The Use of Concept Map as a Consolidation Phase Based STAD to Enhance Students’ Comprehension about Environmental Pollution

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Abstract. The purpose of this study was to improve students’ concept comprehension using concept map as a consolidation phase based STAD. This study was conducted by randomized control group pretest-posttest. Data was collected by using an instrument test to evaluate the effect of concept map as a consolidation phase based STAD on students’ understanding about environmental pollution. Data was analyzed using normalized gain (n-gain) and independent t-test. The n-gain analysis shows the increased of students’ understanding about environmental pollution at experimental group are higher than at the control group. The result of this study showed that students’ comprehension at the experimental class (0.53) higher compared to the control group (0.23). Whilst the t-test analysis shows that there is a significant effect of mapping concept as a consolidation phase based STAD towards students’ concept comprehension. It can be concluded that the implementation of mapping concept based STAD may improve the students’ understanding on science concept.

1. Introduction

There are several things that hang on experiences and adding visualization in the teaching learning practice for the student in the class that can improve the students’ soft skill. Visualize the concept of the science materials can increase students interest to science. This thing has already implemented in some schools, such as concept map as assessment. Visualize the concept of science is also benefit during the teaching activities. Meanwhile there is another way using concept map, which is concept map as a consolidation phase.

According to Stegemann and Sutton-Brady\cite{McNamara, et al., 2010} provide a useful summary of the benefits of posters as identified by the literature. Several studies have reported that students feel comfortable with the concept of concept map. The map concept at an intervention session is an enjoyable and rewarding experience for students. Constructing a concept map is an effective of developing both research skills and creative abilities”. According to Huddle\cite{McNamara, et al., 2010}, it was written that “Concept map allows students to become active learners and encourages deeper learning”.

According to Bloom’s Taxonomy proposed\cite{Anderson, 2001} reveal the mastery is the ability of these terms, like being able to capture a material that is presented in a form that can be understood and be able to provide interpretation and classify. Mastery and understand of the concept of a person’s level of learning outcomes that can define or describe a piece of information with their own words, students are required not merely to remember the material by using their own words. Mastery and understand the concepts is essential in teaching and learning activities because without concept, the learning process will be hampered.

Environmental pollution is a topic to be raised in the research of concept map as a consolidation phase bases STAD. There are various kinds of environmental pollution on earth, such as water pollution, air pollution, land pollution, etc. Those kinds of pollution materials explained to all students...
in the class that hopefully can be explored by students during the activity. This activity will increase of students’ skills in finding the problem of environmental pollution, mention the characteristics of each environmental pollution, etc.

The concept map is a learning tool that has been used in learning and have a positive impact on the quality of student learning (Gerstner & Bogner, 2009; Lalor, 2014; Lian, 2009) and has been positively received in higher education (Lalor, 2014). A number of educational journals found that the various aspects of the application of a higher concept maps required the development of appropriate reviews to help students.

Based on Dahar (1996) said that the aim of concept map refers to investigate students behavior, knowing students way of learning, investigate students’ misconception, and evaluation. Refers to Yamin (2006) concept map has some characteristics which are concept map is a representation of students mind, illustration from two dimension that show the relationship between some concept to another concept, every concept map has different score each other, and the form of concept map is hierarchy.

Map concept seems to offer the most valuable contribution to student learning where the task concept map reflects actions taken to practice the discipline (Lalor, 2014). So, for example, in teaching physiology, students are encouraged to build concept maps actively integrating components subject and identify the causal relationship to reflect the desired learning outcomes (Lian, 2009). While the map concept is often a tendency to map the results of students in providing accurate and simple way to record student progress, it should be stressed that this approach has the potential of losing important information (Lalor, 2014).

Map concept is a competeive approach that help to develop visual presentation of complex and allow reflection on the students learn new material (Gerstner & Bogner, 2009). Some knowledge structure is more open than the others to the assimilation of new knowledge (Lalor, 2014) and will be a determining factor in the success of the intervention of concept map, especially for certain students as their reference to assimilate or rejection of new content (Hay 2007 in the journal Conrady & Bogner, 2012). An additional reason to focus on the concept map concept map is a tool that is commonly found in educational theory (as summarized in the journal Amadieu, et al., 2009), so as to study the conceptual gives access to a greater understanding to the students and find out why certain interventions can improve learning for more effective results.

STAD is a cooperative teaching method which was developed by Slavin. STAD is strategy in which small groups of learners with different levels of ability work together to accomplish a shared learning. It is considered as one of the simplest cooperative learning. The students was placed in small group or teams. Students will get more chance to share with other students. The reason why STAD was implemented because STAD can provide student to share their knowledge.

2. Experimental Method
The design that used in this research is quantitative research. In this research the test was conducted to evaluate students’ prior knowledge or pretest (T1), Concept map as a consolidation phase based STAD (X), and post-test (T2). The type of method in this research is Randomized Control Group Pretest-Posttest Design. This method is chosen because using two classes which is one is control group and another one is experimental group (Arikunto, 2010).

| Group        | Pretest | Implementation | Posttest |
|--------------|---------|----------------|----------|
| Control group| T1      | C              | T2       |
| Experimental group| T1    | X              | T2       |

From the table above show that in the experiment group did the intervention such as making concept map as a consolidation phase based STAD. Population in this research are all students of SMPN 1 CurugTangerang. Sample of this research are two classes of 7th grade from the population. Random cluster sampling was used as the sampling technique (Frankel & Wallen, 2007). Two classes
consist of experiment and control group. Experiment group was used concept map as a consolidation phase based STAD.

3. Result and Discussion

The result of implementation about the effectiveness of science learning using concept map as consolidation phase base STAD towards students’ concept comprehension about environmental pollution. Five periods have already implemented in this research.

Mastery of the concept of data obtained through a written test with a shaped of multiple choice question with 4 answer choices, with amounts to about 20 questions. Pretest is used to obtained students’ concept comprehension about environmental pollution. After intervention using concept map (only in experiment group), there will be a posttest to measure students’ improvement about environmental pollution. The calculation results are summarized in the Table 1.

Table 2. Result of Research Experiment

|                      | Experiment Group | Control Group |
|----------------------|------------------|---------------|
|                      | Pretest          | Posttest      |
| N                    | 39               | 39            |
| Mean                 | 67               | 84.63         |
| The highest score    | 90               | 100           |
| The lowest score     | 40               | 75            |
| Gain                 | 18.88            | 11.79         |
| N-Gain               | 0.53 (Medium)    | 0.21 (Low)    |
| Normality test       | Sig. ≥ 0.05 = Normal |
| Sig.                 | 0.153            | 0.079         |
| Conclusion           | Normal           | Homogen       |
| Homogeneity test     | Sig. ≥ 0.05 = Homogen |
| Sig.                 | 0.102            |               |
| Conclusion           | Homogen          |               |
| Independent-Sample T-test | Sig. (2-tailed) ≥ 0.05 = H₀ Accepted |
| Sig.                 | 0.00             |               |
| Conclusion           | H₀ Rejected, H₁ Accepted |

Based on the table shown that mean of students’ concept comprehension in pretest (experiment group) is lower than posttest which is 67 < 84,63 meanwhile in control group the pretest 48,36 > 64.36means that mean of experiment group is higher than control group. This table also show the results of high score and low score of students’ concept comprehension. In pretest, the highest score of students is 90 and the lowest score of students is 40. Meanwhile in posttest, the highest score of students is 100 and the lowest score is 45.

The result of normality test of concept comprehension in experimental group is 0.152 and in control group is 0.079. Using significant interpretation (α) 0.05 so it can be concluded that the value of significant from normality test both of pretest and posttest is lower than significant. This result shows that the distribution of pretest and posttest score is normal.

The result of homogenity test of concept comprehension in pretest and posttest is 0.102. Using significant interpretation (α) 0.05 so it can be concluded that the value of significant from homogeneity test both of pretest and posttest is higher than significant. This result shows that the distribution of pretest and posttest score is homogen. Based on the result of normality test and homogenity test is shown that the data of pretest and posttest of concept comprehension is not normal and homogen, and after that is hypothesis testing. By using a software of IBM SPSS 20 for windows is obtained that the value of significant is 0.00. This data is lower than α=0.05, it can be concluded that hypothesis H₀ is not accepted, H₁ is accepted, means that there is a significant effect of concept comprehension as a consolidation phase based STAD towards students’ concept comprehension.

Concept map implementation as a treatment of the research was successfully conducted, the pretest as well as the posttest has been conducted as well. According to the result of compare mean
analysis that there is improvement of students result between pretest and posttest. Based on the result the average amount of students’ pretest in experimental group is 67 and the result of the average amount of students’ posttest is 84.63 and the average amount of students’ pretest in control group is 48.36 and the result of the average amount of students’ posttest is 64.36. Thus, it indicates that the implementation of concept map as a consolidation phase based STAD has positive impact in improving students’ concept comprehension.

The result of n-gain average in experimental group is 0.53 and in control group is 0.21. Based on the result of gain average indicates that the quality of improvement of students’ concept comprehension after implementation is categorized medium in experimental group and categorized low in control group. According to Slameto (2003) there are 2 factors that can influence the learning achievement they are; internal and external factor. The internal factor is determined by physical, physical factors and psychological factors (intelligence, interests, talents, and motivations. Concept map provide a physical activity to the students, the students actively involved in raising the prior knowledge and integrated it with another knowledge. Besides, the students not only having a physical activity they also had finding the best solutions to overcome the problem.

4. Conclusion
The implementation of concept map as a consolidation phase can improve student concept comprehension about environmental pollution. This study was calculated by SPSS 20 to measure student improvement. The results of experiment group is higher than control group. Cooperative learning based on STAD gave the best impact for student concept comprehension because students learned by sharing in the small group. Concept map helps teacher to analyze student understanding and misconception about environmental pollution. Thus, concept map as a consolidation phase is the best way to do before doing the evaluation.

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