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The Difference between Mathematical Reasoning Ability Improvement by Learning with Meta Cognitive Approach Aided Probing and Prompting Techniques in SMP Negeri 4 SeiSuka

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Abstract

The purpose of this study were: (1) analyzed the differences in students' mathematical reasoning ability improvement taught by metacognition approach aided probing technique (PMT-probing) and metacognition approach aided prompting technique (PMT-prompting); and (2) described the process of the students' responses in solving mathematical reasoning abilities. This study was a quasi experimentalresearch. The population in this study were all students of class VIII SMP Negeri 4 SeiSuka, with a purposive sampling techniques, the obtained sample was VIII-1 and VIII-2. The research instrument used a test of mathematical reasoning ability, and had qualified the criteria of content validity, and reliability coefficient of 0.819. Anova two ways was used to analyze the difference of mathematical reasoning ability improvement, while descriptive analysis was used to analyze students' answers process. The results showed that: (1) There were differences in students' mathematical reasoning skills improvement which were taught by metacognition approach aided probing techniques and the students taught by prompting technical approach; and (2) The process of the students' responses on students' mathematical reasoning abilitythrough learning with metacognition approach aided by prompting techniques was better than metacognition approach aided by probing techniques.

Keywords

Mathematical reasoning ability, PMT-probing, and PMT-prompting

1. Introduction

The main objective of organizing learning process is the success of students in learning, either on a particular subject or education in general. Various efforts to improve student learning outcomes, ranging from curriculum improvement, adjustment of the subject matter and teaching methods are continued to do in order to create a learning breakthrough suited to the conditions of students in the field. One of the effort is the implementation of Curriculum 2013. The curriculum 2013 is a competency-based curriculum which the development is directed at achieving competence formulated of graduating standards competence (SKL). In connecting with the implementation of the current curriculum 2013, especially in Math, it is expected that learners have the ability of core competence such as attitudes, knowledge and skills scope.

The ability that expected is contained in the aims of curriculum 2013 in the form of mathematical learning objectives, namely: (1) understanding math concepts; (2) using the pattern as alleged in the resolution of problems; (3) using the reasoning on the nature, perform well in streamlining mathematical manipulations, as well as analyzing the components in the context of problem solving in mathematics and outside mathematics; (4) communicating the ideas, reasoning and able to devise mathematical proofs using complete sentences, symbols, tables, diagrams, or other media to clarify the situation or problem; (5) having an attitude in appreciating the usefulness of mathematics in life; (6) having the attitudes and behavior in accordance with the values in mathematics and learning; (7) doing any motoric activities that uses mathematical knowledge. Based on the importance and purpose of learning math, learning math process is expected to be able in encouraging the development of students' understanding and appreciation of the principles, values, and mathematical processes. This will pave the way for the advance of reasoning, logical, systematic, critical, and creative, even students enjoy learning mathematics. This is supported by research Saragih and Napitupulu (2015), as one of the goals of teaching mathematics to junior high school students, higher order mathematical thinking ability need serious attention.

However in fact the quality of mathematics education in Indonesia is still low. It is supported by the TIMSS results (The Third International Mathematics Science Study) started in 1999, 2003, 2007, and 2011. Indonesia in 1999 was rated 34th out of 38 countries, 2003 was rated 35th out of 46 countries, and in 2007 was rated 36th out of 49 countries (Kemdikbud, 2016).

Meanwhile, in 2011, Indonesia was to rank 38 of the 42 countries with a value of 386 (IEA, 2012). The conditions were not much different can also be seen from the results of studies conducted PISA (Programmed for International Student Assessment), where the results of PISA in 2012 Indonesia was ranked 64th out of 65 participating countries with an average score of 375, while the average of international score is 500 (OECD, 2014).

The low quality of mathematics education as mentioned above should be fixed. Therefore, the mathematics in schools should be able to strive for students to develop the ability to think, reason, communicate ideas and can develop creative and problem-solving activities. This is in line with that expressed NCTM (2000), the standard capabilities that must be achieved in mathematics include problem solving, reasoning, connection, communication and representation.

Referring to one of the standard process, namely mathematical reasoning ability is an ability that must be owned by the students. Ministry of Education (Sadiq, 2004) stated that the matter of mathematics and mathematical reasoning are the two things that can not be separated, i.e., matter understood through reasoning and mathematical reasoning to understand and learn the material drilled through mathematics. In other words, learning mathematics is inseparable from the activity of reason.

Based on the initial findings of researchers by asking questions to measure the ability of mathematical reasoning to the material flat wake SMPN 4 Sei Suka indicates that students have not been able to use his reasoning well. Of the 30 students only 13% (4) were answered correctly and completely. Based on the indicator of the ability of reasoning, 27% (8) may submit allegations, 33% (10 people) can perform mathematical manipulations and 20% (6) were able to draw conclusions or give reasons against several solutions and 20% (6 people) to find pattern or mathematical models.

Recognizing the reality on the ground that the reasoning abilities of students is still relatively low, so methods or appropriate learning approaches are really important. This is consistent with that disclosed by RJ (2010), as a professional teacher, then we have a duty to select and to determine the methods and approaches that can be used to facilitate the delivery of teaching materials to be accepted easily by the students. Metacognition approach could be one solution, because the learning approach that metacognition is to create awareness of learning how to design, to monitor, and to control, about what they know; what is required to do and how to do it. Learning with metacognition approach focuses on students' learning activities; help and guide the students if there are difficulties; as well as helping students to develop self-concept what to do when studying mathematics.

To raise awareness about the process of thinking and learning of students requires a learning technique. Questioning technique is one of techniques that fits in the learning with metacognition approach, because according to Marno and Idris (2008) on teaching and learning, asking plays an important role, because the questions are structured properly will increase student participation in learning activities, generate interest and taste curious students to a problem, develop a way of thinking and active learning of students, guide the students' thinking process, focus on the students' attention to the issues which are being discussed.

Probing and prompting technique is one of the effective questioning techniques in guiding and exploring the thinking of students so that students can find their own knowledge to be achieved. According to Suyanto (2009) probing and prompting learning techniques is learning by the teacher presents a series of questions that are guiding and digging, resulting in the thinking process linking knowledge students' attitudes and experiences with new knowledge that is being studied. The questions posed to the students will make students think more rationally about the knowledge that has been acquired previously, and linking the questions that arise causing new knowledge.

The same thing in the research of Fauzi (2011), teachers can act as facilitators who provide direction and guidance by givingleading questions (prompting questions) or digging questions (probing questions) so that students are aware of their cognitive abilities and linking students' knowledge with new knowledge that is being studied.By looking at the characteristics and advantages of the probing and promptingtechniques, if both of these learning techniques using metacognition approach, it could be expected to improve the ability of students' mathematical reasoning. To see whether the approach metacognition aided probing or prompting techniques is better to improve students' mathematical reasoning ability, the writer needs to examine differences in improvement between students' mathematical reasoning abilities by learning metacognitive approach aided probing and prompting techniques.

Based on the description of the problem described earlier, the purpose of this study are: (1) analyze the differences in mathematical reasoning capacity building among the students taught bymetacognition approach aided probing and prompting techniques; and (2) describe the responses of the students in solving mathematical reasoning abilities.

2. Literature

2.1 Mathematical Reasoning Ability

According to Copi (2001), the reasoning is process with which one advances, with arguments from premisses known (or affirmed for the purpose) to conclusions. This is supported by Keraf (the true, 2004) reveals that the reasoning is a process or an activity thought to draw conclusions or make a new statement which was based on some statements whose truth has been proven or assumed previously.

The indicator of the ability of mathematical reasoning in this study are (1) submitted allegations; (2) perform mathematical manipulations; (3) draw conclusions and provide the reasons or evidence of the truth of the solution; and (4) find the pattern or nature of symptoms mathematical generalization.

2.2 Assisted Metacognition Approach Probing Techniques (PMT-Probing)

According to Huitt (1997), metacognition as one's knowledge of the cognitive system, a person's thinking about thinking, and the essential skills of a person in "learning to learn". Further Huitt argued that metacognition include a person's ability to ask and answer some types of questions related to the task at hand. Meanwhile, according to Huda (2013), probing technique is defined as a technique of guiding students with the teacher presents a series of questions that are dug so that a process of thought that associates the knowledge and experience of students with new knowledge.

Thus, it was concluded that the approach metacognition aided probing technique is learning by building awareness strategies to think about what he thinks the students through the submission of questions probing the form of questions tracker to get an answer more in-depth than the students with the intention to develop the quality of the answers, so that the next answer more clear, accurate, and reasonable.

2.3 Metacognition Approach Assisted Techniques Prompting (PMT-Prompting)

Learning by using prompting techniques is learning by asking a question that is directed or guided in his thinking process to find the right answer, and if the student fails to answer the question, or the answer is less than perfect, the teacher will give another question which is much simpler. This is supported by Sudarti (Huda 2008), reveals that the question prompting can be done by changing the arrangement of questions with words more simply bringing them back to the original question.

So it was concluded that the metacognition approach aided by prompting technique is a way to build awareness of learning strategies to think about what he thinks the students through the submission of questions that are directing or guiding students in his thinking process to find the right answer.

2.4 Students' Answer Resolution Process in Problem-Solving Mathematical Reasoning Ability

Each students must have had vary pattern of responses in solving mathematical problems, because the students have a different mindset so the solving problem process is also different. It is appropriate with Pramesti's opinion (2013), naturally the students' ability in solving mathematical problems is different. The answer process is the systematic of students' answers on tests of mathematical reasoning abilities. The process of answe or the students' problem solving process are not covered in one way only. In order to make the answer process be more varied, structured and systematic then the teacher should be able to create learning which is enable students to answer the question more systematically. Hopefully, through learning and PMT-PMT-Probing Prompting settlement process students' answers are more varied, structured and systematic.

3. Materials and Methods

3.1 Population and Sample Research

The population in this study were all of students of SMP Negeri 4 SeiSuka which consist of 17 classes, with purposive sampling the sample obtained in this study were students of class VIII SMP Negeri 4 SeiSuka is class VIII-1 and VIII-2 respectively consists of 30 students. Then experiment class 1 is class VIII-1 by learning with metacognition approach aided probing technique and experimental class 2 is class VIII-2 by learning with metacognition approach aided prompting technique.

3.2 Research Design

This research was experiment research which used the type of quasi experiment (experiment false). The design of this study are presented in the following table:

Table 1. Study Design

Class	Pretest	Treatment	Posttest
Experiment 1	O_1	X_1	O_2
Experiment 2	O_1	X_2	O_2

Modification: Sugiyono, 2012.

Information:

O_1: pretest

O_2: posttest

X_1: Metacognition approach probing aided engineering (PMT-Probing)

X_2: Metacognition approach prompting aided engineering (PMT-Prompting)

3.3 Research Instruments

Early mathematics ability test used to determine the students' mathematical knowledge possessed by students prior to the study were drawn from UN matters elementary level. Based on early mathematical ability scores obtained, students were grouped into three groups, namely the group of students of high, medium and low. Further tests of mathematical reasoning ability that is used is a test in narrative form. The selection of the test description intended to reveal students' reasoning ability fully to the material presented. The mathematical reasoning ability test is based on lattice tests of mathematical reasoning abilities and be based on indicators of mathematical reasoning ability and achievement of learning outcomes to be achieved.

To acquire the learning and to research tool for using is as a measuring tool in the study, the first validated by experts, then tested and analyzed the validity and reliability to get good test results. Through the help of SPSS 22, all of the test items declared valid mathematical reasoning ability, and reliability tests of mathematical reasoning abilities of students is 0.819 with very high criteria.

3.4 Data Analysis Technique

One of the requirements in quantitative analysis is the fulfillment of the assumption of normality distribution of data to be analyzed. By using the Kolmogorov-Smirnov normality test through SPSS 22, mathematical reasoning ability test data for the experimental class 1 and experimental 2 has a normal distribution of data. Further testing homogeneity using *Lavene* test through SPSS 22 groups of test data obtained mathematical reasoning abilities experimental class 1 and experimental 2 has a homogeneous variance data. Then to determine the increase score pretest to posttest scores on mathematical reasoning abilities in the experimental class 1 and experiment 2, the gain index is calculated using the formula:

$$index\ gain = \frac{score\ posttes - score\ pretest}{maximum\ score - score\ pretest}$$

The statistical analysis used to determine there is a difference or not between the increase in mathematical reasoning ability between the experimental class 1 and experiment 2 by grouping students KAM is anava two ways with helping of SPSS 22.

4. Results

4.1 Description Early Mathematics Ability (KAM)

To get a student KAM calculation of mean and standard deviation. To complete calculation results are presented in the following Table.

Table 2. Description of KAM Students Based Learning

Class	Ideal Score	N	x_{min}	x_{max}	$\bar{X}$	SD
Experiment 1	20	30	10	18	14,400	2,159
Experiment 2	20	30	10	18	14,600	2,143
Whole	**20**	**60**	**10**	**18**	**14,500**	**2,151**

The Table 2 above shows that the average score KAM for each class sample is not much different. Next is a grouping students into three categories, namely the ability of high, medium and low. These groupings are based on the average value ($\bar{X}$) and Standard Deviation (SD). For students who have grades $KAM \geq \bar{X} + SD$ grouped in mathematical ability is high, students who have grades KAM among less than $\bar{X} + SD$ and more than $\bar{X} - SD$ grouped in mathematical skills were, while students who have grades KAM ≤ $\bar{X} - SD$ grouped in low ability. Results summary KAM grouping students are presented in the following Table.

Table 3. Distribution of Research Samples

Class Research Sample	Ability Stsdents		
	Low	**Medium**	**High**
Class Experiment 1	6	17	7
Class Experiment 2	4	18	8
Total	**10**	**35**	**15**

4.2 Description of Mathematical Reasoning Ability Pretest Results

To obtain a picture of students' mathematical reasoning skills pretest calculating mean and standard deviation. A summary of the results are presented in the following Table:

Table 4. Description of Pretest Results Mathematical Reasoning Ability Students

Learning	Category KAM	$\bar{x}$	*SD*	X_{Min}	X_{Max}
Experiment 1	High	8,857	0,378	8	9
(PMT-*Probing*)	Medium	7	0,707	6	8
	Low	5,167	0,408	5	6
	Whole	**7,067**	**1,363**	**5**	**9**
Expeiment 2	High	8,625	0,518	8	9
(PMT-*Prompting*)	Medium	7	0,767	6	8
	Low	5	0	5	5
	Whole	**7,167**	**1,389**	**5**	**9**

From Table 4 shows that the minimum and maximum score pretest of mathematical reasoning abilities of students in the experimental class 1 and class 2 is the same experiment. Analisis Statistics with the t-test of the pretest results of mathematical reasoning skills students are presented in the following Table:

Table 5. Test Results-t Pretest Mathematical Reasoning Ability Students

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	**Sig.**	**T**	**df**	**Sig. (2-tailed)**
Pretes	Equal variances assumed	.022	.883	-.292	58	.771
	Equal variances not assumed			-.292	57.820	.771

Based on Table 5 above, the value of sig. (2-tailed) of 0.771 which is greater than the significance level of 5%, it can be concluded that there was no significant difference between pretest results achieved by the experimental class 1 and experiment 2.

4.3 Description of Mathematical Reasoning Ability Postest Results

At the last meeting of each experimental class 1 and class 2 given postes experiment to see an increase in students' mathematical reasoning abilities, whether there are differences in the increase of the expeimental class 1 and class 2 experiment or not. A summary of the results are presented in the following Table.

Table 6. Description Results Postes Mathematical Reasoning Ability Students

Learning	Category KAM	$\bar{x}$	SL	x_{Min}	x_{Max}
Experiment 1 (PMT-Probing)	High	16,714	1,380	15	19
	Medium	15,471	1,546	13	19
	Low	13,333	1,366	12	15
	Whole	**15,333**	**1,826**	**12**	**19**
Expeiment 2 (PMT-Prompting)	High	18,500	1,309	17	20
	Medium	16,278	1,708	12	19
	Low	15,250	2,872	11	17
	Whole	**16,733**	**2,067**	**11**	**20**

From Table 6 shows that the minimum score on the posttest experimental class 1 with a score of 12 is higher than the students in the experimental class 2 with a score of 11, while the maximum score on the posttest experimental class 1 with a score of 19 is lower than in the experimental class 2 with a score of 20. The Scores average postes showed mathematical reasoning abilities of students in the experimental class 1 with an average score of 15.333 is lower than the students in the experimental class 2 with an average score of 16.733.

4.4 The Enhancement of Mathematical Reasoning Students based on Learning Approach Factors and Early Mathematical Ability

Based on the results of the pretest and posttest administered prior learning is given after learning to both classes, N-Gain calculation to determine the magnitude of the increase after learning. The gain of students mathematical reasoning ability (N-Gain) based on two learning groups for each category are presented in the form of KAM diagram:

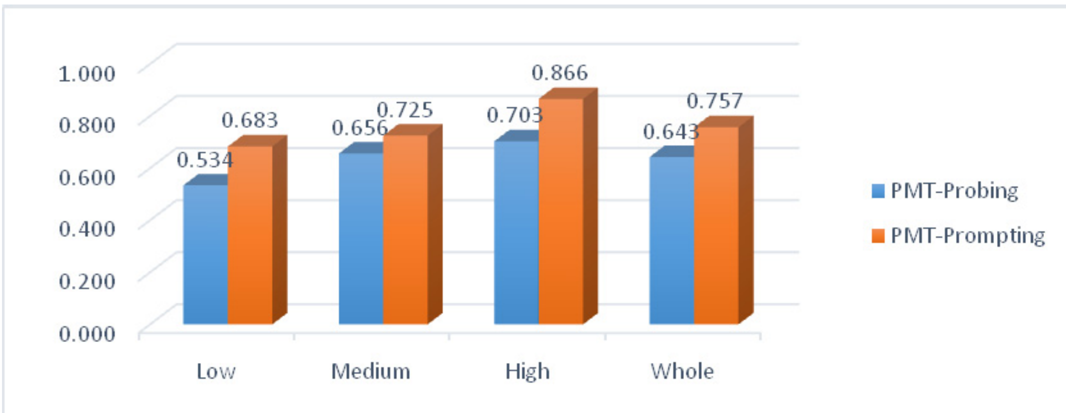


Figure 1. Mean N-Gain Mathematical Reasoning Ability

By using statistical analysis of anava two ways to determine there are differences or not in mathematical reasoning capacity building among the students taught by metacognition approach aided probing and prompting techniques, the results are presented in the summary Table below:

Table 7. Test Results Anava Two Line N-Gain Mathematical Reasoning Ability

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	.429[a]	5	.086	6.157	.000
Intercept	21.741	1	21.741	1559.661	.000
KAM	.190	2	.095	6.803	.002
Pendekatan	.181	1	.181	12.958	.001
Error	.753	54	.014		
Total	30.569	60			
Corrected Total	1.182	59			

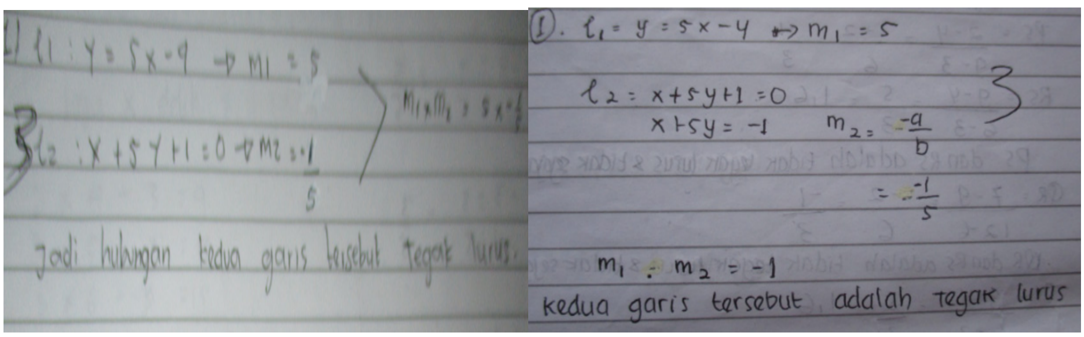
According to the Table 7 above, it can be seen that the significant value of 0.001 on learning approach (PMT-Probing and PMT-Probing) smaller than the significance level of 5%, so it concluded there is no difference between the increase in mathematical reasoning abiltity students are taught through metacognition approach aided engineering probing and the students taught by metacognition approach aided engineering prompting, where learning by metacognitive approach aided prompting technique (average gain of 0.757) was better than learning through metacognitive approach aided probing technique (average gain of 0.643).

4.5 Description of Students' Answer Process on Reasoning Ability Test

The process of the students' answers on tests of mathematical reasoning abilities were analyzed descriptively as follows:

Item Problem No. 1

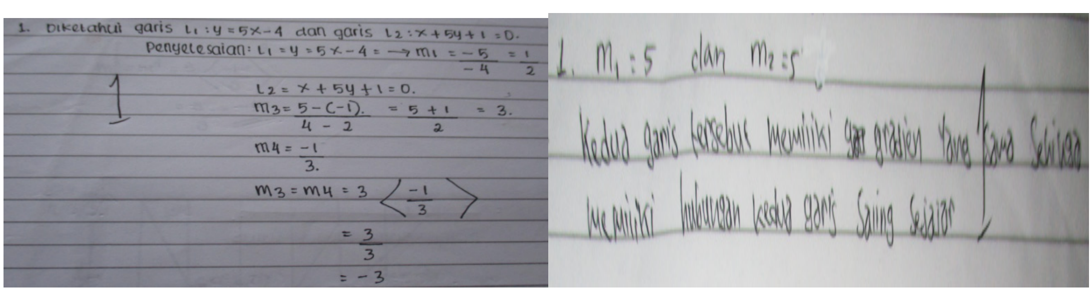
Those items number 1 in measuring the allegations put forward. Here variance process students' answers on aspects of the allegations filed a class experiment 1 and experiment 2:



class experiment 1 **class experiment 2**

Figure 2. Example of the Students' Answers to Both Aspects of the Category Filed Allegations

From Figure 2 shows that the responses of the students already may submit allegations properly. The number of students in the experimental class 1 and experiment 2 were obtained both categories with the perfect answer to the allegations put forward indicators are accurate and complete are each 18 students and 25 students.



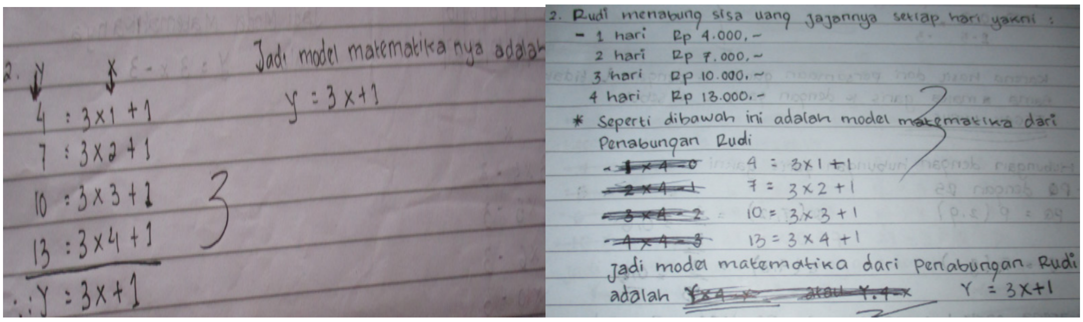
class experiment 1 **class experiment 2**

Figure 3. An Example of How the Students' Answers Unfavorable Category Filed Allegations

From Figure 3 shows that the students' answers give some of the allegations but still wrong. The number of students in the experimental class 1 and experiment 2 were obtained unfavorable category by presenting some of the allegations but still one is 1 of each student.

Item Problem No. 2

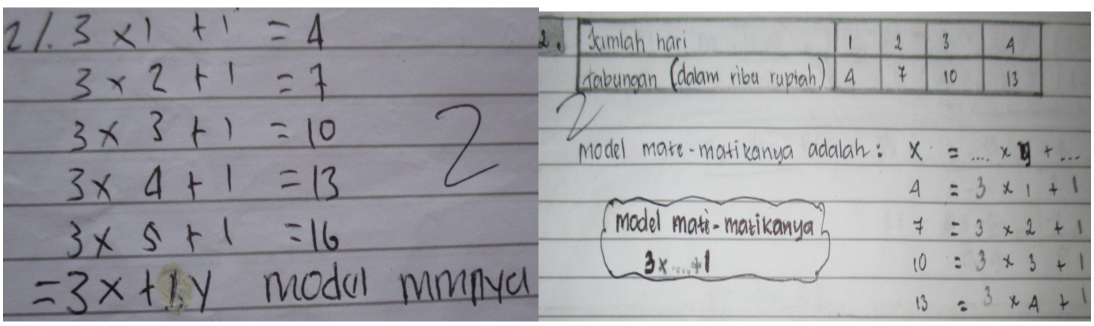
Those items number 2 measure aspects of finding a pattern or mathematical nature of the symptoms to make generalizations. Here diverse student answers process on aspects of finding a pattern or nature of mathematical symptoms to generalize the experimental class 1 and experiment 2.



class experiment 1 **class experiment 2**

Figure 4. Example of the Students' Answers to Both Aspects of the Category of Finding Patterns or Mathematical Nature of the Symptoms to Make Generalizations

From Figure 4 shows that the students' answers can create a pattern or nature of symptoms mathematical generalization is true, accurate and complete. In the first experimental class of students who received a score of 3 as many as 18 students while the experimental class 2 as many as 24 students

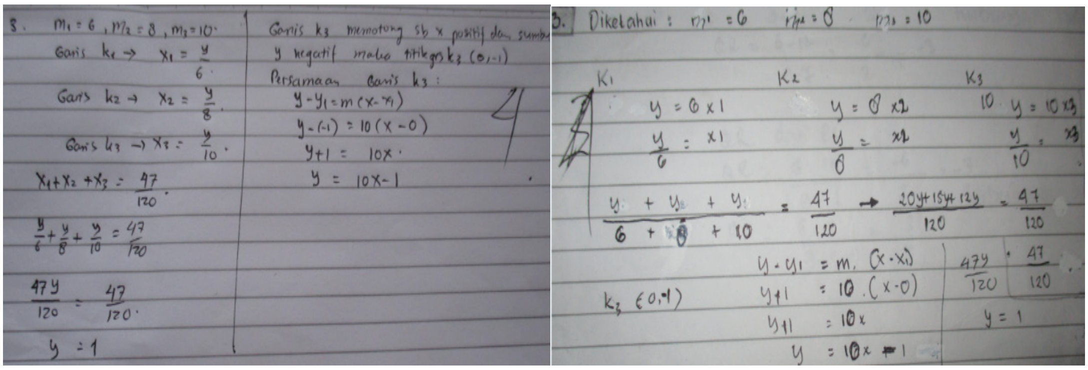


class experiment 1 **class experiment 2**

Figure 5. An Example of How Students' Answer to Enough Categories Aspects of Finding a Pattern or Mathematical Nature of the Symptoms to Make Generalizations

From Figure 5 shows that the responses of the students have found mathematical patterns but less true in making generalizations (create mathematical models). The number of students in the experimental class 1 and experiment 2 were obtained enough categories are each 12 students and 6 students.

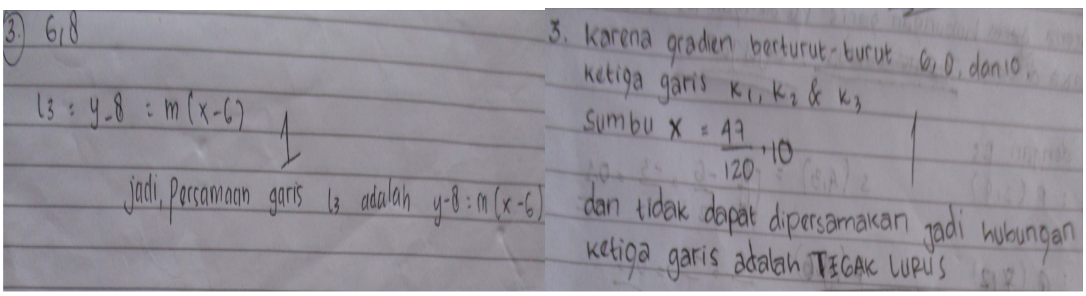
Item Problem No. 3 Item Question 3 measure aspects perform mathematical manipulations. Here variance process students' answers on aspects of doing math at grade manipulation experiment 1 and experiment 2.



class experiment 1 class experiment 2

Figure 6. Example of the Students' Answers to Both Aspects of the Category of Mathematical Manipulations

From Figure 6 shows that the responses of the students already perform mathematical manipulations correctly and complete the number of students in the experimental class 1 and experiment 2 were obtained either category are each 5 students and 4 students.



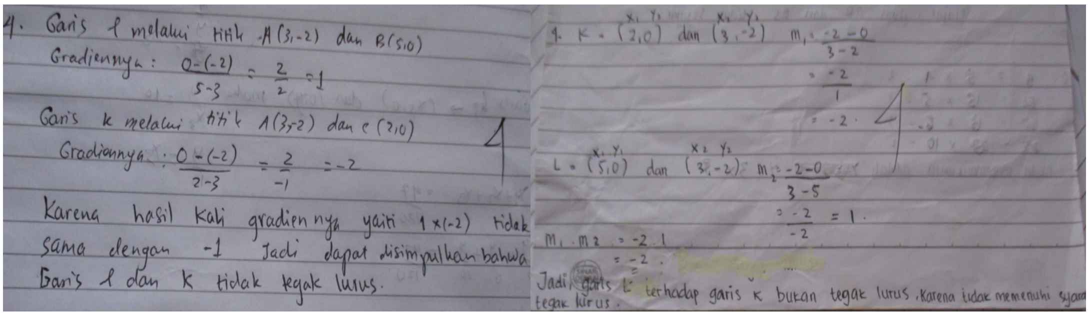
class experiment 1 class experiment 2

Figure 7. An Example of How the Students' Answers to Unfavorable Category Aspects Perform Mathematical Manipulations

From Figure 7 shows that the responses of the students perform mathematical manipulations but still wrong. The number of students in the experimental class 1 and 2 were obtained unfavorable category are each 2 students and 1 student.

Item Problem No. 4

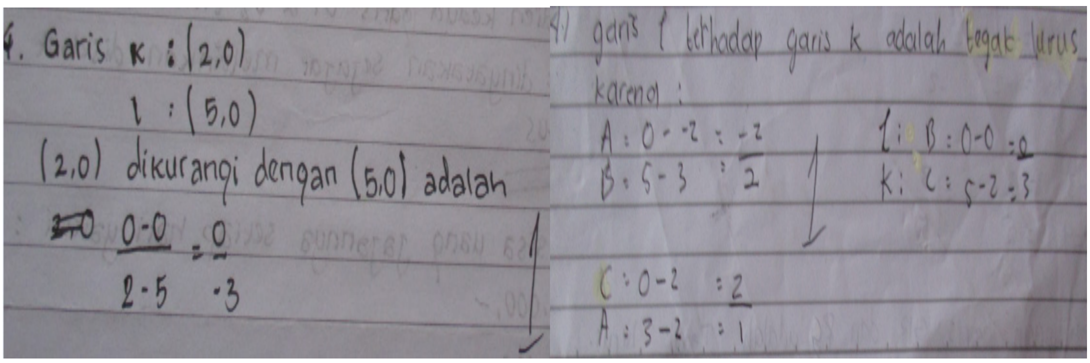
Items in measuring the number 4 draw conclusions and provide the reasons or evidence of the truth of the solution. Here diverse students' answers on aspects of the process of drawing conclusions and give reasons or evidence of the authenticity of the solution in the experimental class 1 and experiment 2.



class experiment 1 **class experiment 2**

Figure 8. Examples of Students' Answers to Both Aspects of the Category Draw Conclusions and Give Reasons Evidence of the Truth of the Solution

From Figure 8 shows that the students' answers are already giving any reason or evidence and conclusions are correct, accurate and complete. Many students in the experimental class 1 and experiment 2 obtain good category that is 5 students and 6 students.



class experiment 1 **class experiment 2**

Figure 9. Examples of Students' Answers to the Unfavorable Category Aspects Draw Conclusions and Give Reasons/Evidence of the Truth of the Solution

From Figure 9 shows that the answers students gave some reason or evidence but still wrong. The number of students in the experimental class 1 and 2 were obtained experiment unfavorable category are respectively 1 students.

The process of the students' answers to mathematical reasoning abilities in the experimental class 1 and experiment 2 can be seen in the following Table:

Table 8. Process Answer Student in Mathematical Reasoning Ability Test

Indicators Mathematical Reasoning	Grain Problem	The number of students		Category
		experiment 1	experiment 2	
Asking allegations	1	18	25	Good
		11	4	Enough
		1	1	Unfavorable
	5	13	20	Good
		16	10	Enough
		1	0	Unfavorable
Performing mathematical manipulations	3	5	4	Good
		23	25	Enough
		2	1	Unfavorable
Drawing conclusions and give reasons/evidence of the truth of the solution	4	5	6	Good
		24	23	Enough
		1	1	Unfavorable
Finding the pattern or nature of symptoms mathematical generalization	2	18	24	Good
		12	6	Enough
		0	0	Unfavorable
	6	4	23	Good
		24	6	Enough
		2	1	Unfavorable

From the description of the students' mathematical reasoning abilities answers process on the experimental class 1 and experiment 2, it can be concluded that the students' answers on the experimental class 2 is better than the process of the students' answers on the experimental class 1. It is evident from the number of students who obtain more value by category both the experimental class 2 of the experimental class 1.

4. Discussion

The results of research have been analyzed shows that learning with metacognitive approach aided by prompting technique (PMT-Prompting) is better than learning with metacognitive approach aided by probing technique (PMT-probing) in improving students' mathematical reasoning abilities. The learning with metacognition approach aided by prompting technique is learning how to respond to (respond to) the student's answer when the student fails to answer the question, or the answer is less than perfect so it can be used lead students to find the right answer. The questions were packaged in such a manner of steps to resolve the issues presented, so inevitably every student must participate actively, students can not escape from the learning process, because every time they will be involved in the process of debriefing, while teachers could act as facilitator, mediator and partner in assisting students. On learning through metacognitive approach aided engineering prompting, students are given the LAS that the problem is based on a common problem students and through students LAS guided with simple questions are easy to understand the students, so it will be easier for students to understand and solve the problems given.

This is consistent with the theory of Vygotsky (Trianto, 2010), namely scaffolding aid to children during the early stages of its development and reduce the effort and provide opportunities for children to take over greater responsibility as soon as a child can do. Students should be given the tasks of complex, difficult and realistic and then given enough assistance to complete those tasks. This does not mean that taught piecemeal components a complex task that one day is expected to translate into an ability to solve the complex task.

Learning through metacognition approach aided probing technique is learning that requires students to think higher (Sudarti, 2008). Good for students who have a high reasoning ability but not necessarily for students who have the reasoning abilities that are especially that low reasoning ability. From the teacher's observation during the study, students are still a lot of confusion with questions probing given by LAS so many issues that are not resolved through discussion.

Thus, it's normal if learning with metacognitive approach aided by prompting technique better than learning through metacognitive approach probing techniques aided in improving students' mathematical reasoning abilities. This is consistent with the results of research Ciftci (2013) concluded that it is significantly effective in prompting techniques teaching the concepts can improve student learning outcomes.

This is supported by research Jayapraba (2013), revealed that metacognitive instructions can increase their metacognitive awareness and develop in them a positive attitude towards learning. Besides, this students' academic achievement can be increased if teaching strategies are planned in a metacognitive way. Students must be taught how to develop and be aware of the strategies.From the results of these studies indicate that metacognition approach can enhance metacognitive awareness of students and develop positive attitudes towards learning, and student learning outcomes can be improved if the teaching strategies planned by way of metacognitive.

The same thing on the research results Desoete (2007), shows that we suggest that teacher who are interested in metacognition in young children use multiple-method designs, including teacher questionnaires to get a complete picture of metacognitive skill. Studies also reveal that metacognition can be trained and has some value added in the intervention of young children solving mathematical problems. Our data seem to suggest that metacognitive skill need to be taught explicitly in order to improve and cannot be assumed to develop from freely experiencing mathematics. From the results of the study revealed that by using a metacognitive approach to learn, including the questionnaire teachers can view students' metacognition abilities. Metacognition can be trained and one in solving mathematical problems. From the data obtained showed that metacognitive skills need to be taught explicitly in order to improve students' mathematics learning outcomes.

A similar trend in research Shannon (2008), states that teaching students metacognitive strategies is a valuable skill that helps students become more self-directed learners. Before studying, the majority of the students did not give any thought to "how they learn" and what type of learning style they have. But now, these students are interested in developing a "study skills" course that would be mandatory for all incoming freshmen. Students were interested in trying the learning styles survey to help them think about how they think. From these statements can be concluded that metacognitive strategies are the right skills to help students become more independent. Prior to the study, most students do not think about "how they learn" and what types of learning styles they have. But now, these students are interested in developing the "study skills" with the strategy of "thinking about how they think".

The same study Smith (2013), revealed that the MAI (Metacognitive Awareness Inventory) were aimed at three components concerning the students' knowledge about their cognition: declarative knowledge, procedural knowledge, and conditional knowledge. Analysis shows student performance, as measured by the course grade can be predicted by metacognitive awareness levels. From the research result can be concluded that *MAI* (Metacognitive Awareness Inventory) showed at three components leading to the students' knowledge about their cognition such as: declarative knowledge, procedural knowledge, and conditional knowledge. Analysis shows the students' work, as measured by the unit level can be predicted by the level of metacognitive awareness. This is supported by research of Inprasitha (2013), states thatthe open approach-based mathematic class helped students exhibit metacognitive behavior and abilities relevant to the four teaching steps: 1) posing open-ended problem, 2) students' self learning, 3) whole class discussion and comparison, and 4) summarization through connecting students' mathematical ideas emerging in the classroom.

In terms of the KAM seen that students who have high KAM in both classes also have the high reasoning ability, while students who have moderate and low KAM in both classes have the medium and low ability reasoning as well, meaning that the benefit of treatment both learning given that students who have high KAM. This was seen when the student is active in the implementation of learning, especially in answering teachers and friends questions, while students who have moderate and low capability experiencing difficulties in the implementation of learning even have problems in understanding and resolving a given problem. It can be understood that in the study of mathematics in the new material is related to the material students learned in the previous material which is used as the material prerequisites. It is appropriate with opinion Ruseffendi (2005) that the new concepts which the students will learn should be associated with the concepts learned/previously recognized by the students. The stronger of the connection the better of the students will learn.

Furthermore, the process of mathematical answers related to mathematical reasoning skills students through metacognition approach aided by prompting technique is better and more complete than the students taught metacognitive approach aided by probing techniques. The ability of mathematical reasoning in question in this research is the expression of an idea or ideas in solving mathematical problems given students by showing aspects of reasoning covering filed allegations, perform mathematical manipulations, draw conclusions and provide the reasons or evidence of the truth of the solution, and finding patterns or the nature of the symptoms mathematical generalization. Of the four indicators of the ability of reasoning, the three indicators of the process of the students' answers to both categories is more dominant in the experimental class 2 by learning with PMT-Prompting, while the experimental class 1 by learning with PMT-Probing just one indicator of good category that stands out.

4. Conclusion

Based on the analysis and discussion in this study,it presented some conclusions as follows:

(1) There were the differences in students' mathematical reasoning ability to improve between metacognition approach taught by probing technique (PMT-Probing) and metacognition approach aided prompting technique (PMT-Prompting), where learning through metacognitive approach aided prompting with an average gain of 0.757 better than learning through metacognitive approach aided probing techniques with average gain of 0.643.

(2) The process of students "answers on students" mathematical reasoning ability through learning by PMT-Prompting better than the PMT-Probing. It can be seen from the four indicators of the ability of reasoning, the three indicators of the process of the students' answers to both categories was more dominant in the experimental class 2 by learning with PMT-Prompting, while the experimental class 1 by learning with PMT-Probing just one indicator of good category prominent.

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