guide the student to reflect on themselves by looking at the differences between initial concepts and new concept, help students to make the change from the initial concept to the new concept. At the end of the learning given exercise enrichment of phenomena in the environment as a reinforcement of the concept.

After the learning, students do the final test or a posttest, and the obtained results are shown in the diagram chart below :

Figure 3 Diagram of Class VIII-A Posttest Results

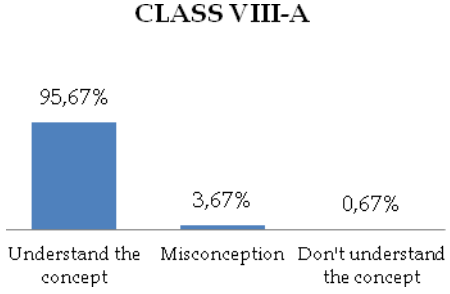
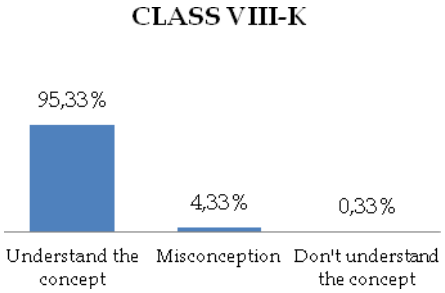


Figure 4 Diagram of Class VIII-K Posttest Results



After learning with conflict cognitive strategies the percentage for the misconceptions decreased if compared with the results of the pretest. The highest percentage of that obtained on the percentage of understand the concept, with the average percentage value of 95,67% for class VIII-A and 95.33% for class VIII-K. The average percentage of misconceptions of the class VIII-A only by 3.67% and 4,33% for class VIII-K. The amount of the percentage of misconceptions decreased and the percentage of students understand the concepts increased.

Based on the results of pretest and posttest it can be identified the shift of misconceptions before and after learning which is presented through the diagram chart below :

Figure 5 The Diagram Results From The Value Shift Misconceptions of Class A

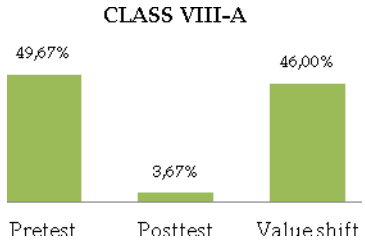
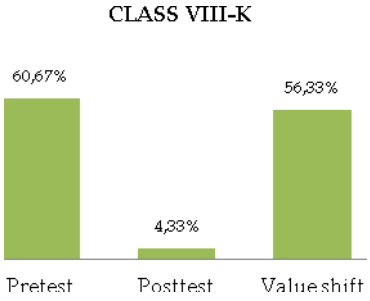


Figure 6 The Diagram Results From The Value Shift Misconceptions of Class K



The diagrams showed that there is a value decrease in the percentage of misconceptions. Class VIII-A values decrease in misconceptions by 46,00%. While the class VIII-K value of the decrease in misconceptions by 56,33%. These results overall indicate that both of the classes percentages of misconceptions decrease after learning with strategy of conflict cognitive. The results of the largest percentage changes was students having

misconceptions before learning and became understanding the concept after learning, but there are still some students who have misconceptions.

According to Berg (1991) stated that misconceptions are difficult to be eliminated, the concept of easy may be acceptable to learners, but when there is a new concept misconception can appear again. Therefore in this study after doing the learning, misconception not successfully eliminated 100% because, every student also has varying abilities in understanding and developing a concept (Tayubi, 2005). Although misconceptions can not be 100% gone, but in this study experienced a decrease in the percentage of misconceptions are quite drastic.

The students are still having misconceptions about hydrostatic pressure with a percentage of 16.67% for class VIII-A and 13,33% for class VIII-K. Students assume that when the water is put into the container, the vast size of the container will affect the pressure. The larger the area of the container the greater of the pressure. Meanwhile, according to the theory which affects the pressure is the height of the water (h), the force of gravity (g) and the density of water (ρ). So the size of the container does not affect the pressure (Octafiana, 2017).

Second, misconceptions about the law of Archimedes with a percentage of 3.33% to the class VIII-A and 6.67% for class VIII-K. Students assume that the deeper the objects are inserted into the water then the buoyant force was getting bigger. As for the thought of getting close to the surface of the water then the buoyant force was getting bigger because it can lift objects to the surface. Meanwhile, according to the theory of the lifting force was influenced by the large volume of objects that go into the water. If two of the same objects were completely immersed in water, at any depth the buoyant force will be the same. through the experimental results when the same object was inserted into the tube then the water that comes out of the tube if the measured result was the same, and the weight of water that spills equals the value of the lift force itself, like the law of Archimedes, which: "Objects submerged partially or completely into a liquid substance, having the buoyant force that equal to the weight of the displaced liquid" (Giancoli, 2001).

Third, misconceotions about law of Pascal with a percentage of 3.33% to the class VIII-A and 6,67% for class VIII-K. students assumed that the diameter of hose will affect the pressure, the largest diameter the bigger of the pressure, but the theory the smaller hose the pressure generated will be bigger (Giancoli, 2001).

Fourth, still misconceptions about law of Pascal with with a percentage of 13,33% to the class VIII-A and 16,67%. for class VIII-K. students assumed when two pistons were interconnected and have different sizes, the bigger pressure was at the base of the hose which has a big size. As for who think that the large pressure on the piston which has a small size. Meanwhile, according to the theory of the pressure in the closed space have the same value. Which is in tune with the law of Pascal is: "the Pressure exerted on the liquid substance in a room or a closed container then the pressure will be forwarded to all directions will be the same" (Giancoli, 2001).

The results of the normality test to know the distribution of data is normal or not, shown in the table below :

Table 3 Data Normality Test Results Kolmogorov-Smirnov

	Pretest	
	VIII A	VIII K
N (Students)	30	30
Mean	37,33	40,33
Asymp. Sig. (2-tailed)	0,200	0,200

Based on Table 3 the results of the normality test, a significance value of both classes obtained 0,200>0,05. It shows the distribution of data was normal.

Data results of the homogeneity test, shown in the table below :

Table 4 Data Homogeneity Test Results

Levene Statistic	df1	df2	Sig.
,308	1	58	,581

The significance value of both classes obtained 0,581>0,05. it showed the data obtained was homogeneous.

From the results of a paired t-test to test the difference in the average of the results of the pretest and posttest, shown in the table below :

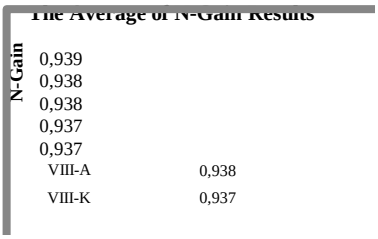
Table 5 Data Paired T-Test Results

	Probability of Sig. (2-tailed)
Class VIII-A	,000
Class VIII-K	,000

So the significance value of both classes obtained 0,000<0,05. It shows there is a significant difference between pretest and posttest.

The effectiveness of learning is shown from the results of the N-Gain score in the diagram below :

Figure 7 Diagram of N-Gain Results.



The results of the N-Gain score obtained by 0.938 For class VIII-A And 0.937 Class VIII- K, and both of classes classified in the high category.

CLOSURE

Conclution

Implementation of conflict cognitif strategies in science learning with structured inquiry can reduce the misconceptions about preassure material, shown from the percentage of misconceptions before learning, class VIII-A 49,67% and class VIII-K of 60,67%. After learning the percentage of misconceptions of class VIII-A 3,67% and class VIII-K 4,33%. From the results of the pretest and posttest, the percentage of misconceptions decreased, with the percentage of class VIII-A decreasing by 46.00% and class VIII-K by 56.33%. The lagerst shift percentage was

from misconceptions to understand the concepts after learning. The effectiveness of learning is shown from the results of the N-Gain score, class VIII-A 0.938, and class VIII-K 0.937, and both of the classes classified in the high category.

Suggestion

In the learning process, provide a media which can be demonstrated in front of the class. The problem presented must be related to phenomena that occur in the student's environment. learning with the strategy of conflict cognitive, teacher needs to manage time appropriately, so the process of understanding the students is well-formed and misconceptions can be reduced is the maximum.

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