

Connected Mathematics Project (CMP) Model Based on Presentation Media to the Mathematical Connection Ability of Junior High School Student

Dedi Rohendi^{1*} Jojon Dulpaja²

1. Mechanical Engineering Education Department, Faculty of Technology and Vocational Education, Indonesia University of Education, Jl. Dr. Setiabudhi No. 207 Bandung, Indonesia
2. Mathematics Education Study Program, School of Teacher Training and Education YASIKA, Jalan Kasokandel Timur No 64, Majalengka 45453, Indonesia

* E-mail of the corresponding author: dedir@upi.edu

Abstract

Connection mathematics ability will be greatly needed by students, especially to solve the problems that need the relation between mathematical concepts with other concepts in mathematics and other disciplines or in everyday life. To get that mathematics ability in this research used *Connected Mathematics Project* (CMP) model based on Presentation Media. CMP model based on presentation media was a student-centered learning model that involved student more; student not only did the problem but also sought the solution actively that enabled student to explore the relation of mathematical concept in real life. This research was a quasi experiment research with the student of 7th grade of Junior High School of Ujungjaya 2 of Sumedang district, Indonesia as the research sample. After the learning in the experiment class was conducted, the data description by using instrument of pre-test and post-test were collected to find out the student's ability of mathematical connection, as well as observation sheet to find out the activity and condition of student during mathematical learning. The result of the research showed that the student's mathematical connection ability by using *Connected Mathematics Project* (CMP) model based on presentation media was better than the conventional one. Besides, student's activity in the learning process by using *Connected Mathematics Project* (CMP) based on presentation media was really positive and they became very active.

Keywords: connected mathematics project model, presentation media, mathematical connection ability.

1. Introduction

Mathematics is a universal science and a basis for other science or as a tool in problem solving on a daily basis. Kline (1973) stated that: "Mathematics is not an autonomous knowledge that can be perfect by itself, but was mainly to help people in understanding and mastering the problems of social, economic, and nature."

In the subject of mathematics, a lot of teachers only teach the concept, without relating it to other concepts or everyday life. Yet, by providing knowledge about the relation between mathematical concepts with other concepts or in everyday life will be greatly needed by students, especially to solve problems encountered in everyday life.

One of the goals to be achieved in the process of learning mathematics is the student's mathematical connections ability. The mathematical connections ability is one of the very useful learning objectives for students since mathematics topic is interrelated to each other as well as to other disciplines. In addition, mathematics has a relation with the real world or everyday life. Therefore, in order the students be more successful in learning mathematics, teachers should give more the opportunity to the students to see the relation.

The learning approach that is able to bring up the mathematical connections ability is connected mathematics. Connected mathematics emphasizes on the ability to use mathematical tools, resources, procedures, knowledge and ways of thinking to make comprehension in the new situation (Herawaty, 2002). Connected mathematics can be useful if it is combined with the project. Projects in mathematics are tasks given to the students to come up with something by themselves on a topic related to mathematics. The use of project in mathematics learning process is highly relevant to equip the students with the ability to face problems in daily life.

Based on the preliminary research in Junior High School of Ujungjaya 2 Sumedang, the learning process that occurs was still the teacher-centered one. Many teachers were not able to create the conditions and atmosphere which allows the students to develop the their mathematical connection abilities. Besides the conventional

learning which was still used by the teacher, the lack interest of the students in learning mathematics also affect the student's mathematical connections ability at this time.

2. Connected Mathematics Project (CMP) Model Based on Presentation Media

CMP model is a learning model which emphasizes on the given mathematics projects related to connected mathematics. By providing the given project, the learning is expected to be focused on important materials. In addition, students are expected to have responsibility in completing a project given according to the roles in the group. CMP stimulates the understanding of circumstantial problems with the use of a particular form of representation, such as graphic, numeric, symbolic, and verbal forms, then discusses and evaluates the problem resolution. Herawaty (2002) stated that CMP not only could help students grow in accordance with their ability to effectively think, by presenting information in graphic, numeric, symbolic, and verbal form but also change these representations flexibly. CMP requires teachers to think in different ways of teaching technique which centers on issues required in the aspects of learning.

CMP model based on presentation media means the teaching learning process by using CMP model based on presentation media. Presentation media based on computer can be used as a facility to perform simulations, training skills and competences. Presentation media in learning has a function as a tool to clarify the teachers message.

The research result showed that the advantages of using computers as a teaching media are as follows: in presenting graphics and images as a visual form that can be observed and studied by students in the conceptualization and mathematical modeling besides that, computer potentially can be used to improve the quality of learning, especially in the mathematical modeling (Ryan, 1991; Soegeng, 1998, Graham and Rowlands, 2000). Fumiuyuki (2000) indicated that the computer could be used in mathematics teaching for several reasons. First, the computer could be used as a presentation tool that had the speed and accuracy in information processing. Second, the computer could be used as a learning tool which interacted with students. Finally, the computer could be used as a tutor that served the needs of each individual in the study.

A way to apply the Connected Mathematis Project (CMP) model is children are involved in tasks that require computing, measuring, estimating, building, problem solving and reasoning. Children look for the activities that require the use of mathematical skills such as model scale building, cooking, travel planning and playing a game of logic. Children are told to explain what they discuss and learn with their group.

Stages of learning in the Connected Mathematics Project (CMP) are: launching problem, exploring and summarizing as to stimulate the students in understanding the circumstantial problem by using a particular form of representation, discuss and evaluate the problem solving. Thus, the activities of learning mathematics by using the CMP model are expected to stimulate students' ability especially their mathematical connection ability. CMP model study aims to help students and teachers develop their mathematical knowledge, understanding and skills as well as awareness and appreciation toward linkages between those parts of mathematics and between mathematics and other subjects as well as with the real world. Through this model, the students' mathematical connections ability is expected to be improved. Steps of learning with the CMP model are presented in Table 1.

3. Mathematics Connection Ability

According to the *National Council of Teacher of Mathematics (NCTM) Standard* (1989), a meaningful learning is a basis to create *Mathematical Connection*. Mathematical connection is the most important part which needed to be emphasized in every level of education. According to Kusuma (2008), the mathematical connection ability is one's ability in presenting internal and external relationship of mathematics, which includes the connection between mathematical topics, the connection with other disciplines, and the connection in everyday life. Thus, in a broad meaning mathematical connection is the linkages between mathematical topics, between mathematics and other disciplines, and between mathematics and the real life or everyday life.

The mathematical connection means capacity above given information, with a critical attitude to evaluate something and has a metacognitive awareness and problem-solving ability. Marzano, et al., (1988) stated that metacognition is the process by which individuals utilize their cognition in understanding him/herself, thinking processes, and control of thinking processes. Suryadi (2003) stated too that metacognitive is important since someone's knowledge about the cognitive processes can guide him/herself in choosing a strategy to improve further cognitive performance.

Mathematical connections or connections in mathematics study the students' understanding of connecting the mathematical ideas that will facilitate the ability to formulate and verify conjectures deductively between topics.

The mathematical concept and procedure developed which are newly can be applied to solve the other problems in mathematics and other disciplines. Sumarmo (2002) describe some of the indicators in mathematical connections:

- a. Finding the relationship of the various representations of concepts and procedures,
- b. Understanding the relationship between mathematical topics,
- c. Using mathematics in other areas of study or daily life,
- d. Understanding the representation of equivalent concept or similar procedure,
- e. Finding the connection between one procedure to another in an equivalent representation.
- f. Using connections among mathematical topics and between mathematics with another subject.

But in reality, the study of mathematics is generally viewed as a number of topics so that each topic tends to be taught separately. This of course makes students remember numerous concepts and do not recognize the general principles that are relevant to various fields. Therefore, the learning should help the students to be able to see how the ideas of mathematics interrelated. When the idea of mathematics were associated with the daily experience, students will definitely appreciate the usefulness of mathematics.

3. Methodology

This research was a quasi experiment method. The purpose of this research was to find out the students' ability of mathematical connection by using the learning model of Connected Mathematics Project (CMP) based on presentation media. In this research, there were two classes i.e. learning class with Connected Mathematics Project (CMP) based on presentation media and class with the conventional learning. Before research was conducted, both classes were given the pre test and after the treatment post test was given, so that the research design used was as Question (1) follows:

$$\begin{array}{l} \text{Experiment class : } O_1 \text{ X } O_2 \\ \text{Control class : } O_1 \quad O_2 \end{array} \quad (1)$$

Notes:

- O_1 = pre test
- O_2 = post test
- X = treatment with CMP model based on presentation

The sample of this research was the students of 7th grade with 27 students each. While the research instrument used were written test, observation sheet, and the mathematics project.

The formula which was used to prove the hypothesis was t-test Question (2).

$$t = \frac{\bar{x}_1 - \bar{x}_2}{dsg, \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \quad (2)$$

Hypothesis criteria: the hypothesis (H_1) was accepted if: $t_{tes} > t_{table}$, otherwise hypothesis was rejected.

The proposed hypothesis was:

- H_1 : The students' mathematical connection ability by using CMP model based on presentation media more better than the conventional learning

4. Result and Discussion

After the research was conducted, the data of pre-test and post-test gained were presented by Table 2. Based on the results in table 2, a description was obtained that the students' ability of mathematical connection by using CMP showed a better result seen from the average acquired. Next, to test the proposed hypothesis, a difference test of two means toward the result of post-test performed.

Based on the statistics results, the value of $t_{test} = 18.50$ was retrieved and $t_{table} = 2.01$. Thus, based on the criteria, the hypothesis was accepted so that it can be concluded that the students' ability of mathematical connections by using the CMP model of learning based on presentation media improved more than those with the conventional learning.

Yet, based on the results of observation during the learning, a result was obtained that the teacher had been conducted well each stage of the CMP model based on presentation media.

In general, by using the CMP model of learning, the students were more enthusiastic and gave positive response to learning mathematics. It could be seen from the analysis results of the observations conducted by the mathematics teacher at the school. It was the same with the students' enthusiasms on the CMP model based on presentation media which were positive. This was because of the students were given a problem, then the students searched for and investigated the problems itself, so that students could pour the ideas of mathematics by themselves. With the existence of a mathematical project given by the teacher, the students were very enthusiastic because they could work on the issues that related to the real world as well as how their mathematical skills can be applied in the real world. In addition, mathematical project could open the door to bring in other subjects and disciplines/fields to the class of mathematics so that students could quickly recognize that mathematics dealt with many things in life.

Enthusiasms of students toward the ability of mathematical connections were positive, since students were given problems in order to be able to associate the connection between mathematics and mathematics itself, mathematics with other subjects and mathematics with the problem of the real world. Thus, the students were challenged to implement the CMP model based on presentation media to their mathematical connection capabilities. Figure 1 showed the learning activities with the CMP based on presentation media.

When the learning took place, there were observers who observed the learning activity by CMP model based on presentation media. Based on the observation, a description of the learning process was obtained as follow:

Learning implementation was done in several meetings. Each meeting lasted for 90 minutes. The material discussed in this reseach was the comparison. At the meeting students discussed the definition of the comparison and the scale as a comparison.

At the time of apperception, the teacher set the classroom for learning and provided an overview of the material to be studied. Furthermore, teachers divided students into groups, to carry out mathematical group discussions and projects that have been provided.

At first the students seemed to have difficulties in finding the problem, solving mathematical problems and projects. It was because they were not accustomed using this kind of learning. The students were still reluctant to seek their own mathematical ideas, but on the second and third meetings the students started to be more familiar to learn that model .

At the time of presenting the material, there were some opportunities for each group to ask some questions about the given mathematical project. Teachers did not directly answer the questions of the students, but the teachers just repeated the material and provided guidance, so the students could find their own answers.

Teachers also motivated students to continue exploring the mathematical skills and engaged students in the learning activities to let them know about the relevance of mathematics that is universal. Once group discussions completed , the teacher asked one representative of each group to present the results of their discussions and write them on the board. After the group presented and delivered the result on the board, then the teacher straight invited the students to see whether the explanation was right or wrong. Then the teacher would also explained further to confirm the group explanation. At the end of the lesson, one of the groups was awarded to be the best group and each group had to write the learning conclusions.

5. Conclusion

Based on the analysis results of the data obtained from pre test, post test, and observation sheets, the conclusions of the research results of 7th grade of Junior High School of Ujungjaya 2 were as follows:

1. The students' ability of mathematical connections by using Connected Mathematics Project (CMP) learning model based on presentation media improved more than conventional learning.
2. From the result of observation, the students were more enthusiastic in learning mathematics by using Connected Mathematics Project (CMP) based on presentation media. It means that the students are excited and interested to participate in the learning process.

Based on the conclusions above, learning mathematics by using Connected Mathematics Project (CMP) model based on presentation media could enhance the students mathematical connections ability.

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Dedi Rohendi, is a lecturer of Mechanical Engineering Education Department, Faculty of Technology and Vocational Education, the Study Program of Computer Science, Faculty of Mathematics and Sciences Education, Indonesia University of Education, and also the lecturer of the Study Program of Mathematics Education, School of Teacher Training and Education Yasika, Majalengka. He received Master degree in Computer and Informatics Systems from Gadjah Mada University and Doctor degree in Mathematics Education from Indonesia University of Education. Dedi Rohendi's research interest are in implementation e-learning and technology in Mathematics Education.

Jojon Dulpaja, is a teacher staff of SMP Negeri 2 Ujungjaya Kabupaten Sumedang. He graduated bachelor degree in Mathematics Education from Study Program of Mathematics Education, School of Teacher Training and Education Yasika Majalengka. Jojon Dulpaja research interest are in implementation teaching methodes in Mathematics Education.

Table 1. The stages of CMP model

Stage	Teacher's role	Student's role
<i>Launching</i>	Teacher launched a problem and helped the students understand the problem's setting which would be a project of mathematics later	Students listened to the problem given by the teacher and understood the setting of the problem
<i>Exploring</i>	Teacher observed the performance of the students either individually or groups, directed and encouraged students to solve the problem	Students worked to solve the problem individually or in a group
<i>Summarizing</i>	Teacher helped the students improve their understanding of mathematics in the problem	Students discussed the strategy used to approach the problem, organize the data, find the solution and make a conclusion

Table 2. Data description of *Pretest* and *Post test*

test	Class	Number of Subject	Mean	Highest Score	Lowest Score
Pre test	Experiment	27	31,61	45	10
	Control		29,39	45	10
Post test	Experiment	27	69,83	90	45
	Control		47,44	65	25

Maximum score: 100



Figure 1. The Learning Activity of Students by Using CMP
 Based on Presentation Media