

Relationships Between Retention Of Mathematical Critical Thinking And Self Regulated Learning Through Contextual Approach

Hamidah

STKIP Siliwangi Bandung
Jl. Terusan Jenderal Sudirman Cimahi
shiroimida@gmail.com

Abstract

This study is a part of research entitled "Developing a high-level mathematical thinking skill and its retention and self regulated learning of junior high school students through contextual approach." The problem is the learning process in the classroom are still not rising high-level mathematical thinking skill and it is less directly related to their real life.

This research used experimental control group and posttest design and also retention tests which aimed at examining the association of students' mathematical critical thinking skill with self regulated learning through contextual learning. The population of this research were all eighth grade students of junior high schools in Cimahi, while the samples were the eighth grade students from one of Junior high school which were purposively set in junior high school in Cimahi and two classes were randomly selected from the eighth grades. The samples were randomly assigned into the experimental class and the control class. Based on the analysis of the data, it is concluded that: 1) there is an association between students' mathematic critical thinking skills and their self regulated learning, 2) there is an association between retention of mathematical critical thinking skills of students and self regulated learning, and 3) there is association between students' mathematical critical thinking skills and the retention of mathematic critical thinking skill.

Keywords: Mathematical Critical Thinking, Retention, Self Regulated Learning, Contextual Learning

INTRODUCTION

Preceded by a sense of concern for the way the students do math problems that tend to be exactly the same as the example given problems in the book or exactly the same as the sample questions given by teacher ever. Though students are not enough to understand just yet need a mathematical thinking skills to a higher level of human capital in order to produce intelligent, creative and innovative students. Herman (2005) revealed that the high-level mathematical thinking ability is to use complex thinking, non-algorithmic to solve a problem that can not be predicted, using a different approach with existing tasks or other examples.

Reality on the field is often found that the teacher's teaching style is not maximized so that students' learning outcomes are inefficient. The results of Sadiq's research (2007) revealed that the learning process in the classroom increases the ability to think less high and less directly related to everyday life. Further research from Ratnaningsih (2007) with the subject of junior high school students reported that the results of mathematical ability of students with contextual learning is better than conventional learning.

Contextual approach (Contextual Teaching And Learning) is one of alternative learning which can create conducive classroom and empower students. This contextual approach emphasizes to the students' engagement process to find material and practice it in everyday life. So, learning the contextual approach is not just to listen and take notes, but the process of learning is experienced directly. Through that process is

expected the growth of learners as a whole, which is not only the cognitive, but the aspect of Psychomotor (skills students) and also affective aspects of behavior in the sense that today forgotten by educators and learners.

In addition, to the role of the teacher, the students in the learning process itself is very important role in encouraging the intention or motive to master the competencies that emerged within oneself. A person has the opportunity to develop personal involvement in activities, observation, and does every plan he or she made, the strategy chosen, and also overview what he has done. It indicates that through self-regulated learning will answer every problem responsibility and use learning strategy effectively. Learning by his/her self can determine the way of learning. The role of motivation in learning is very important to start and administer the students' effort.

The concept that's comprehended by students from the lesson can be stored in their memory and it can be used when they need it. Then, storing this memory it is called as retention. So, in this research, the writer will also investigate how contextual learning influences the students' retention.

Generally, the formulation of the problem in this research are: 1) is there any association between the ability of critical thinking mathematic and self-regulated learning?, 2) is there any association between the ability of students' critical thinking mathematic and self-regulated learning?, and 3) is there any association between the ability of critical thinking mathematic and retention of critical thinking mathematic?

The objective of this research is to investigate the role of contextual learning deeply toward the association of the ability of critical thinking mathematic and self-regulated learning. The operational definition of variable in this research are presented as follow:

1. The ability of critical thinking mathematic is the ability which covers: a) analyzing and evaluating the argument and evidence; b) arranging the clarification and making the valuable consideration; c) arranging the explanation based on relevant and non-relevant data; d) identifying and evaluating the assumptions.
2. Self-regulated learning is the effort which is done by individual to manage his or her self in learning by involving the ability of meta-cognitive, motivation and behavior.
3. Retention is the ability to store or save in their mind or memory, the concept that's comprehended well by students from the lesson given.
4. Contextual learning is teaching and learning process which contains the characteristic as follow: constructivism, questioning, inquiry, learning community, modeling, reflection, and authentic assessment.

REFERENCES

Critical Thinking Mathematics

Glaser (Sumarmo, 2012) states that critical thinking ability and disposition combined with the knowledge, mathematical reasoning ability, and cognitive strategies, to generalize, prove mathematical reflectively assess the situation. Furthermore, Langrehr (2003) states that critical thinking is thinking that involves evaluative criteria that are relevant in assessing the accuracy of information accompanied by accuracy, relevancy, reliability, consistency, and bias. Similar to Langrehr's opinion, Bayer (Hassoubah, 2004) suggests that critical thinking includes the ability to determine a

reliable source, distinguish between something or relevant data and not, identify and analyze assumptions, identify bias and point of view, and assess the evidence.

Self-regulated Learning

Susilawati (2009) describe independent learning as follows:

1. The Students try to increase responsibility in taking decisions.
2. Independence is seen as a character that already exists in every person and learning situation.
3. Self-reliance does not mean separate themselves from others.
4. Self-regulated learning can transfer their learning outcomes in the form of knowledge and skills in a variety of situations.
5. The students who have self-learning can involve a variety of resources and activities such as reading itself, group learning, training and work correspondence.
6. The role of effective teachers in independent study was made possible as a dialogue with students, find sources, evaluate the results and develop critical thinking.
7. Some educational institutions find ways to develop self-learning through open learning programs.

Sardiman (2006: 45) mentions the characteristics of independent learning which include:

1. There is a tendency to argue, behave and act on his or her own.
2. Having a strong desire to achieve the goal.
3. Making a plan and trying to tenacious and determined to bring hope.
4. To be able to think and act creatively, full of initiative and not merely imitate.
5. Having a tendency to progress, which is to improve learning achievement.
6. Being able to find yourself on something that should be done without expecting guidance and direction without the other person.

Retention

Bandura (Hill, 2011) mentions that one of the basic components of learning is retention. Retention indicates that what is learned is not practical effect unless we remember it long enough. Rahman (2010), Christoph and zehender (2006) mentions that the test to determine the retention done after four weeks of posttest. Dahar (Tapilouw and Setiawan, 2008) defines retention as the addition of materials studied in memory (which is not forgotten); it means that retention refers to the storage of information acquired in the memory.

Contextual Learning Approach

Ministry of Education (2006: 10) states that contextual learning involves learning the seven major components, namely: Constructivism, inquiry, questioning, learning community, modeling, reflection, and authentic assessment. Thus, learning by using contextual learning approach is learning which begins by taking the problems of everyday life or simulated problems, then through dialogue, discussion, question and answer as well as representation appointed to the concepts that will be studied and discussed by students through mentoring, facilitation and negotiation educators.

THE METHOD OF THE RESEARCH

This study was designed in the form of experiments with and posttest control group design and retention tests are aimed at examining the role of contextual learning and retention of mathematical ability, as well as junior high school students to learn

independence. In addition, this study is also expected to improve the ability of high-level mathematical thinking and retention of students, as well as junior high school students' independent learning. The population of this research was all students of class VIII SMP Cimahi, while the sample is a class VIII student of one of the junior set purposively on SMP in Cimahi two classes VIII and selected randomly from the eighth grade. Then from these two classes were randomly assigned into experimental class and control class. Test high-level mathematical thinking skills students each composed refers to the characteristics of a high-level mathematical thinking skills as well as good test in arranging guidelines. Data will be analyzed using statistical t-test, ANOVA test and χ^2 test statistics (to test the association between variables).

Before the treatment is done, the students will be given early mathematics ability test the students will be classified into Initial Ability Level Students (TKAS). After knowing TKAS the experiment started with learning setting providing treatment to students with contextual learning (experimental class) and learning how the usual (control group) at the end of treatment that will be the final test (posttest) for the first phase saw the development of students' mathematical abilities. Then to see and find out how much retention mathematical abilities of students, the student is given the final test (posttest) a second stage with a span of four weeks after the first posttest stage performed. Thus the design of the research is as follows:

Table 1 Research Design

Treatment	Posttest ₁	Period of time	Posttest ₂
X ₁	T ₁	4 weeks	T ₃
X ₂	T ₂	4 weeks	T ₄

Explanation:

- X₁ : Contextual Learning. T₁: Posttest of experiment class (T₁).
- X₂ : Conventional Learning. T₂: Posttest of control class (T₂).
- T₃ : Posttest of experimental class after 4 weeks posttest (T₃).
- T₄ : Posttest of control class after 4 weeks posttest (T₄).

Steps of the Research

To see the steps of the research are presented in Table 2. as follows:

Table 2 Step of the Research

Nature of study	Method	Step of the Research	Expectations
Theoretical, Empirical	studies Identification documentation	1. Identification of the ability to think high level of mathematical and retention, independent learning, teaching materials, as well as the initial students	Data on initial conditions and student learning difficulties
Theoretical, Rational, Empirical	Studies analysis\ descriptive	2. Designing teaching materials and samples instruments for research.	The design of instructional materials and instruments With respect to the ability of high-level mathematical
Theoretical, Rational, Empirical	Studies Analysis-Descriptiv	3. Test samples of teaching materials and instrument.	Teaching materials and test capabilities high-level mathematical thinking

Rational, Empirical, Naturalist	The study analyzes descriptive,	4. Conducting research in terms of doing the learning, analysis the data, the analysis of the implementation of learning, reports, attachments	Research reports and articles for seminars and / or published in the journal scientific air-ISSN national standard accredited and / or proceedings
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Research Data Processing Techniques

Test data (posttest 1, posttest-2, and retention) both groups were processed using Microsoft Excel 2007 software assistance, MINITAB 16 and SPSS 19 with the following steps:

1. Calculating the average and standard deviation.
2. Testing the normality of the sample data.
3. Mean Difference Test.
4. Test ANOVA.
5. Test Chi Square and Contingency Coefficient.

The link between the formulation of the problem, hypothesis, data group and the type of statistical test used in the data analysis are presented in Table 3 with the following information:

Explanation:

- KBKR-PK : Students' Critical Thinking Mathematically with contextual learning
- ReKBKR-PK : Students' Retention Capability Critical Thinking Mathematically with contextual learning
- KB-PK : Independence of students with learning Contextual Learning

Table 3 Relation of Problem, Hypotheses, Data Group and kinds of Statistic Test Used

Problem	Hypotheses	Data Group	Types of Statistic Test
Association of critical thinking skills Students' mathematical learning and independence of students on Contextual Learning	1	KBKR-PK KB-PK	Chi-Square and Contingency Coefficient
Retention Association mathematical students' critical thinking skills and independent learning students toward Contextual Learning	2	ReKBKR-PK KB-PK	
Association of critical thinking skills and Retention of students' mathematical and critical thinking skills in the students' mathematical toward Contextual Learning	3	KBKR-PK ReKBKR -PK	

RESULTS AND DISCUSSION

The following are the findings regarding the critical thinking skills of mathematics, retention of critical thinking skills and independent learning mathematics students.

Table 4. Critical Thinking Mathematically, Retention Capability Critical Thinking Mathematically, and Students' Self-Regulated Learning

Ability and Disposition	Class PK (n =31)		Class PB (n =31)	
	Mean	SD	Mean	SD
Critical Thinking	0.59	0.087	0.45	0.045
Retention of Critical Thinking	0.47	0.057	0.38	0.052
Self-Regulated Learning	139.06	7.23	113.29	8.51

Table 4 shows that the critical thinking skills in descriptive mathematical graders experiment better than the control class as well as retention. Furthermore, descriptive independence experimental class students learn better than the control class. That descriptively unknown that the frequency of students who fall into the category of learning ability lacking in independence and categorized lacking in critical thinking skills mathematically less than the frequency of students who fall into the category of good abilities in learning independence and well categorized in mathematical critical thinking skills. Furthermore, it appears that the frequency of students who fall into the category of learning ability lacking in independence and categorized lacking in critical thinking skills retention mathematically less than the frequency of students who fall into the category of good abilities in learning and independence including both categories in the retention of the ability to think critical mathematical. Based on the above it is known that in general students have a good learning independence tends to have the critical thinking skills of mathematics are good also. Furthermore, known also that in general, students have a good learning independence tends retention of mathematical critical thinking skills are good also.

Table 5 Summary of Results of the Chi-Square and Contingency Coefficient Critical Thinking, Critical Thinking Skills Retention, and Student Independence

Hypothesis	Sig.	Interpretation
1	0.001	There is an association between students' mathematic critical thinking skills and their self-regulated learning
2	0.000	There is an association between retention of mathematical critical thinking skills of students and self-regulated learning
3	0.021	There is association between students' mathematical critical thinking skills and the retention of mathematic critical thinking skills

Source: adapted from the output of SPSS 19

The existence of an association between Critical Thinking, Critical Thinking Skills Retention, and Student Independence analyzed using contingency between the two variables. From Table 5 shows that the contingency coefficient and significance value indicates that there is a significant association at the 5% significance level.

CONCLUSIONS AND SUGGESTIONS

Conclusion

This study provides some conclusions, namely:

1. There is an association between students' mathematic critical thinking skills and their self-regulated learning.
2. There is an association between retention of mathematical critical thinking skills of students and self-regulated learning.

3. There is association between students' mathematical critical thinking skills and the retention of mathematic critical thinking skills.

Suggestion

Suggestions can be submitted of which is the development of mathematical critical thinking skills students should be accompanied by the development of students' independent learning, and are preferred for essential mathematical content and be accompanied by the provision of teaching materials and help teachers according to students' needs.

DAFTAR PUSTAKA

- Christoph dan Zehender, I. (2006). Effectiveness of Reptile Species Identification-A Comparison of A Dichotomous Key with An Identification Book. *Euresia Jurnal of Mathematics Science and Technology Education*. Vol 2, No 3 Hal 55 – 65.
- Costa, A.L. "Habits of Mind" dalam A. L. Costa (Ed.) (2001). *Developing Minds. A Resource Book for Teaching Thinking*. 3 rd Edidition. Assosiation for Supervision and Curriculum Development. Virginia USA.
- Depdiknas. (2006). Panduan Pengembangan Silabus Mata Pelajaran Matematika untuk SMP. Jakarta: Ditjen Dikdasmen.
- Hassoubah, Z.I. (2004). *Developing Creative & Critical Thinking Skills*. Cara berpikir Kreatif & Kritis. Bandung: Nuansa.
- Herman, T. (2005). *Pembelajaran Berbasis Masalah untuk Meningkatkan Kemampuan Berpikir Matematis Tingkat Tinggi Siswa Menengah Pertama (SMP)*. Disertasi UPI. Tidak diterbitkan.
- Hidayat, W. (2011). Meningkatkan Kemampuan Berpikir Kritis dan Kreatif Matematik Siswa SMA Melalui Pembelajaran Kooperatif *Think-Talk-Write*. Tesis UPI: Tidak diterbitkan.
- Hill, W. (2011). Teori-teori Pembelajaran Konsepsi, Komparasi, dan Signifikansi; (Penerjemah: M. Khozim). Bandung: Nusa Media.
- Ismaimuza. (2010). Kemampuan Berpikir Kritis dan Kreatif Matematis Siswa SMP Melalui Pembelajaran Berbasis Masalah Dengan Strategi Konflik Kognitif. Disertasi UPI: Tidak diterbitkan.
- Langrehr, J. (2003). *Teaching Children Thinking Skills*. Jakarta: PT Gramedia.
- Minarni, A. (2012). Pengaruh Pembelajaran Berbasis Masalah Terhadap Kemampuan Pemecahan Masalah Matematis. Seminar Nasional Matematika dan Pendidikan Matematika FMIPA UNY 10 November 2012. mp-94.
- Musbikin, I. (2006). *Mendidik Anak Kreatif ala Einstein*. Yogyakarta: Mitra Pustaka.
- Nicholl, M. J. (2006). *Accelerated Learning for The 21st Century (Cara Belajar cepat Abad 21)*. Bandung: Nuansa.
- Polya, G. (1973). *How to Solve It. A New Aspect of Mathematical Method*. New Jersey: Princenton University Press.
- Rahman. (2010). Peranan Pertanyaan terhadap Kekuatan Retensi dalam Pembelajaran Sains pada Siswa SMU. Dalam *Educare: Jurnal Pendidikan dan Budaya*. [Online]. Available: <http://educare.efkipunla.net/index2.html>. [10 November 2011].
- Ratnaningsih, N. (2007). Pengaruh Pembelajaran Kontekstual terhadap Kemampuan Berpikir Kritis dan Kreatif Matematik Siswa Sekolah Menengah Atas. Disertasi UPI: tidak diterbitkan.

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- Sardiman, (2006). *Interaksi dan Motivasi Belajar Mengajar*. Jakarta: Raja Grafindo Persada.
- Shadiq, F., (2007). Laporan Hasil Seminar dan Lokakarya Pembelajaran Matematika 15 – 16 Maret 2007 di P4TK (PPPG) Matematika. Yogyakarta.
- Sugandi, A. I. (2010). *Mengembangkan Kemampuan Berfikir Tingkat Tinggi Siswa SMA melalui Pembelajaran Berbasis Masalah dengan Setting Belajar Koopertatif JIGSAW*. Disertasi pada Sekolah pascasarjana UPI. Tidak diterbitkan.
- Sukmadinata, N.S (2004). *Landasan Psikologi Proses Pendidikan*. Bandung: PT Remaja Rosdakarya.
- Sumarmo, U, dkk. (2012). Kemampuan dan Disposisi Berpikir Logis, Kritis, dan Kreatif Matematik (Eksperimen terhadap Siswa SMA Menggunakan Pembelajaran Berbasis Masalah dan Strategi *Think-Talk-Write*). Jurnal Pengajaran MIPA Universitas Pendidikan Indonesia, Vol 17, No 1. Hal. 30.
- Suryadi, D. (2004). *Penggunaan Pendekatan Pembelajaran Tidak Langsung serta Pendekatan Gabungan Langsung dan Tidak Langsung dalam Rangkaian Meningkatkan Kemampuan Berpikir Matematik Tingkat Tinggi Siswa SLTP*. Disertasi. UPI Bandung : Tidak dipublikasikan.
- Susilawati, D. (2009). Upaya Meningkatkan Kemandirian Belajar dan Kemampuan Matematika Siswa Kelas X SMA N 1 Gamping dengan Menggunakan Lembar Kerja Siswa. Skripsi UNY: Tidak diterbitkan.
- Tapilouw, F dan Setiawan, W. (2008). Meningkatkan Pemahaman dan Retensi Siswa Melalui Pembelajaran Berbasis Teknologi Multimedia Interaktif (Studi Empirik pada Konsep Sistem Saraf). Jurnal Pendidikan Teknologi Informasi dan Komunikasi. Vol 1, No 2, Desember 2008. Hal 21.
- Thomas, A., Thorne, G., & Small, B. (2000). High Order Thinking – It’s HOT!. Online 23 April 2012, (<http://cdl.org/resource-library/pdf/feb00PTHOT.pdf>).
- Yudha,A.S. (2004). *Berpikir Kreatif Pecahkan Masalah*. Bandung: Kompas Cyber Media.