

Values And Characters-Nuanced Innovative Teaching To Develop Hard Skills And Soft Skills Of Junior And Senior High Students' Math

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Abstract

This research is a quasi-experimental study that applies values and character-nuanced innovative teaching to develop hard skills and soft skills of junior and senior high students' math. The research subjects consisted of 130 senior high students and 115 junior high students in some districts / cities in West Java. The results showed that the hard skills and soft skills of students' math of which the process of teaching and learning is using values and character-nuanced innovative teaching is better than using regular learning. There is an association between hard skills and soft skills of students. The attitude of the students toward the values and character-nuanced innovative teaching is positive. But there are still many difficulties experienced by students when accomplishing the tasks of hard skills and the soft skills components of students are still weak.

Keywords: *Learning innovative, value, character, hard skills, soft skills*

A. Introduction

Education is a process of enculturation, functioning to bequeath and to develop the values of culture and achievements of the past became cultural values and national character which is suitable of life the present and future. Starting the 2013-2014 school year, the government introduced a new curriculum called 2013 Curriculum. Basically, 2013 curriculum is the development and refinement of the previous curriculum which is called School Based Curriculum (*KTSP*, 2006). In the era of information and increasingly fierce competitive atmosphere, the development sphere cognitive, affective and psychomotor (*KTSP*, 2006, Curriculum, 2013) are also the values of the culture and character of the nation's education (Ghozi, 2010) became a necessity in every field of study including learning in mathematics. Cultural values and national character (Ghozi, 2010) in accordance with the objectives in the cognitive and affective domains contained in the vision of mathematics and mathematics learning objectives (*KTSP*, 2006) which includes: a) develop an understanding of mathematical concepts, their application, and the relationship between concept carefully, efficiently, and appropriately; b) reasoning by using the pattern of mathematical properties; c) generalizing, proving, and explaining mathematical ideas; d) solving problems and communicating by using mathematical symbols and mathematical ideas; e) think critically and creatively, foster self-confidence, showing appreciation for the beauty of regularity mathematical properties, objective and open attitude, curiosity, attention and interest in learning mathematics.

In terms of ongoing processes, mathematical skills in a cognitive domain that is illustrated in the process of mathematical thinking is a component of hard skills in mathematics, meanwhile, the behavior in the affective domain or mathematical statistic is also called a component of soft skills in mathematics. Based on the analysis of the opinion of some experts, Sumarmo (2006, 2010) outline detailing the hard skills of

mathematics in some types include: comprehension, problem solving, communication, connections, reasoning, logical thinking, creative thinking, critical thinking, and reflective thinking mathematically. In addition, based on the study of some writing experts, Sumarmo (2006, 2010) suggests some kind of disposition that are components of soft skills in mathematics include: mathematical disposition, logical thinking disposition, critical thinking disposition, creative thinking disposition, self-regulated learning, self-efficacy, self-esteem, habits of mind, emotional intelligence, dan educational values, culture, and character.

2013 curriculum suggests that mathematical ability in mathematics learning hard skills as a component of mathematics and affective behavior, including the values of the culture and character of education as a component of the soft skills of mathematics should be developed simultaneously and balanced. There are some questions such as: what type of learning mathematics can develop hard and soft skills mathematic simultaneously and balanced? How to design the implementation of learning? What type of mathematic exercises should be presented or selected students so they have the hard and soft skills such mathematic? How to measure and assess the achievement of hard and soft skills defined math? In essence, the learning of mathematics involves a variety of elements such as students and teachers with all personal, subject matter and its characteristic, situations or learning environment, and other elements so that the learning process can not be simplified in the form of recipes. Therefore, the answers to these questions are not simple and single.

There are a variety of innovative learning approaches, holds the active students, and provide an opportunity to answer the above questions, for example: a contextual approach, metacognitive approach, the direct-indirect approach, inductive-deductive approach, problem-based learning, exploration approach, inquiry, discovery, problem-based learning, a variety of cooperative learning strategies, and many others. However, NCTM (2000) suggested that the study of mathematics by any approach, it is necessary to consider some important points include: selecting appropriate mathematical tasks and increase students' motivation, fostering meaningful learning, set the discourse in order to foster disposition of students, and the active participation of students so that it creates a conducive learning atmosphere. In addition, Berman (2001) suggested nine instructional strategies to develop the ability to think openly and critical understanding in students, namely: a) Create a safe environment, b) Follow the way of thinking of students, c) Encourage students to think collaboratively, d) Develop how to ask and not just how to answer, e) Develop the ability of students to relate the concepts learned, f) Encourage students to think in multiple perspectives, g) Encourage students to be sensitive, h) Help students set standards and work in a positive outlook for the future, and i) Provide an opportunity or a chance to students to act according to his/her way of thinking. With regard to the value and character of education, Sauri (2010) suggests four ways of implementing learning character-based fields of study, namely through: a) giving a true understanding of character education, b) habituation, c) an example or role model, and d) instructional field of study integrally. Pay attention to the values contained in the culture and character of education as well as how to develop it, the question arises: how the implementation of culture and character of education in mathematics that mathematical competence and disposition as well as cultural values

and developing character simultaneously. Basically the value is not taught but is actively developed and sustained (Ghozi, 2010).

A review of the characteristics of hard and soft skills of mathematics, a variety of mathematical teaching approaches, as well as general and specific suggestions for teaching mathematics, encourage researchers to conduct in-depth study of the development of hard and soft skills mathematics by implementing innovative learning and synergy with educational character.

B. Operational Definition

1. The Hard skills are the skills and knowledge to live decent lives. Type of Mathematics hard skills selected in this study include: comprehension, problem solving, communication, connections, reasoning, logical thinking, creative thinking, critical thinking, and mathematical representations.
2. Soft skills is the ability to be a good human being. Some of the soft skills of mathematics that can be selected include: mathematical disposition, logical disposition, critical thinking disposition, creative thinking position, self regulated learning.
3. Innovative learning nuances and character values is student-oriented active learning, the view on the philosophy of constructivism as well as integrating the development of hard skills, soft skills, and education and character values simultaneously and balanced. Some learning approaches that can be selected such as: a contextual approach, inductive-deductive approach, problem-based learning, and a variety of ICT-assisted learning. Learning will be applied selectively adjusted by hard skills, soft skills mathematic and the characteristic of its learning.

C. Hard Skill Secondary School Mathematics

Based on an analysis of several experts (Baron and Sternberg, (Editor), 1987, Baroody in Yonandi, 2010, Glazer, 2000 Hassoubah 2004, Jojo, 1977, Polya, 1973, Schafersman, 1991, Sriraman, 2004 Starko, 1995 , Supriya, 2000, Williams, 2002, Yudha, 2004), Sumarmo (2006, 2010a, 2012) offers some kind of hard skills that can be selected mathematic students include: comprehension, problem solving, communication, connections, reasoning, logical thinking, creative thinking, critical thinking, and mathematical thinking reflective. Furthermore, as a guide for preparing test items and instructional materials for each sub-indicator study will be prepared for each type of hard skills that will be developed in the sub-research question. These indicators will be modified over the hard skills of mathematical indicators that have been developed Sumarmo (2006, 2010, 2012) or other relevant sources and teaching materials will be tailored to each sub-research question. In the diversity of the hard skills of mathematics to be developed in each sub-depth research there is similarity level maths hard skills are not all mathematical process but that requires regular observation process, development, and elaboration of the concepts, principles, and formulas that have been studied by students . Thus the hard skills of mathematics concerned not merely memorizing but requires the ability to think of students that will be gained significant knowledge and a high level of mathematical thinking.

In addition, Sumarmo (2006, 2010a, 2012) offers several types of soft skills that can be selected mathematic student researchers, among others: the mathematical

disposition, logical thinking disposition, critical thinking disposition, creative thinking disposition, self-regulated learning, self-efficacy, self-esteem, habits of mind, emotional intelligence, and educational values, culture, and character. As the mathematical hard skills, soft skills indicators will be modified soft skills of mathematical indicators that have been developed Sumarmo (2006, 2010a, 2012) or other relevant sources (Baron and Sternberg, (Editor), 1987, Glazer 2000, Hassoubah 2004, Polya, 1973, Schafersman, 1991, Sriraman, 2004 Starko, 1995, Supriya, 2000, Williams, 2002, Yudha, 2004) and will be adapted to the material of each sub-research. The selection of the type of soft skills in mathematics each sub-research will consider the appropriateness of the indicators or characteristics of the hard mathematic skills, learning approaches, teaching materials, and student grade level to be studied.

D. Mathematics Learning Approach

In general, any learning approach can be applied to develop various types of hard and soft skills for students of mathematics at secondary school level and any grade level. Several types of approaches that can be selected include: a contextual approach, metacognitive approach, the direct-indirect approach, inductive-deductive approach, problem-based learning, exploration approach, inquiry, discovery, problem-based learning, a variety of cooperative learning strategies, ICT-assisted learning and many others. Each type of learning approach has the characteristics, advantages and disadvantages of each so that the election must be tailored to the characteristics or indicators of hard and soft skills of mathematics to be developed by utilizing the advantages and reduce weaknesses.

It is rational that no one learning the most appropriate to develop all the skills in a particular field of study. However, for mathematical thinking skill, learning of any kind, and any learning strategy, which needs attention is the achievement of meaningful learning in students. Adopting the opinion of the NCTM (1989), there are six standards of learning achievement of meaningful learning, namely: 1) the task of training; 2) the role of the lecturer / teacher in the discourse, 3) the role of learners in discourse, 4) a tool to advance the discourse; 5) learning environment, and 6) an analysis of learning.

Relating to the value and character of education, Sauri (2010) suggests four ways of implementing learning character-based fields of study, namely through: a) giving a true understanding of character education, b) habituation, 3) the example of the character of the teacher, and 4) implementation of learning mathematics integrally. Basically the value is not taught but is actively developed and sustained (Ghozi, 2010). Pay attention to the values contained in the culture and character of education as well as how to develop it, the question arises: how the implementation of culture and character of education in mathematics that mathematical competence and disposition as well as cultural values and developing character simultaneously.

E. Some Relevan Studies

Several studies, Rohaeti (2008) to high school students and exploration approach, Mulyana, (2008) to high school students and implementing instructional synthetic analytic reports that students who achieve innovative learning above to reach

critical thinking skills and creative mathematical and classified between good and enough better than critical and creative mathematic which gets regular learning. However, other studies reported that there is no difference between the mathematical creative thinking abilities of high school students who received problem-based learning and students who received conventional learning, and creative mathematical ability is relatively low (Sumarmo, Hidayat, Zulkarnaen, Hamidah, Sariningsih, 2012). The questions of creative thinking mathematically is more difficult than other mathematical questions.

Several studies applying problem-based learning and the diverse subject, among others, Herman (2006) on problem solving, reasoning, and mathematical communication junior high students, Permana (2004) on mathematical reasoning and connections junior high school students, and Ratnaningsih (2004) on mathematical thinking of high school level mathematical ability of students reported that the experimental classes are better than conventional mathematical ability graders.

Another innovative teaching excellence than conventional learning in developing mathematical understanding abilities were also reported in several studies including: Afgani (2004) to the junior high school students, Ansyari (2004) to high school students, Hendriana (2009) to the junior high school students, Nidiasari (2004) on high school students, Permana (2010) to high school students, Rohaeti (2008) on the junior high school students, and Sukmadewi, (2004) to high school students. Several other studies (Permana, 2010, Qohar, 2010, Sugandi, 2010, Yonandi, 2010) reported that through a variety of innovative learning approaches students achieve mathematical communication skills better than the ability of students receiving conventional learning.

Relating to the association between hard and soft skills mathematic, several studies reported inconsistent findings. Sumarmo, Hidayat, Sariningsih (2013), found no association between understanding and communication and between understanding and self regulated learning abilities, similar to findings other studies that there is no association between communication skills and mathematical disposition (Permana, 2010, Yonandi, 2010) and between problem-solving ability with mathematical disposition (Yonandi, 2010). However, other studies found there were associations between mathematical ability and self regulated learning, between creative ability and disposition of high school mathematics (Wardani, 2009), communication skills and self regulated learning of junior high school students (Qohar, 2010), and a high level of mathematical ability with independent learning high school students (Sugandi, 2010). The above findings indicate that the association between the existence of mathematical ability as a component of hard skills affective aspects of mathematics and mathematics as soft skills are inconsistent.

F. Research Methodology

The research involved three main researchers and six postgraduate mathematics students who are preparing a thesis. This is an experimental research with pretest-posttest design and the control group by providing innovative learning certain math and aims to develop a variety of hard and soft skills as well as the value and character of mathematics at secondary school students.

The sample of this research were 486 high school and junior high school students. The sample was set purposively high school will be a place the research, and then at the school two classes were randomly selected from an existing class, and from the last two classes were randomly assigned into a class that is also experimental class and control class. The test of hard and soft skills scale that will be used are prepared in accordance with the purpose of research.

G. Result and Discussion

1. The Results by Using Innovative Learning

Results of research conducted at 3 junior high school and 3 senior high school in the district / town in West Java are presented as follows:

Table 1
The description of hard and soft skills of students
Based on learning

Variable	Statistical data	Innovative Learning			Conventional Learning		
		N	Pretest	Posttest	N	Pretest	Posttest
Hard skills	\bar{x}	241	18,25	66,14	245	17,55	55,04
	s		1,12	2,61		1,43	1,91
Soft skills	\bar{x}	241	68,39	68,39	245	63,64	63,64
	s		11,39	11,39		10,61	10,61

From the data processing using SPSS it is concluded that the achievement of and hard skills enhancement students getting innovative learning better than that using conventional learning. Similarly, soft skill that getting innovative learning gets better than that using conventional learning in the form of self regulated learning. Opinions of students to the SAVI approach is generally positive.

2. Connection between Hard and Soft Skills Math Students

To view the association between hard and soft skills of students can be seen in the following table:

Table 2
The total of Students Based on the Students' quality of hard and soft skills

Soft Skills \ Hard Skills	Low	Middle	High	Total
Low	47	64	9	120
Middle	63	138	36	237
High	3	63	63	129
Total	113	265	108	486

From the data processing using SPSS it is concluded that there is a significant association between hard and soft skills of students, but the association at the level of medium. From table 2 shows that the students hwo are low in hard skills, their soft skills tend to moderate,meanwhile, the students who have middle hard skills their soft

skills tend to moderate, but the students who gave high hard skills, their soft skills tend to medium and high.

H. Conclusions and Suggestions

1. Conclusions

From the data processing has been done, it is concluded as follows:

- a. The achievement and enhancement students' mathematic hard skills that acquire innovative teaching values and character nuances better than the math students hard skills who received conventional learning. Where the hard skills that students acquire innovative teaching values and character nuances are in the medium level, whereas the conventional learning gain is at a low level.
- b. Soft skills mathematic students acquire innovative teaching values and character nuances better than soft skills math students who received conventional learning. But both at the level of medium.
- c. There are associations between hard and soft skills math students, the degree of association including the medium category. Where the students who have low hard skills, their skills tend medium, which their hard skills is medium, their soft skills tend to be moderate, and their hard skills is high, their soft skills tend medium and high.
- d. The opinions of students towards innovative learning the nuances of the character values and generally positive.

2. Suggestions

- a. Innovative learning nuances and character values should be applied in the teaching of mathematics in schools on selected topics.
- b. Needs to be studied more deeply about how to improve the hard skills and soft skills to the students further enhance the provision of problem-solving questions open, exposing the data / concepts / definitions / theorems that are relevant, make a mathematical model of a story about, searching for various ways and strategies answers or looking for new ways to solve the problems.
- c. To optimize the hard and soft skills of students in learning mathematics, teachers should have designed the learning that will be implemented in such a way that there is enough time for students to reflect on their thinking processes. In addition, teachers should improve their creativity in managing learning in the classroom, both of methods, media, making question, and so on.
- d. Teachers to be constantly strive to develop innovative learning to further enhance student engagement in the learning process, both individually and collectively, as based on the results of this study involves students learning more not only to greater cognitive abilities but also able to develop students' affective aspects such as confidence.
- e. For the implementation of innovative learning more effective students should be trained and familiarized given mathematical questions which include non-routine problems and provide encouragement to the students to accept the challenge and pointed it at the time of the problem solving process.

I. Bibliography

- Afgani, J. D. (2004). *Meningkatkan Kemampuan Penalaran dan Pemahaman Matematika Siswa SLTP melalui Pendekatan Open-ended*. Disertasi pada Pascasarjana UPI, tidak dipublikasikan
- Ansyari. B. (2004), *Menumbuhkembangkan Kemampuan Pemahaman dan Komunikasi Matematik Siswa SMU melalui Strategi Think-talk-write*. Disertasi pada Sekolah Pascasarjana Universitas Pendidikan Indonesia . Tidak dipublikasi.
- Aswandi, (2010). "Membangun Bangsa melalui Pendidikan Berbasis Karakter". *Pendidikan Karakter. Jurnal Publikasi Ilmiah Pendidikan Umum dan Nilai*. Vol. 2. No.2. Juli 2010.
- Baron, J. B. dan Sternberg, R.J. (Editor), (1987) *Teaching Thinking Skill*. New York: W.H. Freeman and Company
- Berman, S. (2001) "Thinking in context: Teaching for Open-mindedness and Critical Understanding" dalam A. L. Costa., (Ed.) (2001). *Developing Minds. A Resource Book for Teaching Thinking*. 3rd Edition. Assosiation for Supervision and Curriculum Development. Virginia USA
- Glazer ,E (2000). *Technology Enhanced Learning Environments that are Conducive to Critical Thinking in Mathematics: Implications for Research about Critical Thinking on the World Wide Web*. [On Line]. Tersedia:<http://www.lonestar.texas.net/~mseifert/crit2.html>. [24 April 2006]
- Ghozi, A. (2010). *Pendidikan Karakter dan Budaya Bangsa dan Implementasinya dalam Pembelajaran*. Makalah disampaikan pada Pendidikan dan Pelatihan Tingkat Dasar Guru Bahasa Perancis Tanggal 24 Oktober s.d 6 November 2010
- Hendriana, H. (2009). *Pembelajaran dengan Pendekatan Methaphorical Thinking untuk Meningkatkan Kemampuan Pemahaman Matematik, Komunikasi Matematik dan Kepercayaan Diri Siswa Sekolah Menengah Pertama*. Disertasi pada Sekolah Pasca Sarjana UPI : tidak diterbitkan.
- Herman, T. (2006) . *Pengembangan Kemampuan Pemecahan Masalah, Penalaran, dan Komunikasi Matematik Siswa SLTP melalui Pembelajaran Berbasis Masalah*. Disertasi pada Sekolah Pascasarjana Universitas Pendidikan Indonesia, tidak dipublikasi.
- Kementerian Pendidikan dan Kebudayaan.(2013). Kurikulum Sekolah Menengah tahun 2013.
- Mulyana, T. (2008). *Pembelajaran Analitik Sintetik untuk Meningkatkan Kemampuan Berpikir Kritis dan Kreatif Matematik Siswa SMA*. Disertasi pada SPs UPI. Dipublikasikan pada Educationist, tahun 2009.
- NCTM (2000). *Principles and Standards for School Mathematics*. Reston, Virginia: NCTM.
- Nindiasari, H. (2004). *Pembelajaran Metakognitif untuk Meningkatkan Pemahaman dan Penalaran Matematik Siswa SMU Ditinjau dari Tahap Perkembangan Kognitif Siswa*. Tesis pada Pascasarjana UPI, tidak dipublikasikan
- Polya, G. (1973). *How to Solve It. A New Aspect of Mathematical Method*. New Jersey: Princenton University Press
- Permana, Y. (2004). *Pengembangan Kemampuan Penalaran dan Koneksi Matematis Siswa SMA melalui Pembelajaran Berbasis Masalah*. Tesis pada Sekolah Pascasarjana Universitas Pendidikan Indonesia, tidak dipublikasi.
- Permana, Y. (2010). *Kemampuan Pemahaman dan Komunikasi serta Disposisi Matematik: Eksperimen terhadap Siswa SMA melalui Model – Eliciting Activities*

- Disertasi pada Sekolah Pascasarjana Universitas Pendidikan Indonesia, tidak dipublikasi.
- Qohar, A. (2009). *Mengembangkan Kemampuan Komunikasi Matematis dan Kemandirian Belajar Siswa SMP melalui Reciprocal Teaching*. Sebagian disertasi pada Sekolah Pascasarjana Universitas Pendidikan Indonesia, tidak dipublikasi.
- Ratnaningsih, N. (2004). *Pengembangan Kemampuan Berpikir Matematik Tingkat Tinggi Siswa SMU melalui Pembelajaran Berbasis Masalah*. Tesis pada Sps UPI, tidak dipublikasikan.
- Rohaeti, E.E (2008). *Meningkatkan Kemampuan Berpikir Kritis dan Kreatif Matematik Siswa SMP melalui Pembelajaran dengan Pendekatan Eksplorasi*. Disertasi pada Sps UPI, tidak dipublikasikan.
- Sauri, S. (2010). Membangun Karakter Bangsa melalui Pembinaan Profesionalisme Guru Berbasis Pendidikan Nilai. *Jurnal Pendidikan Karakter*. Vol.2. No.2.
- Schaferman, S. D. (1991). *An Introduction to Critical Thinking*. [Online]. Tersedia: <http://www.google.com/url?sa=t&rct=j&q=an%20introduction%20to%20critical%20thinking%20schaferman%201991&source=web&cd=1&cad=rja&ved=0CCoQFjAA&url=http%3A%2F%2Ffacultycenter.ischool.syr.edu%2Ffiles%2F2012%2F02%2FCritical-Thinking.pdf&ei=E3x6UfidG8mXrgeo8YCQCA&usg=AFQjCNGc5e6yj9UsYTqhiuDSzXyIHU4w&bvm=bv.45645796,d.bmk>. [20 September 2005].
- Sriraman, B (2004). "The Characteristics of mathematical Creativity". *The Mathematics Educator Journal*. Vol 14 No. 1. 19 – 34.
- Starko, A.J. (1995). *Creativity in The Classroom. (Schools of Courious Delight)*. USA: Longman Publisher.
- Sugandi, A. I. (2010). *Mengembangkan Kemampuan Berfikir Tingkat Tinggi Siswa SMA melalui Pembelajaran Berbasis Masalah dengan Setting Belajar Kooperatif JIGSAW*. Disertasi pada Sekolah pascasarjana UPI. Tidak diterbitkan
- Sukmadewi, T.S. (2004). *Meningkatkan Kemampuan Pemahaman dan Komunikasi Matematis Siswa SMA melalui Strategi Transactional Reading*. Tesis pada Pascasarjana UPI, tidak dipublikasikan
- Sumarmo, U. (2006), *Pembelajaran untuk Mengembangkan Kemampuan Berfikir Matematik*. Makalah disajikan pada Seminar Nasional Pendidikan Matematika dan Ilmu Pengetahuan Alam, FPMIPA UPI, Desember 2006
- Sumarmo, U. (2010a). *Berpikir dan Disposisi Matematik: Apa, Mengapa, dan Bagaimana Dikembangkan pada Peserta Didik*. Makalah disampaikan pada Seminar Pendidikan IPA dan Matematika di FPMIPA UPI. Tidak diterbitkan
- Sumarmo, U. (2010b). "Evaluasi dalam Pembelajaran Matematika". Makalah dimuat dalam Hidayat, T, Kaniawati, I, Suwarma, I.R, Setiabudi, A, Suhendra (Editor), *Teori, Paradigma, Prinsip, dan Pendekatan Pembelajaran MIPA dalam Konteks Indonesia*. FPMIPA UPI.
- Sumarmo, U. (2012). *Bahan Ajar Perkuliahan Proses Berpikir Matematik. Program Magister Pendidikan Matematika STKIP Siliwangi Bandung*. Publikasi terbatas
- Sumarmo, U., Hidayat, W., Zulkarnaen, R., Hamidah, Sariningsih, R. (2012). "Kemampuan dan Disposisi Berpikir Logis, Kritis, Dan Kreatif Matematis: Eksperimen terhadap Siswa SMA Menggunakan Pembelajaran Berbasis Masalah dan Strategi *Think-Talk-Write*". *Jurnal Pengajaran MIPA*, Vol. 17, No.1, 17-33, April 2012.

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- Sumaryati, E. (2012). *Pendekatan Induktif-Deduktif disertai Strategi Think-Pair-Square-Share untuk Meningkatkan Kemampuan Pemahaman dan Berpikir Kritis Matematis Siswa SMA*. Tesis pada Sekolah Pasca Sarjana UPI : tidak diterbitkan.
- Supriadi, D. (2000). *Perkembangan Kreativitas dan Peranan Faktor-Faktor*
- Wardani, S. (2009) *Meningkatkan kemampuan berfikir kreatif dan disposisi matematik siswa SMA melalui pembelajaran dengan pendekatan model Sylver*. Disertasi pada Sekolah Pascasarjana Universitas Pendidikan Indonesia, tidak dipublikasi
- Williams, G. (2002). "Identifying Tasks that Promote Creative Thinking in Mathematics: A Tool". *Mathematical Education Research Group of Australia Conference*. Auckland New Zealand, July , 2002
- Yonandi (2010). *Meningkatkan Kemampuan Komunikasi dan Pemecahan Masalah Matematik melalui Pembelajaran Kontekstual Berbantuan Komputer pada Siswa Sekolah Menengah Atas*. Disertasi pada PPs UPI, tidak dipublikasikan
- Yudha, A.S. (2004). *Berpikir Kreatif Pecahkan Masalah*. Bandung: Kompas Cyber Media