A Development of Mathematical Connecting Ability of Students in Junior High School through a Problem-Based Learning with Course Review Horay Method

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Abstract. The aim of this research is to develop the lower ability of mathematical connection. The population of this research was the entire students of grade VII at one of state junior high school in Tangerang. The instrument used on the research is math connecting ability test. The results of the research showed that: 1) the average of post-test of mathematical connection in experimenting group is 74.78 and 66.61 for controlling group; 2) the average of gain of mathematical connection in experimenting group is 0.39 and 0.22 for controlling group. The conclusions of the research are: 1) the final result of mathematical connection in experimenting group with adequate criterion is getting way better than controlling group with poor criterion; 2) a developing mathematical connection in experimenting group with sufficient criterion is getting way better than controlling group with sufficient criterion. According to this study results, the author presented some suggestions that: 1) problem-based learning with course review horay method can be used as an alternative to improve mathematical connecting ability; 2) mathematics learning alternatives for implementing curriculum 2013; 3) continue with other aspect of research on a broader study.

1. Introduction
Learning in school includes a wide range of science presented in the form of subjects. Each subject has its own role to develop students’ skills. Mathematics is one of the important subjects taught in school. Many problems in daily life can be solved with mathematics. Mathematics also has a role in supporting the advancement of other sciences, such as education, physics, astronomy and others. Mathematics courses consist of various topics and concepts related to each other. This is consistent with the argument of attribution Bruner that in mathematics there is a close relationship between one concept with another, not only in terms of content, but also in terms of formulas are delivered [1].

Educational Unit Level Curriculum (KTSP) explains that one of the purposes of mathematics courses at the level of secondary school is that students have the ability to explain the relationship between concepts. This objective can be accomplished if the student has the ability mathematical connections. Mathematical connection capability is one of the five standard capabilities that must be possessed students in learning mathematics [2] Importance of mathematical connections, that if the students were able to see the connection of topics in mathematics, the students are able to associate mathematical ideas, so the understanding of math will be deeper and last longer [2].
Based on the results of preliminary studies Malasari[3] on mathematical connection capability using instruments Listyotami[4] states that the average score of students' mathematical proficiency test connections in one of state junior high school Tangerang amounted to 33.8 while the maximum score of the test is 81, with the lowest indicators that write object relationships and mathematical concepts. Based on the results of the preliminary study, it appears that the ability of students' mathematical connections in one of state junior high school Tangerang is low.

In connection with the above problems, it can be affirmed that the performance improvement of mathematical connections through a learning process as well as innovative in one of state junior high school is an important need to be implemented. A lesson that can be used to enhance these capabilities is a problem-based learning with course review horay method. The process of problem-based learning with problem scenarios and their order can help students develop cognitive connections [5]. Problem-based learning with course review horay method presents a problem at the beginning of learning to support the achievement of the concept, while the conventional learning presents a problem at the end of the learning and serves as an exercise of the material that has been studied.

Based on these problems, this research relates to the development of mathematical connection, entitled a development of mathematical connecting ability of students in junior high school through a problem-based learning with course review horay method. These research questions are whether the final result and developing in mathematical connection ability of students who received problem-based learning with course review horay method better than students who received the conventional learning.

2. Theoretical Background

2.1. Mathematical Connection

Mathematical connection derived from the two words, mathematics and connection. The connection is a relationship that can facilitate all activities, while the mathematical is concerned with mathematics [6]. Mathematical connection is the ability to make a meaningful relationship between the concepts of mathematics, between concepts with other areas, and with the daily life [7]. Based on the explanations that have been described above, it can be concluded that the mathematical connections is the ability to connect internally mathematics, mathematics with other sciences and mathematics to daily life. There are two general types of mathematical connections, modeling connection and mathematical connection. Modeling connection is the relationship between problem situation that arise in the real world or in other disciplines with a mathematical representation, while the mathematical connection is the relationship between the two representations are equivalent and the completion of each representation [2]. According to the statement, the mathematical connection can be classified into three types, namely, the connection between math topics, connections with other disciplines and real-world connections with students or connection with everyday life. Mathematics is not a collection of separate topics, although in reality it is often partitioned math and taught in several branches [2]. There are topics in mathematics prerequisites as a basis for understanding the next topic [8]. Like building a multi-story building, the second floor and the next will not be realized if the foundation and the floor before being prerequisites have not really mastered. Mathematics as a discipline of science can be useful for other disciplines and mathematics has a role as the queen of science at the same attendant [8].

2.2. Problem-Based Learning with Course Review Horay Method

Problem-based learning is an approach to learning where students work on authentic problems with a view to preparing students' own knowledge, develop discoveries and thinking skills, develop independence and confidence with problem-solving activity [9]. Course review horay method based is a method of learning with comprehension testing using a box that is loaded with a number to write down the answer, which first gained true sign immediately shouted horay [10]. Problem-based learning with course review horay is problem-based learning that in its implementation using the
course review horay with steps which course, the formation of the group, team work, review, horay and evaluation [11].

3. Experimental Method
This research was a quasi-experimental research designs with nonequivalent control group design [12]. The design of the research show as follows:

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Description:
- O : Pretest and posttest mathematical connection
- X : Problem-based learning with course review horay
- --- : The subject is not grouped randomly

The population of this research was the entire students of grade VII at one of state junior high school in Tangerang. The sampling technique used was a cluster sampling technique. There were 76 students taken as sample, and they were divided into two groups, namely the experiment group and the control group. The students in experiment group learned rectangular topic used problem-based learning with course review horay method and the control group learned the same topic used conventional learning. The teaching and learning process was done within five weeks.

The indicators used in this study, as follows: (a) Recognize equivalent representations of the same concept; (b) Recognizing the relationship mathematical procedure a procedural representation equivalent representation; (c) Use and assess the linkages between different mathematical topics and linkages outside mathematics; (d) Use of mathematics in daily life [13].

The data was collected using a test of mathematical connection ability, before the instrument test is used to collect data, the instrument tested for validity, reliability, distinguishing features, and level of difficulty, and also the test instrument was validated by expert. In the pre-test, normality test using chi square test and F test for homogeneity test. With \( \alpha = 0.05 \), sample come from normal distributed population and homogeneous. Method of hypothesis testing used is t-test (right tailed-test).

Post-test is used to determine the final result of mathematical connection. The modify criterion of the final result of mathematical connection as follows: (1) score 90 – 100 (excellent criterion); (2) score 80 – 89 (good criterion); score 70 – 79 (adequate criterion), and score < 70 (poor criterion) [1]. Normalized gain is used in this study to determine the improvement in mathematical connection ability. The formula of gain level [14]:

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\text{gain} = \frac{\text{posttest} - \text{pretest}}{\text{maximum score} - \text{pretest}}
\]

4. Result and Discussion
Data processing mathematical connection tests such as pretest, posttest and gain using descriptive statistics to determine the average value, standard deviation and variance. According to Table 1, the average score of post-test both groups are presented in the diagram below and shown in Figure 1 that the final result of mathematical connection of the experimental group was better than the control group. It is supported by t-test (right tailed-test). This means, the final result of students’ mathematical connection in experimental group who obtained problem-based learning course review horay method better than control group students who get conventional learning. The data processing results can be seen in the following Table 1:
Table 1. Descriptive Data

| Data | Group       | N  | Max Score | Highest Score | Lowest Score | $\bar{x}$ | S     | $S^2$ |
|------|-------------|----|-----------|---------------|--------------|---------|-------|-------|
|      | Pretest     | 38 | 100       | 55            | 10           | 36.95   | 10.99 | 120.86|
|      | Control     | 38 |           | 60            | 15           | 38.82   | 11.33 | 128.42|
|      | Posttest    | 38 | 100       | 85            | 60           | 74.78   | 6.22  | 38.78 |
|      | Control     | 38 |           | 80            | 55           | 66.61   | 7.01  | 49.16 |
|      | Gain        | 38 | 1         | 0.67          | 0.38         | 0.57    | 0.08  | 0.0061|
|      | Control     | 38 |           | 0.55          | 0.18         | 0.42    | 0.10  | 0.0099|

Based on the results of data analysis, gain experimental group is better than the gain of the control group. This is supported by the results of t-test analysis one side (right side). This means that an increase in students' mathematical connection in experimental group who obtained problem-based learning course review horay method better than control group students who get conventional learning. For more details about comparing final result and gain of mathematical connection can be seen in the Figure 1 below.

Figure 1. Average Score of Final Result and Gain of Mathematical Connection

The average of final result experimental group is 74.78 and 66.61 for controlling group. Based on these results, it appears that the final result of the experimental group included in adequate criterion and the final result of the control group were in poor criterion. Data from the gain obtained by the average value of the gain in the experimental group of 0.57, while the average gain in the control group of 0.42. Increased ability to connect mathematical experimental and control groups included into the sufficient criterion. Indicators connection with the mathematical average of the highest value is the use of mathematics in daily life, while the indicator with the lowest average value is used and assessing the linkages between different mathematical topics and linkages outside mathematics.

Students still have difficulties when work on the problems of mathematical connections. The experimental group experienced relatively fewer difficulties than the control group. Difficulties students during work on the problems that require mathematical connection capabilities are presented in Table 2 form below.
Table 2. Difficulty of Student

| Number | Indicator                                                                 | Experiment                                                                 | Difficulty Control                                                                 |
|--------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 1      | Recognize equivalent representations of the same concept                  | Some students have difficulty in drawing conclusions for the kite concept. | Students difficulty in writing the steps equivalent representations of the same concepts and the conclusion is still not quite right. |
| 2      | Recognizing the relationship mathematical procedure an equivalent representation of procedural representation | There are some students who are not taking the equivalent mathematical procedures. | Most students write answers directly regardless of mathematical procedures are equivalent. |
| 3      | Use and assess the linkages between different mathematical topics and linkages outside mathematics. | Drawing wake through the process of GLBB.                                 | Determining the time on a moving object, resulting in errors in drawing graphs. |
| 4      | Use mathematics in daily life                                            | Some students are still less appropriate to write down the steps answers, so the connection is less visible. | Mathematical modeling and write down the steps to answer the many framed photos that will be drawn. |

The achievement of the research objectives as mentioned above, is influenced by several factors including: (1) problem-based learning with course review horay method apply active learning by students as the center of learning and the teacher acts as a facilitator, mediator and motivator, (2) activity team work, including group discussions, completing worksheets in groups and exercises while playing, (3) review their activities, the teacher explains the return of the materials studied as well as reviewing the material that supports student understanding of the material being studied, (4) activity evaluation do the students by communicating orally, subject that has been gained in learning and evaluating the course of the discussion process. So, problem-based learning course review horay method can be applied to improve the mathematical connections in junior high school students. This is supported by Rusman [5] that one alternative learning approach that enables the development of thinking skills of students (connection) is problem-based learning.

Relating to the implementation of curriculum 2013 through a scientific approach to learning steps such as observing, ask, experiment (explore), association and communication, the relation with this research is problem-based learning course review horay method in practice there some stages of learning according to curriculum 2013. These stages are, according to the team work and the experiment to question (explore), where students can talk to each other and to ask the teacher about the nature, circumference and area of quadrilateraland wake phases of team work as well in accordance with the stages of the association, the students can analyze and link the properties wake quadrilateral, as well as the stages of evaluation in accordance with the communication, in this case the student can present orally the things they have learned and do a resume with the teacher about the learning materials have been obtained. Similar to students felt that they had improved their personal abilities, such as collaboration, overcoming shyness, listening and communication ability with problem-solving group work [15]. Core competencies in the curriculum in 2013, namely to live responsible behavior,
care (tolerance) and interact with the social environment can also be realized with problem-based learning course review horay method, because this learning is a group learning that fosters responsibility for the student's own and a responsibility to share knowledge through discussion in order to understand the group of their friends.

5. Conclusion
Based on the formulation of the problem and the result of research and discussion of the result of the study as described in the previous chapter, the conclusions of the research are (1) The final result of mathematical connection in experimenting group with adequate criterion is getting way better than controlling group with poor criterion, (2) A developing mathematical connection in experimenting group with sufficient criterion is getting way better than controlling group with sufficient criterion.

According to this study results, the author presented some suggestions that (1) Problem-based learning with course review horay method can be used as an alternative to improve mathematical connecting ability, (2) Mathematics learning alternatives for implementing curriculum 2013, (3) Continue with other aspects of research on a broader study.

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