

THE EFFECT CONTEXTUAL TEACHING-LEARNING APPROACH ON IMPROVING STUDENTS' MATHEMATICAL REASONING ABILITY AND SELF CONCEPT

Toni Alamsyah¹, Utari Sumarmo², Asep Kustiana³

^{1,2,3} IKIP Siliwangi, Jl. Terusan Jend. Sudirman Baros

¹ toni.alamsyah@yahoo.co.id

Received: Aug 13th, 2020; Accepted: Sept 15th, 2020

Abstract

The goal of this research is to examine the role of contextual teaching-learning approach (CTLA) toward students' mathematical reasoning ability (MRA) and self concept in mathematics (MSC). The research involves 66 eighth grade students, a MRA test, a MSC scale. Findings of this research were: students getting CTLA reached MRA at better grade than the grade of students who get SA learning, even if those grades were at low level. However, there was no difference grades on students' MSC in both teaching approaches, and those grades were at fairly good level. Students in both teaching approaches encountered difficulties in solving MRA tasks such as on analogical reasoning about position of two lines, solving tangent equation on a curve problem, and writing down the formula involved in a calculation. Beside that, there was association between MRA and MSC, and students performed active learning during CTLA lessons.

Keywords: Contextual Teaching Learning, Mathematical Reasoning, Mathematical Self Concept

Abstrak

Tujuan dari penelitian ini adalah untuk menguji peran pendekatan pembelajaran kontekstual (CTLA) terhadap kemampuan penalaran matematis (MRA) dan konsep diri siswa dalam matematika (MSC). Penelitian ini melibatkan 66 siswa kelas delapan, tes MRA, skala MSC. Temuan dari penelitian ini adalah: siswa yang mendapatkan CTLA mencapai MRA pada nilai yang lebih baik daripada siswa yang mendapatkan pembelajaran SA, meskipun nilai tersebut berada pada level yang rendah. Namun, tidak ada perbedaan nilai pada MSC siswa dalam kedua pendekatan pengajaran, dan nilai tersebut berada pada level yang cukup baik. Siswa pada kedua pendekatan pengajaran mengalami kesulitan dalam menyelesaikan tugas MRA seperti pada penalaran analogis tentang posisi dua garis, menyelesaikan persamaan tangen pada masalah kurva, dan menuliskan rumus yang terlibat dalam perhitungan. Selain itu, ada hubungan antara MRA dan MSC, dan siswa melakukan pembelajaran aktif selama pembelajaran CTLA.

Kata Kunci: CTL, Penalaran Matematika, Mathematical Self Concept

How to Cite: Alamsyah, T., Sumarmo, U., Kustiana, A. (2020). The Effect Contextual Teaching-Learning Approach on Improving Students' Mathematical Reasoning Ability and Self Concept. *JIML*, 3 (3), 178-188.

INTRODUCTION

Basically mathematical reasoning ability (MRA) and mathematical self concept (MSC) are two essential learning outcomes that need to be improved on high school students. The first reason that supports the statement is that MCTA is contained in the goals of mathematics

teaching (Indonesia, mathematics Curriculum, 2013) such as: a. To use reasoning on patterns and principles, deriving generalizations, proving mathematical statements, explaining mathematical ideas; b. To appreciate the usefulness of mathematics in life, to perform curiosity, attention, and interest in learning mathematics, to be tenacious and confident in solving problem. Other than that, there is writer's conception that in accordance with that statement. For example, Baroody (1993, as cited in Hendriana, Rohaeti, Sumarmo, 2014) expresses that MRA help student to learn meaningfully mathematics fact, rules, and principles, to reason rationally and to select appropriate rules and principles in solving problem.

Some authors define MRA term in different expression namely: a. MRA is to derive conclusions based on relevant data, event, facts, evidence, or sources (Shadiq, 2000, as cited in Kusnandi, 2008); b. MRA is ability to think logically about and with mathematics objects (Brodie, 2010, Kusnandi, 2008). Based on mathematical processes involved in solving MRA task, it illustrates that MRA consists higher order thinking (HOT) skill in mathematics. So for students are able to solve MRA, they should possess positive disposition, such as the view that he was able to complete the task well. Hunlock (as cited in Hendriana, Rohaeti, Sumarmo, 2014) calls that view of him as self concept (SC). Then he explains that self concept is a picture of someone about himself which includes physical, psychological, social, emotional, aspirations and achievements that have been achieved. Physical aspects include physical appearance, attractiveness and worthiness while psychological aspects include thoughts, feelings, adjustments, courage, honesty, independence, beliefs and aspirations.

Indeed, MRA assignments are classified as HOT and MRA must be mastered by students, but at this time many students do not have MRA well. Students condition with low MRA were found in some recent studies (Aminah, Kusumah, Suryadi, Sumarmo, 2018, Bernard, & Rohaeti, 2016, Rijaya, Sumarmo, Syaban, 2018) that reported students taught by ordinary teaching attained MRA at low grade level, while students getting treatment with innovative teaching approaches obtained MRA at moderate to pretty good grade level. In contrast to student's MRA that were not satisfactory, some studies (Prasetyo, Sumarmo, Sugandi, 2018, Rijaya, Sumarmo, Syaban, 2018) found that student's MSC were at quite good grade qualification. Those condition suggested that teacher should select a kind of teaching approach which give opportunity on students to improve their MRA and MSC.

In the teaching-learning process, Polya (1975) argues that mathematics teacher's task is not only to extend mathematics content but the more important tasks are: To behave according to students 'conditions, respect students' way of thinking, encourage students to learn better and think in their own way. Besides that, Indonesia mathematics curriculum, 2013, suggests that mathematics hard-skill and soft-skills such as MRA and MSC should be improved in the same time. Those suggestion motivate researchers to select a certain mathematics teaching approach that support students to improve their MRA and MSC during the lesson. Based on the teaching-learning characteristics, researchers estimate contextual teaching and learning approach (CTLA) will meet the expectations of the 2013 curriculum and Polya's advice suggestion. Johnson (2010) and Rusman (2012) illustrate that CTLA is a teaching-learning approach which beginning by presenting a relevant contextual problem for obtaining concept understanding and then it is improved to master the other higher mathematical abilities. The presented contextual problem should relate to the content are going to learn, to the student's prior ability, and to a real daily life. Two studies reported the advantages of CTLA on improving student's mathematical reasoning (Bernard, & Rohaeti, 2016) and enhancing student's mathematical critical thinking (Kurniati, Kusumah, Sabandar, Herman, 2015).

Those aforementioned arguments and findings stimulate researchers to carry out a study to examine the role of CTLA, on improving student's MRA, and MSC and then we compile research questions as follow.

1. Are MRA grade and its normalized gain, and MSC grade of students getting treatment with CTLA better than the grades of students taught by Scientific approach (SA)?
2. What are student's difficulties on solving MRA tasks?
3. Is there any association between MRA and MSC?
4. What are student's activities during CTLA lessons?

Apart from the discussion about MRA that has been reported in the previous section, there are writers explain the term MRA in more detail. For example, Schoenfeld (1996) argues that MRA contains important, active and dynamic processes needed to solve mathematical and other discipline problems. Other writer, Sumarmo (2010) classifies MRA into two kinds reasoning those are inductive and deductive mathematical reasoning. Inductive MRA is ability to derive conclusion based on observed data of a process, which covers: a) transductive reasoning; b) Analogical reasoning; c) Generalization; d) To Predict solution or tendency; e) To explain based on model, facts, attributes, relation or pattern; f) To analyze situation by using relationship of pattern and compiling conjecture.

While deductive MRA is ability to derive conclusion based on proper rules, which covers: a. To carry out calculation agreed to proper rules and principles; b. To reason based on the rules of inference (propositional reasoning); to examine validity of an argument, to prove and to compile valid argument; c. To reason based on ratio between two or more components that is proportional reasoning d. To conclude based on probability of an event (probabilistic reasoning). e. To correlate relationships between two different situations ; and f. To proof the truth of statement directly, indirectly, or proving by mathematics induction.

Based on those processes involved on MRA, we get impression that MRA tasks had various degrees of depth from the simple to the complex. As an implication, teacher should select kinds of MRA tasks suitable for certain school level of the student. For examples, for junior high school students, we limit MRA tasks on analogical, generalization and proportional reasoning, predicting, and executing enumeration based on certain rules and principles. In the previous section, we proposed that in solving MRA tasks students should accompany with certain level of MSC that support willingness of student to work hard.

Further discussion about the SC presented in the previous section, was explained by Jersild (in Hendriana, Rohaeti, Sumarmo, 2014) as follows. Self concept (SC) includes three components, namely: a. Perceptual component, which is a picture of one's appearance or ability towards others, and other people's responses to his appearance; b. Conceptual component, which is his view of his abilities and disabilities, his self-confidence, and his independence; c) Attitudinal component, which is view of his self-meaning, his feeling proud or his ashamed of own ability. The three SC components above can be positive or negative. Individual who have positive self-concepts is individual who know very well about himself, can understand and accept his own conditions, and can accept the existence of others. While individuals who have negative self-concept are individual who is less familiar with himself, his strengths, his weaknesses and respect for himself. Referring to Polya's suggestion, in learning mathematics the teacher should arrange training assignments given to his students and look in such a way as to help the growth of positive student's self concepts.

Johnson (2010) and Rusman (2012) offer some phases in CTLA namely: constructivism philosophy, inquiry, question; learning community, modeling, reflecting, and authentic assessment. In those phases of CTLA, student is facilitated for mastering the learned concept and obtaining other higher mathematics ability such as MRA, and for promoting positive learning habit such as persistent, working together, unafraid to face difficult mathematics tasks which constitutes of self concept attitudes.

Basically, any teaching approach, has advantages and disadvantages. Mahanani (2014) proposed some advantages of CTL namely: a. Teaching learning environment become more realistic, b. Teaching learning process become more productive, c. The CTLA is student-centered active learning, CTLA creates a pleasant learning atmosphere, students discover new concepts, and students test their findings. Besides those advantages, Mahanani (2014) proposes some disadvantages of CTL among other are: CTL needs more time, maybe arouse non conducive class situation, teacher needs to give more attention and guides.

Beside study findings reported in the previous section, other studies (Batori, Hendriana, Maya, 2018, Hendriana, Rahmat Sumarmo, 2014, Maya & Ruqoyyah, 2018, Permata, 2015, Ruhayat, & Sugandi, 2017, Yustinawati.& Sabandar, 2018) reported superiority of CTLA on improving varieties of mathematical abilities and softskills. In addition, a number studies (Ayal, Kusuma, Sabandar, Dahlan, 2016, Irawan, Rohaeti, Sugandi, 2018, Juhanah, Sabandar, 2018, Mulyana, & Hendriana, 2015, Prasetio, Sumarmo, Sugandi, 2018, Sumarni & Sumarmo, 2017, Sumarmo, Suharyati, Maya, 2018) by using various teaching approaches reported that students obtained MRA were at moderate up to fairly good grade level.

Other some studies (Susanti, Ismatillah, Nurfauziah, Hendriana, 2018, Prasetio, Sumarmo, Sugandi, 2018, Rijaya, Sumarmo, Syaban, 2018) by implementing different teaching approaches found that students obtained MSC were at pretty good grade.

METHOD

This study was a pretest-posttest experimental control group design having a goal to analyze the role of MPSA on students' mathematical reasoning ability (MRA) and self concept (MSC). The study involves 66 eighth grade students, a MRA test, and a MSC scale. The MRA test consisted of 5 items, and the MSC scale consisted of 30 items. Before researchers used the instruments, we consulted the instruments to two mathematics education experts for getting a information that the instruments have sufficient characteristics. Then, by using Hendriana and Sumarmo (2014) and Sumarmo (2015) as references, researchers obtained characteristics of MRA test and MSC scale as attached in Table 1.

Table 1. Characteristis MRA test and MSC Scale

Instruments	N of subye ct	n of ins- trumen t	Relia- bility	Item Validity	Difficulty Index	Discrimina t Power	t _{calculation}
MRA test	33	5	.94	..85 - .90	.50 - .73	..46 - .51.	-
MSC scale	33	27	.85	.	-	-	1.70 – 6.41
							t _{table} = 1.69

In the following we attached some sample of instruments of this study.

Sample 1 MRA test (analogical reasoning)

Observe the graph of line k in figure 1 below

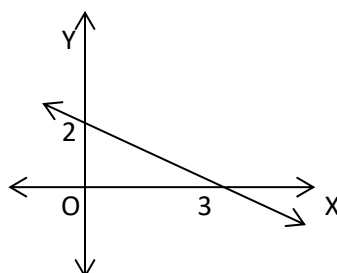


Figure 1. Graph

Given line m through points (2,3) and (0,0).

The position of line k and line m, is similar to position of:

- a. Line of $y = 2x + 1$ and line $4x - 2y - 3 = 0$
- b. Line with equation $y = 1 / (2) x - 3$ and line with equation $2x + y + 1 = 0$.
- c. Lines with equation $3x + y = -3$ and lines with equation $y = 2x + 3$

1. Determine the equation of line k and line m.
2. Which statement is true of the three line pairs above? Explain your reason.
3. Explain your reason that the two rest of the statements are incorrect.

Sample 2: Some items of MSC scale, Table 2

Table 2. Items of MSC scale

No	Statement	SA	A	DA	SDA
1	I am able to present system linear equation of two variables solution in front of the class in my own way.				
2	I feel happy, when my friend asks me to explain about system linear equation of two variables				
3	I failed to do well the system linear equation of two variables test in last examination				
4	I doubt completing the system linear equation of two variables tasks well				
5	I understand the error that occurred in system linear equation of two variables solution in last test				
6.	I was annoyed to be asked by my friend who had difficulty learning system linear equation of two variables				
7	I reject different opinions of my friends on system linear equation of two variables in our small group discussion				

8. I worked on system linear equation of two variables because I liked it

RESULTS AND DISCUSSION

Results

The attainment of student's MRA and its gain (<N-G> MRA), and student's MSC were attached in Table 3.

Table 3. Description of Mathematical Reasoning Ability and Mathematical Self Concept of Students in Both Teaching Approaches

Variables	Stat.	Mathematical Solving Approach (MPSA)				Problem Solving Approach (SA)			
		Pretest	Posttest	N-Gain	n	Pretest	Posttest	N-Gain	n
MRA (IS= 43)	$\bar{x}$	12.24	29.91	.44		11.94	26.15	.35	
	% IS	23.09	56.43		33	22.53	49.34		333
	SD	2.40	4.85	.10		3.46	3.89	.08	
MSC Scale (IS= 124)	$\bar{x}$		90.30				89.82		
	% IS	-	75.25	-	33	-	74.85	-	33
	SD		12.08				12.11		

Note: MRA: mathematical reasoning ability IS: ideal score: 53

MSC: mathematical self concept IS: ideal score: 120

In pre-test, there was no different grades of MRA between students learned by MPSA and students taught by SA and those grades were at low level. It was rational because the students hadn't learned yet the mathematical content that will be studied. However, after teaching process, on MRA, students who learned by CTL attained better grade than the grade of students who taught by SA. First group students obtained MRA at moderate grade level, while students taught by SA attained MRA at low grade level.

However there was no different grades of student's MSC in both teaching approaches. Those grades were at pretty good grade qualification. Testing hypothesis of those grades were attached in Table 4.

Table 4. Testing Hypothesis of Mean Difference of Mathematical Reasoning Ability, Its N-Gain, Mathematical Self Concept on the Both Teaching Approaches

Variable	Teaching approach	$\bar{x}$	SD	n	Sig.one tail	Interpretation
MRA	CTL	29.91	4.85	33	.00 < .05	MRA _{CTL} > MRA _{SA}
	SA	26.15	3.89	33		
N-Gain of	CTL	.46	.16	33	.00 < .05	N-Gain MRA _{CTL} > N-Gain MRA _{SA}
	SA	.33	.18	33		

MRA						
	CTL	90.40	9.33	33		
MSC	SA				.45 > .05	No different MSC _{CTL} and MSC _{SA}
		81.36	8.54	33		
Note: MRA : mathematical reasoning ability				Ideal score MRA: 53		
MSC : mathematical self concept				Ideal score MSC :120		

Finding of this study that the grades of MRA_{CTL} and its <Gain> were higher than the grades MRA_{SA} were similar to the findings of other previous studies (Aminah, et.all 2018, Ayal, et.all, 2016, Bernard, & Rohaeti, 2016, Rijaya, Sumarmo, Syaban, 2018, Gunawan, Prawoto, Sumarmo, 2019, Mulyana & Hendriana, 2015, Prasetyo, Sumarmo, Sugandi, 2018, Sumarni & Sumarmo, 2017, Rohaeti, Budiyo, Sumarmo, 2014) that by using different innovative teaching approaches students still experienced difficulties in solving some MRA tasks. and students' grades of MRA varied from moderate up to fairly good level.

Further findings that there was no different MSC grade between students getting treatment with CTL and students taught by SA and those grades were at pretty good qualification. This finding was similar to findings of some previous studies (Eftafiyana, Nurjanah, Armania, Sugandi, Fitriani, 2018, Mulyasari, Rohaeti, Sugandi, 2018, Susanti, Ismatillah, Nurfauziah, Hendriana, 2018) that found student's MSC were at fairly good grade qualification,

Those findings illustrated that MRA tasks were more difficult to solve than to perform MSC behavior for junior high school students. Those condition were rational caused of MSC behavior basically had been developed in mathematics lessons before the experiment, while MRA tasks apart of MRA was difficult tasks, the students just learned the mathematics contents and processes in this experiment.

Further analysis was about students difficulties on solving MRA tasks, that was illustrated in Table 5

Table 5. Mean Score of Each Item of Mathematical Reasoning Ability Test of Students In Both Teaching Approaches

Teaching approach	Stat.Desc	No.1	No 2.	No.3	No.4	No 5
	Ideal score	10	9	12	12	10
MPSA	$\bar{x}$	4,79	7,33	6,45	4,82	6,52
	% out of IS	47,9	81,44	53,75	40,17	65,2
SA	$\bar{x}$	4,09	6,48	5,85	4,42	5,30
	% out of IS	40,9	72	48,75	36,83	53

Both students groups still experienced many difficulties in solving MRA problems, such as on answering problems accompanied by formulas used at each step of completion, solving

analogical reasoning about position of two lines, and propotional reasoning of daily live. Those difficulties were illustrated in Table 5.

Next analysis was about association between MRA and MSC. By using statistic Pearson-Chi Square (χ^2) and contingency table and data analysis using SPSS for window, the study found that $\chi^2 = 3.373^a$ with two sided sig = .185 or one sided sig = .092 > .05. (Table 6). Those result of testing hypotesis pointed out that there was no association between MRA and MSC. This finding was different with findings of other previous studies (Aminah, et.all 2018, Bernard, & Rohaeti, 2016, Rijaya, Sumarmo, Syaban, 2018, Mulyana & Hendriana, 2015, Prasetio, Sumarmo, Sugandi, 2018, Sumarni & Sumarmo, 2017, Rohaeti, Budiyo, Sumarmo, 2014) that there were association between MRA and various softskills in mathematics. But those findings were similar to finding of that there was no association between MRA and SRL in mathematics.

Table 6. Testing Chi-Square Mathematical Reasoning Ability (MRA) and Mathematical Self Concept (MSC)

MRA and MSC	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.373 ^a	4	.185
Likelihood Ratio	4.134	4	.127
Linear-by-Linear Association	3.139	1	.076
N of Valid Cases	33		

Discussion

Further analysis was about students activities during CTL lessons. Students performed good performance and participated the lessons well, such as they work together to identify the problem actively (Figure 1).



Figure 1. Students compiled metaphor and analogy

Moreover, students tended to be comfortable with implementation of CTL. Despite at first time students were confused to learn in new strategy (MPSA) and to solve new kind mathematics problems, but in next sessions students accustomed to completing tasks in student work sheet (SWS) actively. Overall students showed positive opinions on the implementation of MPSA.

CONCLUSION

Based on study findings and discussion, the study derived some conclusion as follow. Contextual Teaching Learning Approach (CTLA) took better role than SA on improving students' mathematical reasoning ability (MRA), and its gain, but not in mathematical self concept (MSC). However in those teaching approaches students attained MRA at low grade level. Although there were no different grades on MSC between student in both classes, the both grades of MSC were at fairly-good level. Besides that, students in both classes still have many difficulties in completing MRA tasks. The other conclusion, there was no association between MRA and MSC, and students performed intense activities during CTLA. In order students to master MRA better, it was suggested that students should be invited to compile, to select, and to solve non-routine problems by themselves, to write principles and or rules involved in each step of completion.

REFERENCES

- Albreth, K. (1984). *Brain Building*. New Jersey: Prentice-Hall, Inc.,
- Aminah, M., Kusumah, Y.S., Suryadi, D., and Sumarmo, U. (2018). "The Effect of Metacognitive Teaching and Mathematical Prior Knowledge on Mathematical Logical Thinking Ability and Self-Regulated Learning". Paper published in *International Journal of Instruction*. July, 2018. Vol. 11-number.3.
- Ayal, C.S., Kusumah, Y.S., Sabandar, J. 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, 2016
- Baroody, A. J. (1993). *Problem Solving, Reasoning & Communicating, K-8: Helping Children Think Mathematically*. New York: McMillan Publishing Company.
- Batori B., Hendriana, H. Maya, R. (2018). "Improving The Ability Of Mathematic Learning Motivation Connections With A Contextual Approach". *Jurnal Pembelajaran Matematika Inovatif (JPMI)*. Volume 1 Number 2, June 2018, pp. 153-161
- Bernard, M. and Rohaeti, E.E. (2016). "Meningkatkan Kemampuan Penalaran dan Disposisi Matematik Siswa SMK dengan Pendekatan Kontekstual melalui Game Adobe Flash Cs 4.0.". *Edusentris: Jurnal Ilmu Pendidikan dan Pengajaran*. Vol.3. No.1. April. 2016, pp. 85-94.
- Brodie, K. (2010). *Teaching Mathematical Reasoning in Secondary School*. New York: Springer
- Bruce, J., Weil, M., & Calhoun, E. (2000). *Models of teaching*. Yogyakarta: Pustaka Pelajar.
- Fasikhah, S.S.(1994). *Peranan Kompetensi Sosial pada T.L. Remaja Akhir*. Tesis, Program Pascasarjana UGM Yogyakarta.
- Hendriana, H & Sumarmo, U (2014). *Penilaian Pembelajaran Matematika*. Bandung: Penerbit PT Refika Aditama. Bandung.
- Hendriana, Rohaeti, Sumarmo, 2017 *Hard Skill dan Soft Skill Matematika*. Bandung: Penerbit PT Refika Aditama. Bandung.
- Hendriana, H., Rahmat U.S, Sumarmo, U. (2014). "Mathematical connection ability and self-confidence (an experiment on junior high school students through contextual

- teaching and learning with mathematical manipulative)” *International Journal of Education*. Vol.8.No.1. pp 1-11
- Irawan, D. Rohaeti, EE., Sugandi, AI. (2018). “Improving Students’ Mathematical Understanding And Reasoning Ability And Motivation Through Think Talk Write Approach (TTW) Junior High School Students” *Jurnal Pembelajaran Matematika Inovatif (JPMI)* Volume 1 Number 2, June 2018, pp. 194-203
- Juhanah, I., Sabandar, J. (2018). “Increasing Student’s Understanding Ability And Mathematical Reasoning and Learning Motivation Of Junior High School Students Using Discovery Learning Method” *Jurnal Pembelajaran Matematika Inovatif (JPMI)* Volume 1 Number 2, June 2018, pp. 143-152
- Kurniati, Kusumah, Y.S, Sabandar, Y. Herman, T. (2015). “Mathematical Critical Thinking Ability through Contextual Teaching and Learning Approach.” *Journal on Mathematics Education (IndoMS-JME)*. Vol.6.No.1. pp53-62
- Maya,R. & Ruqoyyah, S.(2018). “The Role Of Contextual Teaching And Learning On Student’s Problem Solving Ability And Disposition” *Infinity*. Volume 1 Number 1, March 2018, pp31-40
- Mulyana, A & Hendriana, H. (2015). ”Meningkatkan Kemampuan Penalaran Matematik dan Kemandirian Belajar Siswa SMP melalui Pembelajaran Berbasis Masalah”. *Edusentris, Jurnal Ilmu Pendidikan dan Pengajaran*, Vol. 2, No. July 2015.
- Peraturan Menteri Pendidikan Nasional No. 81a Tahun 2013 tanggal 27 Juni 2013 tentang Implementasi Kurikulum Standar Isi.
- Permata, R. D. (2015). *Upaya Meningkatkan Kemampuan Pemecahan Masalah Matematika melalui Pendekatan Contextual Teaching and Learning (CTL) Siswa Kelas VIIID SMP Negeri1Mlati*. [Online]. Tersedia: <http://repository.upy.ac.id/249/1/ARTIKEL%20RIZA%20DYAH%20PERMATA.pdf>. [27 Juni 2017]
- Polya, G. (1975). *How to Solve It. A New Aspect of Mathematical Method*. New Jersey: Princenton University Press.
- Prasetyo, D. A., Sumarmo, U., Sugandi, A.I. (2018). “Improving Student’s Mathematical Reasoning And Self Concept By Using Reciprocal Teaching”. *Jurnal Pembelajaran Matematika Inovatif (JPMI)* Volume 1 Number 3, September 2018, pp. 283-294
- Rijaya, Sumarmo, U., Syaban, M. (2018). Improving Student’s Mathematical Reasoning and Self Concept by Using Reciprocal Teaching. Paper published in *Journal of Innovative Mathematics Learning* 1 (2), 86-94. 2018
- Rohaeti, E.E. Budiyanto, A.M., Sumarmo, U (2014). “Enhancing Mathematical Logical Thinking Ability and Self Regulated Learning of Students through Problem Based Learning”. Paper published in *International Journal of Education* Vol.8, No. 1. Desember 2014. pp 54-63. Graduate School, Indonesia University of Education.
- Ruhiyat, A. and Sugandi A.I. (2017). Meningkatkan Kemampuan Berpikir Kreatif dan Disposisi Matematik Siswa SMP dengan Menggunakan Pendekatan Kontekstual, published in *Edusentris: Jurnal Ilmu Pendidikan dan Pengajaran*. Vol.3. No.1. April. 2017, pp 281-289.
- Schoenfeld, A. H. (Editor) (1994). *Mathematical Thinking and Problem Solving*. Lawrence Erlbaum Associates, Publishers. Hillsdale, US

188 Alamsyah, T., Sumarmo, U., Kustiana, A. The Effect Contextual Teaching-Learning Approach on Improving Students' Mathematical Reasoning Ability and Self Concept.

Shadiq, F. (2004). Pemecahan Masalah, Penalaran dan Komunikasi. *Yogyakarta: Departemen Pendidikan Nasional*.

Sumarmo, U., Suharyati, S, Maya, R. (2018). "The Role Of Model-Eliciting Activities On Student's Mathematical Reasoning And Self Regulated Learning". *Edusentris* 5 (2), 61-70, 2018.

Sumarni, C. and Sumarmo, U. (2017). Penalaran Matematik dan Kemandirian Belajar: Eksperimen terhadap Siswa SMP melalui Pembelajaran Generatif. Paper published in *Edusentris: Jurnal Ilmu Pendidikan dan Pengajaran*. Vol.3. No.1. April. 2017, pp. 290-

Sumarmo, U. (2015). *Rubrik Pemberian Skor Tes Kemampuan Matematika*. Tersedia: <http://www.utari-sumarmo.dosen.stkipsiliwangi.ac.id> [30 Juli2016]

Susanti, M., Ismatillah, H. Nurfauziah, P. Hendriana, H. (2018) "Analisis Kemampuan Komunikasi Matematis Siswa SMP Di Tinjau Dari Self-Concept" *Jurnal Pembelajaran Matematika Inovatif (JPMI)*. VOL 1, NO 5 923-932

Yuanita, A. & Sugandi, A. I. (2018). "Meningkatkan Kemampuan Koneksi Matematik Dan Kemandirian Belajar Siswa Sma Melalui Pendekatan Kontekstual". *JPMI*
Volume 1 Number 1, tahun 2018, pp. 13-20

Yustinawati, R. & Sabandar, Y (2018). "Improving Students' Mathematical Understanding And Problem Solving Skills And Their Learning Interests In MTs Through Contextual Teaching And Learning Learning (CTL)". *Jurnal Pembelajaran Matematika Inovatif (JPMI)*. Volume 1 Number 2, June 2018, pp. 130-135.