

Influence of CORE Model with Scientific Approach to Students' Mathematical Problem Solving Ability

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Abstract - This research was motivated by the low ability of students' mathematical problem solving, so there was a need of learning model that is able to enhance students' problem solving and self-esteem. One of the learning models that can be used is CORE (Connecting, Organizing, Reflecting and Extending) mixed with scientific approach. The result show: students' mathematical problem solving who get CORE model mixed with scientific approach are better than student who get scientific learning. The enhancement students' mathematical problem solving who get CORE model with scientific approach are better than student who get scientific learning.

Index Terms - *Mathematics problem solving, CORE, Scientific approach*

I. INTRODUCTION

Learning is the most important activity in every aspect of human life, learning is done to know what is not yet known. Learning is a series of body and soul activities to gain a change of behavior as a result of individual experience for the interaction with its cognitive, affective, and psychomotor environments [4].

Mathematics is a knowledge that plays an important role in all aspects, both daily life and in the development of other sciences. States that mathematics plays an important role because mathematics basically equip the man to solve the problems encountered in everyday life by using human mindset, namely logical thinking, rational, critical, accurate, honestly, effective, and efficient [1]. In accordance with the purpose of mathematics in schools, we can see that school mathematics plays a most important role [23].

Problem solving ability is the students' effort to using their skills and knowledge to find out the solutions of mathematical problems. In order for students to be more trained in solving the problems, the students need many opportunities to solve the problems in mathematics field and in the real life. This may be done by undertaking the activities which is covered by problem-solving activities: (a) identifying the adequacy of the data for problem solving; (b) create the mathematical model of a situation or problem and solve it; (c) selecting and implementing the strategies to solve the mathematical problems; (d) explain or interpret the results according to the original problem, and check out the truth of

the outcome or answer; (e) applying the mathematics meaningfully [24].

Based on the results of pfeviuos study conducted by [1] to grade VIII students of SMP N 1 Bayah in four questions, in Phytagoras can be said that the students' mathematical problem solving ability was still low because it does not reach the value of mastery of 70. Of 26 students only six students got a value of more or equal to 70 or about 25.94%, while the other 20 students scored less than 70 or about 74.06%.

One of the learning model that is expected to improve the students' mathematical problem solving ability is connecting, organizing, reflecting and extending (CORE) learning model and combined with the scientific approach. The CORE model is based on Bruner's theory and Cognitivistic learning. CORE learning model emphasizes on students' thinking ability. Thinking activity is very emphasized to the students. This learning model has several steps in the learning process, namely the activity (connecting) to connect the old ideas or concepts with the new ideas or concepts, organizing activities, reflecting activities that deepen the concept they have, extending activities, the students were trained to develop, expand the information they get.

II. MATHEMATICAL PROBLEM SOLVING ABILITIES

Problem solving can be taught on any subject, especially on mathematics. Problem solving is the process used to solve the problem [28].

States that problem solving is a way of thinking, analyzing, and reasoning using the experience and knowledge associated with the problem. Thus problem solving is an educational component which capable to teach the value of mathematics, namely functional, logical and aesthetic [1].

According Polya (Suherman, 2003: 99), states that the of mathematical problemsolving can be achieved by considering the problem-solving process that includes:

- a. understand the problem,
- b. plan the solution,
- c. solve the problem according to the second step,
- d. re-examine the results obtained.

In solving the problem, the students are expected to understand the problem-solving process and have skills to select and identify the relevant conditions and concepts, seeking generalizations, formulating a plan of completion and organizing the previously owned skills. The problem solving has a very important function in the learning process because through the problem solving the students can practice and integrate the concepts, theorems, and skills learned.

III. CORE LEARNING MODEL

CORE learning model is a learning model that emphasizes the students' thinking ability to connect, organize, explore, manage and develop the information obtained. The thinking activity in this model is emphasized to the students. The students are required to be able to think critically about the information obtained.

Connecting is an activity of connecting the old concepts with the new concepts, students are trained to remember the old informations and use them in new information or concepts. As Dymockstated in [8] that: "An effective lesson connects students to the topic. Connectedness is the link between what the reader know and what is being learned. Teacher should connect students to the content and the text structure". This needs to be applied to the students to produce a good relationship or connection, in order to be able to support their metacognitive ability to connect the ideas.

Organizing is an activity to organize the ideas, can train the students' ability to organize, manage the information that they have. At this stage students are expected to organize their knowledge to solve the problems which given by the teacher.

Reflecting is an activity of rethinking, deepening, digging the information that has been obtained to strengthen the concept that has been owned. The process of reflection is passed by making a summary of the questions that have been done and discussed.

IV. SCIENTIFIC APPROACH

The scientific approach is a learning approach that applies the scientific method. This approach more emphasize the process of seeking knowledge than the transfer of knowledge. This causes the students to be seen as learning subjects who need to be actively involved in the learning process and the teacher as a facilitator who guides and coordinates the learning activities [7]. The expected result in the scientific approach are produces the productive, creative, innovative, and affective students and a balance between the ability to be a soft skill and a human who has the skills and knowledge to live on the hard skills of the students.

According to the [7] Seven criterias in the scientific approach, namely:

- 1) Material-learning based on the facts or phenomena that can be explained by certain logic or reasoning; not limited to the imagination, fantasy, legend or fairy tale alone.
- 2) Teachers' explanations, students' responses, and the educational interactions of teacher-student are free of any prejudicial, subjective, or logical reasoning that diverges from the logical thinking path.
- 3) Encourage and inspire the students to think critically, analytically and appropriately in identifying, understanding, solving problems, and applying learning materials.
- 4) Encourage and inspire the students to think hypothetically in seeing the differences, similarities, and links to each other from the learning materials.
- 5) Encourage and inspire the students to understand, apply, and develop the rational and objective thinking patterns in responding the learning materials.
- 6) Based on the concepts, theories, and empirical facts that can be accounted for
- 7) Learning objectives are formulated in a simple and clearz form, but interesting presentation system.

The scientific approach in learning involves digging the information through observing, asking, reasoning, trying, and creating networks. For subjects, materials, or situations, it is very likely that this scientific approach is not always aptly applied procedurally but certainly the learning process must still apply the scientific nature and avoid the non-scientific nature [7].

V. CORE MODEL WITH SCIENTIFIC APPROACH

CORE learning model with scientific approach that will be implemented was learning with CORE model combined with 5M application that are observing, asking, reasoning, trying, and making network.

A. *Connecting phase*

In this first stage, the students are expected to connect the previously learned knowledge with the material to be studied. At this stage, the students observe and question all of activities that they have not understood, The problem solving indicator that can be achieved in this stage is understanding the problem.

B. *Organizing stage*

In the second stage, the teacher divides the students into groups, provides the problems which related to the topics to be discussed, the students organize the knowledge they get, along with the discussion with their group mates. At this stage, the students reason, try the problems faced. The problem-solving indicator that can be achieved is to create a split plan.

C. Reflecting stage

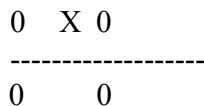
In the third stage, the teachers encourage the students to express their opinions in front of their peers. In this stage the students ask, communicate or create a network about the issues discussed. The problem-solving indicator at this stage is solving the problem.

D. Extending stage

The fourth stage, the teachers give new problems with the same criteria with the different levels of difficulty. In this stage the students reasoning, trying in the problems given teachers. The problem-solving indicator at this stage is interpreting the results,

VI. METHOD

This research method was quantitative research method, [21] reveals that the method of quantitative research can be interpreted as a research method based on positivism philosophy, used to research on a population or a particular sample, the sample collection techniques are generally done randomly, the data collection using instruments, data analysis is quantitative/statistical with the aim to test the hypothesis that has been set. This study aimed to determine the students' mathematical problem solving abilities in mathematics using CORE learning model. This study was conducted based on the design of Nonequivalen Group Design. With pattern:



Information:

- 0 = Pretest and posttest in the experimental class and control class
- X = CORE learning model with scientific approach
- = Indicates the subject is not selected at random.

The population in this study is the students of eight grade in SMP Negeri 1 Bayah. The sample selected in this study there were two classes, namely class VIII D as the control class and VIII E as the experimental class. The sample determination in this study using purposive sampling technique, purposive sampling was determination technique of samples with certain considerations [21].

VII. FINDING AND DISCUSSION

Ability to solve the mathematical problem of students who get CORE model with scientific approach and students who get scientific study was depicted in table 1 while the

improvement of problem solving ability of mathematics is depicted in table 2.

Based on the data in table 1 and table 2, the average score of students' mathematical problem solving abilities that get the CORE model with the scientific approach is greater than the students who get the Scientific study.

TABLE 1
DESCRIPTIVE STATISTICS OF DATA *POSTTEST*

Statistics	Experimental Class	Control Class
Number of Students (<i>n</i>)	33	33
Minimum Score (<i>X_{min}</i>)	9	7
Maximum Score (<i>X_{max}</i>)	29	29
Average (\bar{X})	18,727	14,924
Standard Deviation (<i>s</i>)	5,479	4,99
Ideal Maximum Score (<i>SMI</i>)	40	40

TABLE 2
DESCRIPTIVE STATISTICS OF DATA *GAIN*

Statistics	Experimental Class	Control Class
Number of Students (<i>n</i>)	33	33
Minimum Score (<i>X_{min}</i>)	0,06	0,05
Maximum Score (<i>X_{max}</i>)	0,54	0,50
Average (\bar{X})	0,294	0,189
Standard Deviation (<i>s</i>)	0,134	0,126
Ideal Maximum Score (<i>SMI</i>)	1,00	1,00

After knowing the average score of posttest and data gain then data analysis was done to test whether the score of problem solving ability of mathematical students who get CORE model with scientific approach better than students who get scientific study. The two-tailed difference test used is one-tailed t-test with 5% significance level with prerequisite test ie normality test and homogeneity test. After data analysis is obtained t_{hitung} for posttest data is 2,947 and t_{table} is 1,669 it seems that $t_{hitung} > t_{table}$ So that it can be said that the problem solving ability of mathematical students who get CORE model with scientific approach better than students who get scientific

study. Likewise for the gain data obtained t_{hitung} is 3.255 and t_{table} is 1.669 it seems that $t_{hitung} > t_{table}$ so that it can be said that the improvement of problem solving mathematical ability of students who get CORE model with scientific approach better than students who get scientific study.

VIII. CONCLUSION

1. The ability of mathematical problem solving of students who get a CORE learning model with a scientific approach was better than students who get scientific learning significantly.
2. The improvement of mathematical problem solving skills of students who get a CORE learning model with scientific approach was better than students who get scientific learning significantly.

SUGGESTION

1. For the teachers, CORE learning model which combined with the scientific approach can be used as an alternative for mathematics learning in schools.
2. CORE learning model can improve the problem solving ability so that it can be one of variation of group learning model.
3. In this CORE study, the role of teachers was suggested to create a comfortable learning atmosphere and attract students to participate in every aspect of learning, in order to achieve the success in learning.
4. In this CORE study, it is suggested to pay attention to the grouping of heterogeneously students, so that the learning takes place well.
5. This study was limited to the subject of the System of Linear Equation with Two Variables, suggested to the next researcher to conduct research on other subjects.

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