MATHEMATICAL CONNECTION ABILITY AND SELF-CONFIDENCE (An experiment on Junior High School students through Contextual Teaching and learning with Mathematical Manipulative)

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Abstract

This sudy was intended to examine the role ofprior mathematics ability (PMA) andcontextual teaching approach withmathematical manipulative(CTL-MM) tothe achievement of mathematical connection ability (MCA) and self-confidence(SC) of junior high school students. This study was part ofa masterthesis andit was a sub-study ofa Postgraduate Research Grant from DGHE in 2013 as well.The study was quasi-experimental with pre-testpost-test control group design involving 67 ninth-grade students from a junior high school in Bandung. The instruments of this study werean essaytest on mathematical connection, a self-confidence scale, and a scale onstudents' perception toward CTL-MM.The result of the study revealed that CTL-MM was better in on improving students' MCA, N-Gain of MCA, and SC. This was shown by students'grades of MCA and SC which were better in the group taught by CTL-MM than students' grades in the group taught by conventional teaching.While their grades of SC were better, the grades of MCTA were at low level. However, therewas a moderate correlation between mathematical connection and self-confidence though students demonstrated positive perception toward the implementation of CTL-MM.

Key word: mathematical problem solving, self-confidence,Contextual Teaching, Mathematical Manipulative, perception toward contextual teaching

Introduction

Mathematical connection ability (MCA) and self-confidence(SC) are cognitive and affective components of mathematics learning outcomesthat should be developed by high school students. The reason isthat the outcomesare attributed in the goals of mathematics teaching (BNSP, 2006; NCTM, 2000). Not only MCA, there are other goals of mathematics teaching, for example to improve understanding on mathematical concepts and their application, as well as connectionamong these variables accurately, efficiently, and properly;to recognize the use of mathematics in daily life; to possess curiosity, interest, and concern for learning mathematics; and to possess persistent and self-confident attitudes for working with mathematics.Besides, the importance of possessing mathematical connection ability is in line with the nature of mathematics as a systematic and structured science which contains interrelated concepts.

The school curriculum on mathematics (Peraturan Menteri Pendidikan dan

Kebudayaan Republik Indonesia Nomor 81A Tahun 2013) suggests that cognitive and affective components of mathematics learning outcomes can be improved accordingly through presenting contextual problems relevant to the mathematics contentsand students'prior knowledge, so that prior knowledge together with relevant contents shape meaningful knowledge. One ofthe affective goals of mathematics learning outcomes is self-confident. The term ofself-confident is related with student's perception toward himselfor herselfin learning mathematics, communicating with each other, and his or her perception on the use of mathematics in daily life.

National Education Department of Indonesia (2002) suggests seven principles in conducting contextual teaching and learning (CTL), namely constructivsm philoshopy, inuqiry, questioning, learning community, mathematical modelling, reflection, and authentic assessment. Furthermore, Zahorik (cited in National Department of Educationof Indonesia, 2002) suggests five steps that should be considered in conducting CTL: activating, obtaining, understanding, applying, and reflecting students' knowledge.

Several studies reported the benefits of improving various mathematical abilities and disposition through CTL which was better than conventional teaching (Hutagaol, 2007; Nasir,2008; Putri, 2006; Rusmini, 2008; Yonandi, 2010). Some other studies also stated the benefits of improving mathematical connection through other innovative teaching and learning approaches which were reported better than the conventional teaching approach (Gordah, 2009; Herlan, 2006; Mudzakir, 2006; Rohendi, 2009; Sucipto, 2010). These studies indicated that various innovative teaching approaches gave students opportunity for active learning and achieving better grades on mathematical connection ability and other mathematical abilities as well.

In line with the characteristicof mathematics as a systematic and structured science, students' prior mathematics ability plays an important role in acquiring the subsequent mathematics learning outcomes. Analyses on the attributes of mathematical connection, self-confidence, CTL-MM, students' prior mathematic ability, and the findings of a number of relevant studiesencouraged the researcher to conduct an experimentto investigatethe effectiveness ofCTL-MM in mathematical connection ability and self-confidence of junior high students.

Theorical Review

Mathematical Connection and Self-confidence

Mathematical connection bilityisone of basic mathematics competences that should be improved by high school students (BNSP: Kurikulum Matematika, 2006; NCTM, 2000). Thisisinlinewiththenatureofmathematics,that it is a systematic and structured sciencein which its concepts are organized in an order way and functionallyinterelate each other. On the other hand, mathematics isalso a supportive sciencethatits symbols, rules, and operation share applicable to solve other scientific problemsin the real world.Mathematical connection becomes more important asit supportsstudents to comprehend a concept substantially and assists them to improve their understanding on other diciplines through interrelationshipbetween concepts of mathematics andconcepts of other diciplines. Moreover, mathematical connection helps students provide a mathematical modelthat illustrates the relationship among concepts, data, and situation. Based on the analyses on ideas of several researchers, Sumarmo, Hendriana, Rohaeti, Hidayat, Zulkarnaen, Hamidah, Sariningsih (2013) summarized activitiesrelatedwithmathematicalconnection, such as understand the corresponding representation of mathematics concept, process, or procedure; seek the correlation among various representationsof mathematics concept,process, orprocedure; understand the

interelation among mathematics substances; apply mathematics in other diciplinesin daily life; seek relationship between a procedure with other procedures in a corresponding representation; and apply relationship among substancesof mathematics and other diciplines. These activities indicate that principally mathematics contains a lot of interelated concepts so that students are able to contsruct and to create new meaningfulconcepts. For example, problems of mathematical analogy and generalizationessentiallycontaintasks on mathematical connection,such as to observe and to seek the relationship among the presented concepts or processes and then to determine the formulas of the relationship. Other examples, velocity and acceleration in physics are application of derivative concept in mathematics; computation on financial mathematics basically isan application of rules of sequence and series in mathematics. Those explanations highlight the significance of concept's interrelation in which someone is supposed to be able to meaningfully understand a concept on mathematics if he or she is able to relate or connect one particular concept with other concepts properly, and is able to apply the mathematics concepts correctly.

One of affective components of mathematics learning out comes is self-confidence. Bandura (as cited in Hendriana, 2013) definesself-confidenceassomeone's perception toward himselfor herselfin directing his or her motivation and resources in which these are reflected in the action relevant with the demanded task.A person who possesses strong self-confidence will be motivated to achieve succes. Based on those explanations, in order to acquire mathematical connectionor other mathematics abiliti, students should possess a satisfactori degree of self-confidence. However, self-confidence as a value personal trait can not be taught but it should be improved actively and continuously (Ghozi, 2010). Referring to opinions of Aswandi (2010) and Sauri (2010), there are four steps that teacher can applied for developing students' self-confidence in mathematics teaching, namely recognizing the true understanding of the term 'self-confidence'; being familiar and accustomed to behave self-confidently; being a model for performing behavior of self-confident; and conducting integrated and continuous mathematics teaching and learning.

Contextual Teaching Learning assissted with Mathematical Manipulative

School Mathematics Curriculum (BNSP, 2006) suggests thatmathematics substances should be presented in a contextual situation, which is preceeded byproviding a contextual problemand afterwards students are graduallyguided to comprehend the concept and to communicate it respectively. Berns and Ericson (2001) propose that contextual teaching and learning (CTL) is a teaching and learning process connecting the learned contentwith the real situation, students' knowledge, and withits application in the daily life as well. CTL isprincipallyin line with constructivism philosophy, thatstudents learn to construct their knowledge by assimilation and accomodation processes. Furthermore, Zahorik (as cited in National Education Department of Indonesia (2002). Proposes the characteristics of CTL,namely: a) students'knowledgeis activat as a basis for connection with the new learned material in constructing students new cognitive stucture; b)learning is intended for obtaining and increasing new knowledge; not only understandi and memoriz; c) Students have exposure to practicethe new acquired knowledge into the real world; andd) Reflection all activities has to be carried out.

National Education Department of Indonesia (2002) suggest seven principles in conducting CTL, namely constructivism philosophy, inquiry, qestioning, learning community, modelling, reflecting, and authentic assessment. Technically, there are several activities related to CTL,

such as making meaningful connections, accomplishingsignificant works, self-regulated learning, collaborative working, thinking creative and critical; nurturing individual,reaching high standards, andusing authentic assessment.

In presenting contextual problem while conducting CTL,teacher can select media which are the most relevant and the most familiar object to students.That objectwill bridgethe gap between anabstract mathematical concept with the factual conceptso that students will be able to understand both concepts. The objectbeing anexample of media is calledmathematical manipulative. Smith (as cited in Boggan, Harper, & Whitmire, 2010) states that mathematical manipulativeis similar to a physical object,and it isused in teaching and learning process for encouraging students' involvement in the classroom activities. On the other hand, Schweyer (as cited in Wahyar, 2012) definesmathematical manipulativeas a real or concreteobject which can be manipulated by thestudents, for exampleitcanbe moved oraltered.Moreover,studentsare able to carry outhands-on-activity through mathematical manipulative.A good mathematical manipulative is an object which is able to bridge informal mathematicsto formal mathematics. Therefore, selecting a mathematical manipulative should be adjusted with the students' cognitive development. Some ofthe advantagesofusing mathematical manipulativeare: a) the learning environment could enhance students' and teacher's interest in fostering their positive attitude on teaching and learning process; (b)an abstract mathematical concept is presentedviaa concrete form so that students can comprehend the concept more easily;c) The presence of objects in students' surrounding make the abstract concept easier to understand.

Relevant Studies

Some studies (Hutagaol, 2007; Nasir, 2008;Putri, 2008;Rusmini, 2008; Yonandi, 2010) reported the advantage of employing CTL better than conventional teaching in improving students'various mathematical abilities.Other studies (Gordah, 2009;Herlan, 2006; Mudzakir, 2006; Permana, 2004; Rohendi, 2009; Sucipto, 2010) reported that students taught by various innovative teaching approaches achieve better grades on mathematical connection ability than those who were taught by conventional teaching though most of students obtained a relatively low grades (about 50% out of its ideal scores) on mathematical connection ability. Besides,Heddens (as cited in Schweyer, 2000) assertedthat several studies in America, China, England, and Japan, reported that teaching by employing mathematical manipulative were more effective in improving students' mathematical ability. In addition, Wahyar (2012) revealed that students taught by CTL-MM achieve better grades on mathematical reasoning and communication abilities than those who were taught by conventional teaching.

Method

This study was a quasi-experimentalpre-testpost-test control group design conducted to investigate the role ofstudents' priormathematics ability (PMA) and contextual teaching and learning with mathematical manipulative (CTL-MM) on mathematical connection ability, self-confidence, and their perception on CTL-MM. This study was a part of a master thesis (Rahmat, 2014) and a sub-study of a Post graduate Research Grant from DGHE (Hendriana, Rohaeti, &Sumarmo, 2013). The participants of this study were 67 ninth-grade students of a Junior High School in Bandung that were chosen purposively.The instruments of this study were an essay test on matematical connection, a self-confidence scale, and a scale measuring students' perception toward CTL-MM.The sampel items ofMCTA test, SC scale, and PCTL-MM scale are as follows:

Sampel Items of Mathematical Connection Ability Test

1. Supposedthere is a square of which side is a cm. Then a similar square is placed just at the right side of the first square. The process continues by placing the third square and so on up to n-square.
   a. Illustrate that situationin a figure form!
   b. Design a mathematical model for determining the perimeter and the area ofthe shape from 2 squares, 3 squares, 4 squares, and n-squares!
   c. Write the concept of the problem followed by a short explanation!
2. **Supposedthere is ΔPQR with the right angle at P. Point S and T is inside PQ so that PS = ST = TQ. The length of RS =** $\sqrt{221}$ cm and RT = $\sqrt{521}$ cm. Draw the image of theproblem and determine the area of ΔPQR! Write the formula used for solving the problemfollowed by a short explanation!

The sample items ofself-confidence scale and perception on CTL-MM are presented in Table 1 and 2.

Table 1
Samples Items of Self-confidence Scale

No.	Activities or feeling	QO	O	S	QS
1	I extend my own opinionin a forum discussion.				
2	I learn mathematics because I love it.				
3	I am affraid to pose a question to mathematics teacher.				
4	I feel confident that I will succeedinthe mathematics test.				
5	I feel nervous when solving a problem in front of the class.				
6	I feel challengedwhen I face a complicatedproblem geometry.				
7	I feel asshamed to solve a problem in the front of the class.				
8.	I feel unaffraid to defend my own opinion in front of the class.				

Note: QO is quite often O is often S is seldom QS is quite seldom

Table 2
Samples Items of Students' Perception on Contextual Teaching and Learning with Mathematical Manipulative

No.	Statement	SA	A	DA	SDA
1	Student' worksheet comprising chalenging problems to solve.				
2	The new teaching learning approach is boring.				
3	The instruction in students' worksheet is difficult to understand.				
4	The new approach in teaching learning mathematics fostersmy self-confidence.				
5	Making a mathematical model using a figure and a sketch facilitate me to solve a problem.				
6	Using mathematical objects help me to understand the mathematics concept.				
7	The tasks in student' worksheet allowme to discuss with my friends.				
8	I avoid to solve difficult mathematics problems.				

Note: SA is strongly agree A is agree DA is disagree SDA is strongly disagree

Result and Discussion

Students' Mathematical Connection Ability, Self-confidence, and Perception on Contextual Teaching Learning assisted by Mathematical Manipulative

Mathematical connection ability (MCA), self-confidence (SC), and students' perception on contextual teaching learning with mathematical manipulative (P-CTL-MM) were presented in Table 3. Before the intervention, students were grouped based on their grades on PMA:high (x 7,00), medium (6,00 ≤ x< 7,00) , and low (x < 6,00). Table 3 showed that the students' grades on MCTA in both groups were very low in pre-test (approximately 14% out of ideal score). Meanwhile, in the post-test, students taught by CTL-MM obtainedfairly good grades on MCA (16.63 or 69.27% out of ideal score) which were better than students' grades in another group (14.54 or 60.60 % out of ideal score). Moreover, on the N-Gain of MCA, the result showed that students taught by CTL-MM gained greater grades on N-Gain MCA (0.64) than their fellow students taught by conventional teaching (0.54).Analyses of mean differences of MCA and N-Gain MCA for the whole students in both groups were presented in Table 4.

Table 3
Mathematical Connection Ability based on Prior Mathematics Ability and Teaching-Learning Approach

PMA	Stat.	CTL-MM				Conventional Teaching			
		Pre Test	Post Test	N-Gain	n	Pre Test	Pos Test	N-Gain	n
High	Mean	3.40	19.10	0.76	10	3.22	16.11	0.62	9
	%	13.60	76.40			12.88	64.44		
	SD	2.15	0.8	0.04		0.83	0.93	0.05	
Medium	Mean	3.43	17.14	0.67	14	3.38	14.88	0.56	16
	%	13.72	68.56			13.52	59.52		
	SD	0.65	0.86	0.04		0.89	1.45	0.06	
Low	Mean	3.00	12.63	0.46	8	3.10	12.60	0.46	10
	%	12	50.52			12.40	50.40		
	SD	1.51	0.92	0.06		0.99	1.26	0.05	
Total	Mean	3.31	16.63	0.64	32	3.26	14.54	0.54	35
	%	13.24	66.52			13.04	58.16		
	SD	0.90	2.64	0.13		1.1	3.8	0.08	

Note:PMA is priormathematical ability;Ideal score of MCA was 25

Table 4
Testing of Hypothesis of Mean Difference of MCA , N-Gain of MCA, and SC in CT-MMand in Conventional Teaching

Variables	Teaching Approach	$\bar{x}$	SD	N	Sig.	Interpretation
MCA	CTL-MM	16.63	2.64	32	0.000	$MCA_{CTL-MM} > MCA_{Conv}$
	Conventional	14.54	3.8	35		
N-Gain MCA	CTL-MM	0,64	0,13	32	0.000	$N\text{-}GainMCA_{CTL-MM} > N\text{-}GainMCA_{Conv}$
	Conventional	0,54	0,08	35		
SC	CTL-MM	122.94	22.07	32	0.020	No different SC_{CTL-MM} and SC_{Conv}
	Conventional	112.57	19.82	35		

Note: MCA isMathematical Connection Ability;Ideal score of MCA is 25
N-Gain is normalizedgain
SCisSelf-confidence;Ideal score of SC is 150
CTL-MM is Contextual Teaching Learning with Mathematical Manipulative

Analysis of MCA for each level of PMAwas presented in Table 3for both groups. The table demonstrated the correlation between PMA with MCA and N-Gain MCA; the higher students' grades on PMA, the higher their grades onMCA and N-Gain MCA. This indicated the supremacy of students' PMA in affecting their grades on MCA and N-Gain. These findings supported the hypothesis that having a well understanding on a particular mathematical content will lead students to be more succes in further comprehension of other mathematics contents.As for students with medium and highPMA, their grades on MCA were higher in the group taught by CTL-MM than students' grades from another group. Moreover, students with low PMA and getting teaching on CTL-MM attained better grades (17,14) than the grade of student with high PMA taught by conventional teaching(16,11). These findings supported previous statement thatCTL-MM affected the achievement of students' grade on MCA and its N-Gainbetter than PMA. The findingswere also similar to the findings of previous studies (Gordah, 2009; Herlan, 2006;Mudzakir, 2006; Rohendi, 2009; Sucipto, 2010).

Nevertheless, Table 5 showed that there was no differences in SC grades between student taught by CTL-MM (122.94 or 68.30% out of ideal score) and student taught by conventional teaching (112.57 or 62.54% out of ideal score). Analysis of mean differences of the achievement on SC was presented in Table 5.However, students with low and medium PMA given CTL-MM were better on SC grades than students given intervention using conventional teaching.These findings also demonstrated that CTL-MM was better than PMA in the attainment of SC grades.

Table 5
Self-confidence based on Prior Mathematics Ability and Teaching-Learning Approach

PMA	CTL-MM				Conventional			
	N	Mean	%	SD	N	Mean	%	SD
High	10	122.80	81.87	11.57	9	141.56	94.37	4.39
Medium	14	120.43	80.29	20.24	16	110.31	73.54	3.28
Low	8	127.50	85	28.33	10	90.10	60.67	6.26
Total	32	122.94	81.96	22.07	35	112.57	75.05	19.82

Note:PMA is priormathematical ability;Ideal sore of SC was150

In addition, this study found out that students demonstratedpositiveperceptions on CTL-MM (91.06 or 71.14% out of ideal score). For examples, studentsresponded'agree'on positive statements, such as*The new approach in teaching and learning mathematics fosters my self-confidence*; and *Student's worksheet comprising chalenging problems to solve*. On the contrary, students responden 'disagree'on negative statements, for example *I avoid to solve difficult mathematics problems* and *The new teaching learning is boring*.

Having computed analysis oncorrelation between MCA and SC (presented in Table 6), the study found outχ^2 =24.242and C =0,657 indicate that there was moderate correlation between MCA and SC (presented in Table 7). This finding was similar to the findings of several previous studies (Qohar, 2010;Wardani, 2010; Yonandi, 2010), although itwas different with the findings of other studies (Sumarmo, Hidayat, Zulkarnaen, Hamidah, & Sariningsih, 2012; Sumaryati, 2013) that there were no correlation between cognitive and affective component ofmathematics learning outcomes. Further analysis on the role of PMA and the applied teaching learning approaches generated a result that there was no relation between PMA and teaching approaches on mathematical connection. The analysisofthe interaction was presented in Table 7 and 8 andthe diagram of interaction was presented in Figure 1.

Table 6
The Number of Students in each Level of MCA and SC in CTL-MM Class

MCA	Self-confidence			
	High	Medium	Low	Total
High	9	12	0	21
Medium	0	3	0	3
Low	0	1	7	8
Total	9	16	7	32

Table 7
Testing Hypothesis of Association between Mathematical Connection Ability and Self-confidence

Number of students	dk	^{2}	Contigency Coefficient(C)	Sig.
32	4	31,121	0,702	0,000

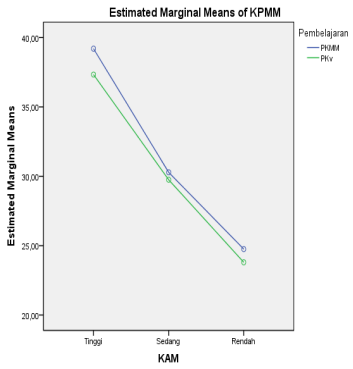

Figure 1: Interaction between PMA and teaching learning on MCA

Table 8
Two Way ANOVA of Mathematical Connection Ability (MCA) Based on Teaching-Learning Process and Prior Mathematics Ability (PMA)

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
PMA	239.749	2	119.874	96.816	0.000
Teaching-Learning	48.938	1	48.938	39.525	0.000
PMA * Teaching-Learning	22.241	2	11.120	8.981	0.000

Interpretation: there was no interaction between PMA and Teaching-learning on MCA

Conclusion

The contextual teaching and learning with mathematical manipulative performed a better role than the prior mathematics ability on the achievement of mathematical connection ability and its N-gain, and on the attainment of self-confidence.The overall students, both with low and medium prior mathematics ability, taught by contextual teaching learning assissted with mathematical manipulative attained better grades on mathematical connection ability, on its N-gain, and on self-confidence than another group. Students' grades on mathematical connection ranged from average to fairly good and their gradeson self-confidencewere relatively good. Moreover, there was a moderate correlation between mathematical connection and self-confidence, though there was no interaction between contextual teaching and learning with mathematical manipulative and prior mathematics ability on mathematical connection ability. Besides, students exhibited positive perceptions toward contextual teaching and learning assissted with mathematical manipulative.

The study found that students' prior mathematics ability affected the attainment of mathematical connection ability and its N-Gainas well. Therefore, teacher has topay more attention on comprehending the prerequisite materialsof mathematics before teachingthe more complex materials. The grades of self-confidence of students werestill average. Improvingstudents' self-confidenceis a continuous process, thus the process of acquiring this trait takes time. Similar to development of value and character, there are four ways for improvingstudents self-confidence of the students: a)teacher makes students recognize the understanding of the expected behavior; b) teacher should modelthe expected behavior; c) students are accustomed toexhibit expected behavior; d) teaching and learning should be conductedintegratedly and continously.

References

Aswandi. (July, 2010). "Membangun bangsa melalui pendidikan berbasis karakter". *Pendidikan Karakter:Jurnal Publikasi Ilmiah Pendidikan Umum dan Nilai*, *2*(2).

Berns R.G., & Ericson, P.M. (2001). Contextual teaching and learning.*The Highlight Zone: Research a Work No 5* (Online). Retrieved fromhttp: //www.ncte.org/publications/infosyntesis/highlight 05/index.asp ?dirid = 145 & dspid =1

BNSP. [Badan Nasional Standar Pendidikan]. (2006). *Panduan Kurikulum Tingkat Satuan Pendidikan (KTSP) 2006*.Jakarta.

Boggan, M.,Harper, S., Whitmire, A. (2010). Using Manipulative to teach elementary mathematics. *Journal of Instructional Pedagogies*. Retrieved from http://www.aabri.com/Manuscripts/10451.pdf

Ghozi, A. (2010). *Pendidikan Karakter dan Budaya Bangsa dan Implementasinya dalam Pembelajaran.* Paper presented at Elementary Training and Education of France Teachers on October, 24th to November, 6th 2010.

Gordah. E.K. (2009). *Meningkatkan kemampuan koneksi dan pemecahan masalah matematik melalui pembelajaran* open-ended. (Unpublished thesis). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Hendriana, H. (August,2013). *Membangun kepercayaan diri siswa melalui pembelajaran matematika humanis*. Paper presented at National Seminar on Mathematics Education at Siliwangi School of Teacher Training and Education, Bandung.

Hendriana, H., Rochaeti, E.E., &Sumarmo, U.(2013). *Meningkatkan beragam* Hard Skills *dan* Soft Skills *Matematika siswa Sekolah Menengah melalui beragam pendekatan pembelajaran.* First Year of Postgraduate Research Grant of Directorate of General Higher Education of Indonesia.

Herlan, A. (2006). *Mengembangkan pembelajaran Berbasis Komputer untuk meningkatkan kemampuan koneksi matematika siswa SMA.*(Unpublished thesis). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Hutagaol, K. (2007). *Pembelajaran kontekstual untuk meningkatkan kemampuan representasi matematik siswa Sekolah Menengah Pertama*. (Unpublished thesis). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Mudzakir, H. S. (2006). *Meningkatkan kemampuan representasi multipel matematik siswa SMP melalui Strategi* Think-talk-write.(Unpublished thesis). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Nasir, S. (2008). *Meningkatkan kemampuan koneksi dan pemecahan masalah matematik SMA berkemampuan rendah melalui Pendekatan Pembelajaran Kontekstual.* (Unpublished thesis). School of Postgraduate Studies, Indonesia University of Education, Bandung.

National Education Department of Indonesia (2002). *Pendekatan kontekstual*. Jakarta: Dirjen Dikdasmen.

NCTM. [National Council of Teachers of Mathematics] (2000). *Principles and standarts for school mathematics*. Reston, VA: NCTM.

Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 81A Tahun 2013, tentang Implementasi Kurikulum, 2013.

Permana, Y. (2004). *Pengembangan Kemampuan Penalaran dan Koneksi Matematis Siswa SMA melalui Pembelajaran Berbasis Masalah.* (Unpublished thesis). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Putri, H.E. (2006). *Pembelajaran Kontekstual dalam upaya meningkatkan kemampuan komunikasi dan koneksi matematik siswa SMP.* (Unpublished thesis). School

of Postgraduate Studies, Indonesia University of Education, Bandung.

Qohar, A. (2010). *Mengembangkan Kemampuan Komunikasi Matematis dan Kemandirian Belajar Siswa SMP melalui Reciprocal Teaching*. (Unpublished dissertation). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Rachmat, U.S. (2014). *Meningkatkan kemampuan koneksi dan pemecahan masalah matematik serta kepercayaan diri siswa SMP melalui Pembelajaran Kontekstual berbantuan* Mathematical Manipulative. (Unpublished thesis). Postgraduate Study, Siliwangi School of Teacher Training and Education, Bandung. (In progress)

Rohendi, D. (2009). *Kemampuan pemahaman, koneksi, dan pemecahan masalah matematik: Eksperimen terhadap siswa Sekolah Menengah Atas melalui Pembelajaran Elektronik (E-Learning)*. (Unpublished dissertation). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Rusmini. (2008). *Meningkatkan kemampuan penalaran dan komunikasi matematik siswa SMP melalui pendekatan pembelajaran kontekstual berbantuan* Cabri Geometry II. (Unpublished thesis). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Sauri, S. (2010). Membangun karakter bangsa melalui pembinaan profesionalisme guru berbasis pendidikan nilai. *Jurnal Pendidikan Karakter, 2*(2).

Schweyer, S. R. (2000). *The effective use of Manipulatives*. Retrieved from http://www.gphillymath.org/ExempPaper/Documents/manipulatives.pdf

Sucipto. (2010). Pengaruh model pembelajaran *Advanced Organizer* terhadap peningkatan kemampuan koneksi dan pemecahan masalah matematik siswa SMA. (Unpublished thesis). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Sumarmo,U.,Hidayat, W.,Zulkarnaen, R., Hamidah, & Sariningsih, R.(2012). Mengembangkan kemampuan dan disposisi berpikir logis, kritis, dan kreatif matematik siswa SMA melalui Pembelajaran Berbasis Masalah dan Strategi *Think-talk-write.* Research report at STKIP Siliwangi Bandung. In U. Sumarmo, D. Suryadi, & Nurlaelah E. Turmudi (Eds.), *Kumpulan Makalah Berpikir dan Disposisi Matematik serta Pembelajarannya*. Bandung: Faculty of Mathematics and Science Education, Indonesia University of Education.

Sumarmo, U., Hendriana, H., Rohaeti, E.E., Hidayat, W.,Zulkarnaen, R., Hamidah, Sariningsih, R.(2013).*Mengembangkan beragam kemampuan dan disposisi matematik, serta kemandirian belajar siswa SMA melalui pembelajaran berbasis masalah dan Strategi* Think-talk-write. (Unpublished research report). Siliwangi School of Teacher Training and Education, Bandung

Sumaryati, E. (2013).*Pendekatan Induktif-Deduktif disertaiStrategi* Think-Pair-Square-Share *untuk meningkatkan kemampuan pemahaman dan berpikir kritis matematis siswa SMA.*(Unpublished thesis). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Schweyer, S. (2000). *The Effective Use of Manipulatives*. [online]. Tersedia: http://www.gphillymath.org/ExempPaper/Documents/manipulatives.pdf.

Wachyar, Y.T. (2012). *Penerapan Pendekatan Kontekstual dengan penggunaan* Mathematical Manipulative *untuk meningkatkan kemampuan penalaran dan komunikasi matematik siswa SMP*. (Unpublished thesis). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Wardani, S. (2010).*Meningkatkan kemampuan berfikir kreatif dan disposisi matematik*

siswa SMA melalui pembelajaran dengan pendekatan model Sylver. (Unpublished dissertation). School of Postgraduate Studies, Indonesia University of Education, Bandung.

Yonandi (2010). *Meningkatkan kemampuan komunikasi dan pemecahan masalah matematik melalui pembelajaran kontekstual berbantuan komputer pada siswa Sekolah Menengah Atas*. (Unpublished dissertation). School of Postgraduate Studies, Indonesia University of Education, Bandung.