



Mathematical Reasoning Ability Based on Self Regulated Learning by Using The Learning of *Reciprocal Teaching* With RME Approach

Eny Sri Wiji Astuty[✉], St. Budi Waluya, Sugianto

Universitas Negeri Semarang

Info Artikel

Article history:

Received 10 August
2018

Accepted 02 October
2018

Published 15 June 2019

Keywords:

Penalaran Matematis
Kemandirian
Reciprocal Teaching
Pendekatan RME

Abstract

The purpose of this study was (1) determine the quality of mathematics learning in the class taught with the RME-approached Reciprocal Teaching learning model, and (2) to find out the description of the mathematical reasoning ability based on self regulated learning. This study was mixed methods research with subject of this research was students of VII grade at SMPN 10 Semarang consist of three students from each self regulated learning (SR). Data in this research was the mathematical reasoning ability based on self regulated learning obtained from questionnaires, tests, observations, and interviews. The results of this study indicate that the quality of learning is good. (1) High SR subjects have mastered six reasoning indicators, (2) medium SR subjects are already mastering five reasoning indicators, and (3) low SR subjects are only able to master one reasoning indicator.

© 2019 Universitas Negeri Semarang

[✉] Alamat korespondensi:

Kampus Pascasarjana Unnes, Jl. Kelud Utara III Semarang
50237, Indonesia

E-mail: sriwijiastutveny@gmail.com

INTRODUCTION

Mathematics as a subject that must be given to all students in order to prepare students with the ability to think logically, analytical, systematic, critical, and creative and the ability to work together (Ayal, 2016: 50). The benefits of mathematics applied by students is not only to support and develop other sciences but also can be used by them to socialize in everyday life. Moreover, the mathematics also serves as a tool and science ministry, which means not only to mathematics itself but also useful for other sciences, both for the sake of the theoretical and practical interest as an application of mathematics. Efforts to skilled in thinking, analyzing, communicating, and critical thinking for students need to be pursued in order to improve and become accustomed. Efforts are made so that the objective can be achieved pembelajaran mathematics (Junaedi, 2010). The purpose of learning mathematics at every level of education indicated on the Content Standards (National Education Standards Agency, 2006) states that students have the ability to use reasoning. Reasoning ability in question is the ability of students to think logically according to its mathematical knowledge through a process of identifying, filed allegations, define, connect, and confirm all the information carried in problem solving.

Some studies show a lack of mathematical ability of students seen from the performance of the reason, for example, there are still many students have difficulties in solving mathematical problems, as revealed by Wahyudin (Mikrayanti, 2016) that, one trend that led to a number of students fail to master the main points of discussion of mathematics as a result they are less use logical reasoning to solve problems or given mathematical problem. Based on the results of research by Isnaeni, et al (2018) obtained the result of the difficulty in solving students' reasoning abilities caused by a lack of understanding of the concept and the difficulty students in reasoning abilities.

Self regulated learning as an active process of constructing and establish learning objectives and monitor, regulate, control their cognition, motivation in the context of the environment (Haji and Ilham, 2015). The learning was conducted by teachers today tend to make students not independent. This situation was indicated by the students' way of learning which only pay attention to the teacher's explanation, follow the problem solving through example given by teacher, and do tasks assigned by the teacher. Lack of independence in the students will produce a wide range of behavioral problems.

Flat rectangular material is a material prerequisite to learn the material geometrical flat side and congruency. Therefore, if the student does not master the material Flat rectangular, it will cause further difficulties in the study material. For example, students made a mistake in solving problems congruency because students do not master the material that is the material precondition Flat rectangular (Rahayu, 2016). In the suspect's ability students still lacking for resolving problems of mathematics. Various studies show the importance for students to master the concept of a rectangular flat wake. Flat study material rectangular geometry can help students develop the skills of deductive reasoning and proof (Fujita and Jones, 2007). Students should often be directed and motivated, and the value of the learning outcome is not satisfactory, there are still many students who have not been able to become independent learners. Therefore, the need for a learning model that refers to mathematical reasoning ability and self regulated learning.

Participation and interaction between students and teachers in the learning of mathematics is an important activity to get good learning outcomes. In fact, teacher becomes the one who has an active role in delivering learning materials, since the teacher did not give a chance to the students to act as teachers to explain the

material. Many students are embarrassed to ask the teacher also one of the causes of passive students, so that students' mathematics learning outcomes is low. One model of learning that can increase participation from students and learning outcomes in mathematics learning process is modeled Reciprocal Teaching. Meanwhile, to emphasize the activity of students in finding, searching, and build their own knowledge required so that learning becomes centered on students it requires an approach that RME approach. To overcome the problems faced by students, the need for appropriate measures to improve the learning process in order to obtain the desired learning outcomes. One alternative that can be used to overcome the above problems is a learning model of Reciprocal Teaching by using RME approach.

Reciprocal Teaching Model is one model of learning that can be used by teachers in the learning process to enhance the students' active role in constructing their own knowledge and find the meaning of learned during the learning process, which is expected to improve student achievement (Yurnalis, 2017). Reciprocal Teaching learning model provides the opportunity for students to get used to analyze and develop his reason of the problem is given, either in the form of reading material or matter.

RME is an approach that promotes math learning activity of students in the learning process in the classroom with the aim that students are able to build his own knowledge of the mathematical problems related to everyday life. The combination of RME describe what it is about math and how to teach and learn mathematics (Arsaythamby and Morina, 2014). The learning process that uses a systematic approach to solve problems that later needed in everyday life so that students are expected not only to memorize formulas, but also able to make and remember the process itself. The average of mathematical communication skills of students learned by using Reciprocal

This study subjects were two classes such as class VII-A and VII-D for the 2017/2018

Teaching with the nuance of karate education is better than the average of communication skills of students learned by using the conventional method (Hasanah, Rochamd, & Hidayah, 2012). The average communication skills of class taught by using Reciprocal Teaching approach (experiment) was significantly more than KKM (Neru, Mariani & Cahyono, 2013). Palinussa study (2013) concluded that RME is able to make students think more active.

Based on the description of the above background, the problem in this research were (1) how is the quality of mathematics learning in the class taught with the RME-approached Reciprocal Teaching learning model, and (2) how is the students mathematical reasoning ability viewed from their self regulated learning after being taught by the learning model of Reciprocal Teaching with RME approach. The purpose of this research were (1) to determine the quality of mathematics learning in the class taught with the RME-approached Reciprocal Teaching learning model, and (2) to find out the description of the mathematical reasoning abilities of students viewed from their self regulated learning after being taught by the learning model of Reciprocal teaching with RME approach.

METHODS

This study was *mixed methods embedded concurrent model* research with quantitative research as the primary method. The collection of qualitative and quantitative data is carried out simultaneously while the analysis is carried out quantitatively first and qualitatively. Quantitative analysis was use to see the quality of RME-related *Reciprocal Teaching* learning. Qualitative research methods in this study are used to describe mathematical reasoning abilities in terms of students' independence based on the learning activities of five selected students.

school year at SMPN 10 Semarang. There are four data collection techniques, such as

questionnaire, observation, written test and interview. Quantitative data analysis techniques ranging from test analysis, prerequisite test analysis and hypothesis test, such as the average test, proportion test, average difference test and proportion difference test. Data analysis techniques in this study were using qualitative descriptive method that refers to the opinion of Miles and Huberman in Sugiyono (2015), such as data reduction, data presentation, and drawing conclusions or verification.

RESULTS AND DISCUSSION

Based on the evaluation of the learning quality of Reciprocal Teaching with RME approach conducted, obtained that the learning of Reciprocal Teaching has effectively improve students' mathematical reasoning abilities. Based on Table 1 the quality of learning can be seen from the validator's assessment of learning planning in good categories, the implementation of effective learning, and the implementation of learning assessment in good categories. In such a way that, Reciprocal Learning Teaching with RME approach is good. Recapitulation of validation data is presented in Table 1

Table 1. The summary of data validation results

No.	Data	Mean Validator Score			Total Mean	Category
		V1	V2	V3		
1.	Learning Tools					
	Syllabus	3.63	4.25	4.00	3.96	Good
	RPP	3.40	4.15	4.00	3.85	Good
	LKS	3.50	4.00	4.00	3.83	Good
2.	TKPM	3.80	4.20	3.80	3.93	Good
3.	Inventori <i>SR</i>	-	-	3.83	3.83	Good

The Recapitulation on observation of quality and the implementation of learning is presented in Table 2.

Table 2. The Recapitulation on observation of quality and the implementation of learning

No.	Quality and the implementation of learning	O-1	O-2	mean	Category
1.	Meeting 1	3.35	3.60	3.475	Good
2.	Meeting 2	3.50	3.75	3.625	Good
3.	Meeting 3	3.70	3.95	3.825	Good
4.	Meeting 4	3.80	3.90	3.85	Good

Learning assessment phase was seen from the TKPM score of pretest and posttest of students in the experimental class and control

class. The calculation of data pretest and posttest of experimental class and a control class can be seen in Figure 1.

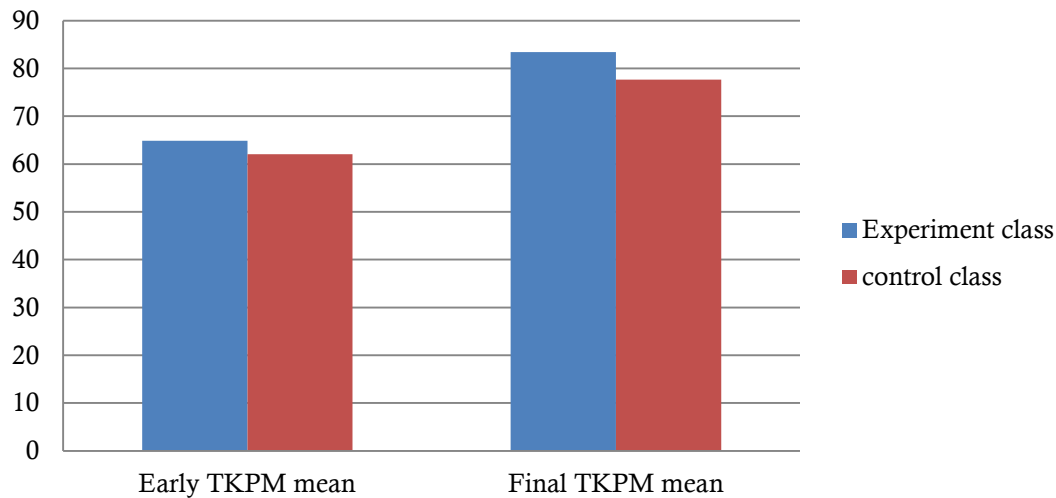


Figure 1. Graph Results of Early TKPM and Student Final TKPM Class Experiment and Control

Based on the above Figure 1, appears that the average score of TKPM of the student's posttest in the experimental class is higher than the control class. In addition, the pretest and posttest score of TKPM showed an increase in the experimental class students. Based on the results of TKPM test, conducted normality test, homogeneity and two averages equality test.

The results of the final data analysis showed that the final data experimental class and control class has a normal distribution and homogeneous variance. The first hypothesis test by using the average test obtained value $t = 10,179$ whereas $t_{table} = 1,684$. Since $t > t_{table}$ therefore it can be concluded that the average math student reasoning skills in classes that are taught by the teaching model Reciprocal Teaching with RME approach is more than 70. The results of the analysis by using the proportion test obtained value of $z = 3,36$ whereas $z_{table} = 1,64$. Since $z > z_{table}$ therefore, it can be concluded that the proportion of students completeness in the classes taught by using the learning model of Reciprocal Teaching with RME approach is more than 75%.

Based on the second hypothesis testing by using the average different test obtained $t = 3,05$ whereas $t_{table} = 1,67$. Since $t > t_{table}$

therefore, it can be concluded that the mathematical reasoning abilities of students in classes taught by using the learning model of Reciprocal Teaching with RME approach is better than the mathematical reasoning abilities of students in a class taught by using the learning model of Discovery Learning.

The third hypothesis test by using a proportion different test obtained $z = 1,8$ whereas $z_{table} = 1,64$. Since $z > z_{table}$ therefore, it can be concluded that the proportion of students' mastery of mathematical reasoning abilities in the classes taught by using the learning model of Reciprocal Teaching with RME approach is better than the proportion of students' mastery of mathematical reasoning abilities in the classes taught by using the learning model of Discovery Learning.

Data obtained from the student self regulated learning inventory granting of self regulated learning in the content of the student. The students' self regulated learning inventory was given to the students before and after the students taught by using Reciprocal Teaching with RME approach. The data of students' self regulated learning taught by using the learning model of Reciprocal Teaching with RME approach can be seen in the following Table 3.

Table 3. Research Subjects

No.	Subject	Pre-score	SR category	Subject	Post-score	SR category
1.	E-14	70	High	E-14	72	High
2.	E-02	72		E-02	72	
3.	E-12	56	Medium	E-12	65	Medium
4.	E-10	65		E-10	65	
5.	E-03	47	Low	E-03	65	

Based on the result of self regulated learning assessment obtained five students as research subjects, two subjects belong to the high self regulated learning category that E-14 and E-02. Subject belong to the moderate category of self regulated learning was that E-12 and E-10. Subject belong to the low category of self regulated learning was that E-03. Furthermore, five students who were representing the self regulated learning of each category will be examined more in depth about the mathematical reasoning abilities through TKPM final answer sheets and interviews.

Students were selected as research subjects at high self regulated learning group that is E-14 and E-02. After participating in the learning of mathematics by using RT learning model with RME approach, two students who initially had high self regulated learning also increased self regulated learning and still included in the high category. The score of mathematical reasoning ability of students E-14 and E-02 showed a good achievement, which was capable of achieving the six indicators of mathematical reasoning abilities.

Students of E-12 and E-10 who initially had medium self regulated learning after following the learning of mathematics by using RT learning model with RME approach, both students who initially have the medium self regulated learning also showed an increased in their self regulated learning and still included in the medium category. The score of mathematical reasoning ability of students E-12 and E-10 showed a good achievement, which was capable of achieving five indicators of mathematical reasoning abilities.

Student of E-03 who initially had low self regulated learning, after being taught by the learning model of RT with RME approach showed an increased in their self regulated learning and included in the moderate category. The scores of the students' mathematical reasoning abilities represent a considerable achievement which was less good, only able to reach one indicator of reasoning. The ability of the students who have high self regulated learning category obtain a good score on all indicators, means that students are able to master the ability of each indicator of the ability of mathematical reasoning.

It shows that the change in the category of self regulated learning is the impact of mathematics learning by using RT learning model with RME approach that focuses on problem solving by a group discussion. Problems that given to the students will make them understand the advantages and weaknesses to solve those problems independently or with the help of others. When faced with the task of mathematics, students who have high self regulated learning will take advantage of the best time to complete the task. The RT learning model with RME approach also has an impact on students' mathematical reasoning abilities. Based on the results of the study, it also showed that the self regulated learning has influence on the students achievement. Students who have a high learning self regulated learning can achieve better results than students who have a low self regulated learning. This is consistent with the statement of (Wongsri, et al, 2002; Kosnin 2007; Daloglu, 2013).

Based on the differences in students' mathematical reasoning ability possessed by each group, it can be concluded that students who have the moderate self regulated learning and high self regulated learning have an increased chance of a better reasoning ability than students who have low self regulated learning. The role of learning model of RT with RME approach that emphasizes in providing problems of rectangular reasoning in order further students can solve those problems through RT. During the lesson, students are involved in-depth investigation, develop ideas in solving problems, increase student involvement in the learning process, helping students understand concepts through experience. Therefore, students who are taught by using the learning model of RT with RME approach is not easy to forget the concepts that are found and will use these concepts to solve problems. Students who have high self regulated learning will have an increase in their ability of mathematical reasoning. This is consistent with the research of Hussain and Akhtar (2013) who stated that there are significant differences between the learning outcomes of science of students in the experimental class and the learning outcome of science of students in the control class. Results of research conducted by Anwar and Pramukantoro (2013) obtained a significant difference between the learning outcomes of student learning by using Reciprocal Teaching model with the learning outcomes of students learning by using STAD model. With an average grade of learning outcomes that follow the model of Reciprocal Teaching which is greater than that following the model of STAD. From the research that has been done, Reciprocal Teaching model is better to be used in the learning compared to the conventional learning models.

CONCLUSION

Based on the results of the study and discussion obtained conclusions (1) the quality

of mathematics learning in classes taught with *Reciprocal Teaching* learning model with RME approach is good. The mathematical reasoning ability of students in classes taught with *Reciprocal Teaching* with RME approach achieved complete learning. The average mathematical reasoning ability of students in classes taught with *Reciprocal Teaching* with RME-related teaching is higher than the classes taught with *Discovery Learning*. The proportion of students' mathematical reasoning ability in the class taught with *Reciprocal Teaching* with RME-related teaching is better than the class taught by *Discovery Learning*. (2) High SR subjects have mastered six reasoning indicators, medium SR subjects are already mastering five reasoning indicators, and low SR subjects are only able to master one reasoning indicator.

REFERENCES

- Anwar, M., & Pramukantoro, J. A. (2013). Perbandingan Hasil Belajar antara Siswa yang Menggunakan Model Pembelajaran Reciprocal Teaching dengan Model Pembelajaran STAD pada Standart Kompetensi Menerapkan Dasar-Dasar Kelistrikan Kelas X TAV di SMK Negeri 7 Surabaya. *Jurnal Pendidikan Teknik Elektro*, 2(2), 493-500.
- Arsaythamby, V., & Morina, C. Z. (2014). How A Realistic Mathematics Educational Approach Affect Students' Activities In Primary Schools? *Procedia - Social and Behavioral Sciences*, 159(2014), 309-313.
- Ayal, C. S., Kusuma, Y. S., & Dahlan, J. A. (2016). The Enhancement of Mathematical Reasoning Ability of Junior High School Students by Applying Mind Mapping Strategy. *Journal of Education and Practice*, 7(25), 50-58.
- Badan Standar Nasional Pendidikan. (2006). *Standar Kompetensi dan Kompetensi Dasar SMP/MTs*. Jakarta: BNSP.
- Daloglu, A & Vural, S. (2013). The Effects of Training on Pre-Service English Teachers'

- Regulation of Their Study Time. *Australian Journal of Teacher Education*, 36(6), 46-70.
- Fujita, T., & Jones, K. (2007). Learner's Understanding the Definitions and Hierarchical Classification of Quadrilaterals. *Research in Mathematics Education*, 9(1), 3-20.
- Haji, S., & Ilham, M. (2015). Membangun Kemandirian Belajar Siswa Melalui Pembelajaran Matematika Realistik. *Jurnal Ilmiah Program Studi Matematika STKIP Siliwangi Bandung*, 4(1), 39-46.
- Hasanah, S., Rochmad., & Hidayah, I. (2012). Pembelajaran Model Reciprocal Teaching Bernuansa Pendidikan Karakter untuk Meningkatkan Kemampuan Komunikasi Matematis. *Unnes Journal of Mathematics Education Reserch*, 1(2).
- Husain, M., & Akhtar, M. (2013). Impact of Hands-on Activities on Students' Achievement in Science: an Experimental Evidence from Pakistan. *Middle-East Journal of Scientific Research*, 16(5), 87-101.
- Isnaeni, S., Fajriyah, L., Sri, E. R., Purwasih, R., & Hidayat, W. (2018). Analisis Kemampuan Penalaran Matematis dan Kemandirian Belajar Siswa SMP pada Materi Persamaan Garis Lurus. *Journal of Medives*, 2(1), 107-115.
- Junaedi, I. (2010). Peningkatan Kualitas Perkuliahan Di Jurusan Matematika Fmipa Unnes Melalui Lesson Study. *Kreano, Jurnal Matematika Kreatif-Inovatif*, 1(2), 130-137.
- Kosnin, A. M. (2007). Self-regulated learning and academic achievement in Malaysian undergraduates. *International Education Journal*, 8(1), 221-228.
- Mikrayanti. (2016). Meningkatkan Kemampuan Penalaran Matematis melalui Pembelajaran. *Suska Journal of Mathematics Education*, 97-102.
- Nerru, P. M., Mariani, S., & Cahyono, E. (2013). Pembelajaran Metode Reciprocal Teaching Berbantuan CABRI untuk Meningkatkan Komunikasi Matematik Siswa Kelas X. *Unnes Journal of Mathematics Education Reserch*, 2(1), 152-156.
- Palinussa, A.L. (2013). Students' Critical Mathematical Thinking Skills and Character: Experiments for Junior High School Students through Realistic Mathematics Education Culture-Based. *Indonesian Mathematical Society Journal on Mathematics Education*, 4(1), 75-94.
- Rahayu, S. (2016). Analisis Kesalahan Siswa dalam Menyelesaikan Soal-soal Kesebangunan. *Jurnal e-DuMath*, 2(1), 1-9.
- Sugiyono. (2015a). *Metode Penelitian Kombinasi (Mixed Method)*. Bandung: Alfabeta.
- Wongsri, N., Cantwell, R. H., & Archer, J. (2002). The validation of measures of self-efficacy, motivation and self-regulated learning among Thai tertiary students. *Annual Conference of the Australian Association for Research in Education*. Brisbane.
- Yurnalis. (2017). Penerapan Model Pembelajaran Reciprocal Teaching dalam Pembelajaran Matematika. *Prosiding Seminar Nasional STKIP Sumatera Barat*, 3(1), 536-553.