THE APPLICATION OF COOPERATIVE LEARNING MODEL OF JIGSAW TYPE TO INCREASE ACTIVITY AND STUDENT LEARNING RESULTS IN LEARNING PHYTAGORAS THEOREM

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ABSTRACT

The problem that is proposed in the research is abaut haow cooperative learning type jigsaw could develop result learns and activity of students at State Junior High School of 34 Medan Baru. Result learns is basic competence of students as the ability or minimal responses that should be owned or conduct by students. And activity students is responses of students in be learning, brave say opinion and motivation to learning. The subject's research are all students in VIII class. And the object's research are result learns and activity students in all square math learning. This research aimed to develop learns result of students in math in do PTK/ Research Class Action by using type cooperative learning type jigsaw that do at State Junior High School of 34 Medan Baru with three cycles. To get data that need in this watchfulness in used explaination test that is result test learns that consist of fiveteen exercise.

Keyword: *Model Cooperative Learning, Theorema Phytagoras*

Introduction

Mathematics is a universal science that underlies the development of modern technology has an important role in various disciplines and advance the human mind power. Rapid development in the field of information and communication technology today is based on the development of mathematics in the field of number theory, algebra, analysis, discretionary theories of opportunity and mathematics. To master and create technology in the future requires a strong mastery of mathematics from an early age.

Mathematics in the curriculum of primary and secondary education is the school mathematics. School mathematics is the mathematics taught in schools, the maths taught in primary education (elementary and junior high school) and secondary education (senior high school and vacational high school). While primary school mathematics education is the mathematics taught in elementary school. Elementary mathematics materials consist of selected mathematical sections, screened and designed from "official" guidelines tailored to school conditions, abilities and needs. Elementary students are expected to develop optimally and can not be separated from the development of mathematics education in the world today. In addition, so that students do not get too difficult in relating the concepts of mathematics to the practical needs of everyday, as well as for the need to continue further education.

The general reality that can be found in secondary schools is that most of the teaching of mathematics is given in a classical way through expository methods with lecture stages, the examples then proceed with the exercises, without a review of whether the application of the method matches the material, students' initial abilities, and available learning media . The unadjusted use of ametodes with the subject matter has an impact on the students' lack of math skills. It is commonly known that mathematics learning in schools is less successful, and even many of the students do not pass the national exam as a result of the mathematics score in the national exam does not reach the minimum target.

In the present reality the problem that arises is the incompatibility of students' ability to the mathematics presented by the teacher. Teachers want to immediately complete the lesson material listed in the mathematical syllabus while the students have not had time to understand it.

The fact that the results of mathematics learning of low students also occur in State Junior High School of 34 Medan at the time of the author made direct observations in the school. This can be seen from the average value of repetition semester 1 last three years obtained from Dewi Permatasari as a teacher of mathematics teaching in the school as follows:

Table 1. Average Value Of Semester 1

Number	Academic Year	Average
1	2009/2010	50,6
2	2010/2011	5,2
3	2011/2012	5,4

This average value when compared with the completeness of learning according to the curriculum of 6.0 or 60% can be said that the value is below the expected thorough standard. The math teacher reveals that students often have difficulty in solving problems using mathematical formulas. According to the researcher's observation by asking a student in the school the researcher concludes that the method used by teacher during this time is expository method, where in this method the dominance of teacher much less, because not continuously talk. He speaks at the beginning of the lesson, explains material and examples of questions, and at times necessary. Students not only hear and make notes, but also make practice questions and ask if they do not understand. This makes the student's interest in learning decrease, especially on the material of Phytagoras Theorem.

To overcome the above problems, it is necessary to apply an effective learning model and spur the interest of students, to be more motivated and active in the learning of mathematics Cooperative Learning Model was developed in an effort to increase joint activities, a number of students in one group during the learning process. Referring to Bruner's theory of learning (1966: 105) which says that: "should learn by actively participating with concepts and principles so that they are encouraged to gain experience and conduct experiments enabling them to discover the principles themselves . "As Usman (2001: 306) puts it" an appropriate learning model in which students participate in mathematical activities is cooperative learning ".

Review of Theory

Cooperative Learning of Jigsaw Type

Cooperative learning is a group work in learning. As Lie (2003: 17) notes that "cooperative learning is usually defined as a structured work system or learning group." In cooperative formation, each group must be heterogeneous, consisting of men and women, coming from different ethnic groups, having Ability high, medium, low. Besides cooperative learning is characterized by task structure, goals and cooperative

awards. If cooperative is formed in the classroom, peer influence can be used for positive purposes in mathematics learning.

Table 2. Steps of Cooperative Learning

Step	Indicator	Teacher Behavior
Step 1	Convey goals and motivate students.	The teacher conveys the learning objectives and communicates the basic competencies to be achieved as well as motivates the students.
Step 2	Present Information.	Teachers convey information to students.
Step 3	Organize students in study groups.	The teacher informs the student grouping.
Step 4	Guiding group learning.	Teachers motivate and facilitate students in study groups.
Step 5	Evaluation	Teachers evaluate learning outcomes about the material they have learned.
Step 6	Reward	Teachers reward individual and group learning outcomes.

Source: www. ppp.pembelajaran cooperative.co.id

Such collections are called "expert groups" (expertgroup). Next the students in the group of experts return to the original group (home team) to teach other members about the material that has been studied in the group of experts.

Finding the Phytagoras Theorem

To find the Phytagoras theorem do the following activities. Take two square pieces of paper (b + c) cm as shown in Figure 1 (i) and 2 (ii). We will find the relationship between the magnitude of a, b and c. Figure 1.3 (i) shows the square ABCD of size (b + c) cm. At the four corners make four right triangles with the length of the sides of the elbows b cm and c cm.

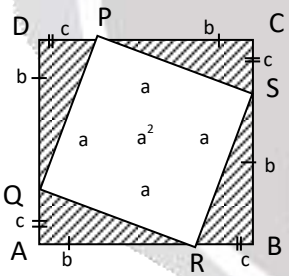


Figure 1. (i)

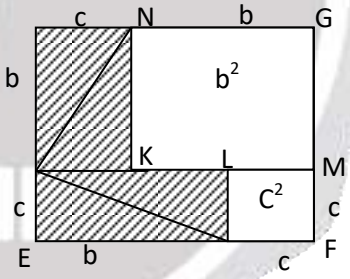


Figure 2. (ii)

From Figure 1.3 (i) it appears that the area of the square ABCD equals the square area (the area of the un-shaded area) plus the area of four right triangles (shaded area), so that it is obtained:

Area of shaded area = Area of un-shaded area

$= 4 \times \frac{1}{2} \times b \times c$

$= 2bc$

And the area is not shaded= square area of PQRS

$= a \times a = a^2$

Then create a square EFGH (b + c) cm as shown in Figure 2. (ii). In the two corners make four right triangles so as to form two rectangles of size (b x c) cm. From Figure 2. (ii) it appears that the square area of EFGH equals the square area (the un-shaded area) is added with the area of four right triangles (shaded area, thus obtained:

Area of shaded area = area of two rectangles

= 2 x *b* x *c*

= 2*bc*

Area of non-shaded area = square area of KMGN + square area of OFML

= (*b* x *b*) + (*c* x *c*)

= b^2 *x* c^2

From Figure 1.(i) and 2. (ii) it appears that the square size ABCD = square size is EFGH, so that it is obtained:

Square area of ABCD = square area of EFGH

$2abc + a^2 = 2bc + b^2 + c^2$

$a^2 = b^2 + c^2$

The above conclusions are illustrated as shown in Figure 3. (iii) below:

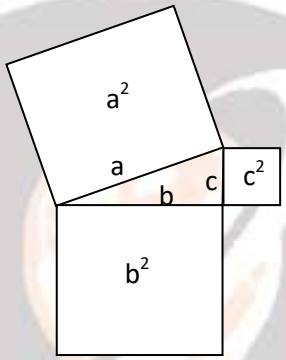


Figure 3. (iii)

The conclusion is then known as the Phytagoras Theorem. The Phytagoras theorem can then be formulated as follows:

"For each right triangle, the square of the length of the oblique side is equal to the sum of the squares of the length of the sides of the elbow"

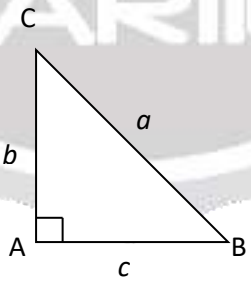


Figure 4. (iv)

If ABC is a right triangle with a long side of italics, while b and c the length of the right side of the elbow then apply the following formula:

$a^2 = b^2 + c^2$

The above statement if changed to the form of reduction to be:

$b^2 = a^2 – c^2$

$c^2 = a^2 – b^2$

Method

This research is research of PTK (Research Action Class) by giving treatment to group which done by cooperative learning type jigsaw model. In accordance with the school that became the source of research problems, the location of this study is State Junior High School of 34 Medan Maimun. The subject of this research is all students of class VIII State Junior High School of 34 Medan Maimun. The object of this research is the result and the learning activity of the students with Cooperative learning model of Jigsaw Type on Phytagoras theorem material of class VIII.

Result and Discussion

A. Results of the Research on Cycle I

1. Teacher Activity

This research was conducted in second semester of 2011/2012 academic year on Phytagoras Theorem material consisting of three cycles, where each cycle takes 1 week, where one week is equivalent to 6 hours lesson. Each cycle contains three meetings, in which one meeting is equivalent to two hours of lesson, followed by evaluation.

This cycle begins on Monday, March 12, 2012. After implementing the learning action in cycle I, the observation and test implementation, the teacher activity, student activity and student learning outcomes are as follows: the average student who perform the activity on Cycle I of 63.21% (around 25 students). When compared to the criteria of the success rate of the action, then the average is on the less criteria.

Figure 5. Students Who Began to Actively Discuss When Given a Task

Table 3. Statistical Results of Student Learning in Cycle I

Statistic	Score
Students	40
Maximum score	100
Minimum score	5
Average	57,50
Standard deviation	15,52

Some of the students are still below the average of 15 people that is equal to 37.30%. While learning mastery reaches 62.50% ie there are 30 students who have reached the value of more than 65.

The average score of teacher activity in cycle II was 3.01. The average teacher activity score is equivalent to 75.29%. This score is the average of the observations made at the second meeting in cycle II. The test of student learning outcomes in cycle II is done on Saturday, March 24, 2012 at the sixth hour of V meeting. The test is done during the last 30 minutes of the lesson. At the time of test execution of 40 students of State junior high school of 34 Medan Maimun this no one is absent. Thus, the participants of THB II are 40 students.

Table 4. Statistics of Student Results in Cycle II

Statistic	Score
Students	40
Maximum score	100
Minimum score	5
Average	66,62
Standard deviation	11,14

Results of student learning on the test results of learning cycle II more can be seen in the appendix. The statistic of student learning outcomes in cycle II referred to is presented in table X. It is clear that with score 5-100 obtained an average of 66.62 with standard deviation which continues to decrease by 11.14.

Analysis of the results of the learning cycle II test provides the percentage of students' exhaustiveness class VIII State Junior High School of 34 Medan Maimun, which can be seen in Table XI follows:

Table 5. Test Learning Results And Students Completeness Of Cycle II

Value	Student	Score	Percentage
≥ 65	31	2180	77,50%
< 65	9	485	22,50%
Average		**66,62**	

The test of learning cycle III was conducted on Saturday, March 31, 2012. The test was conducted during the last 30 minutes of class V. At the time of the test, from 40 students of class VIII State Junior High School of 34 Medan Maimun no one was absent. Thus the test participants of the students' learning outcomes in cycle III are presented in Table 6.

Table 6. Statistical Results of Student Learning in Cycle III

Statistic	Score
Students	40
Maximum score	100
Minimum score	5
Average	74,25
Standard deviation	8,67

Student learning outcomes on THB III tests can be seen in the appendix. The statistic of student learning outcomes in cycle III is presented in Table 6. It is clear that with the interval value of 5-100, the average of student learning outcomes in cycle III is 74.25 with standard deviation 8.67. Analysis of the learning outcomes of cycle III gives the percentage of students' exhaustiveness class VIII State Junior High School of 34 Medan Maimun, which can be seen in the following table:

Table 7. Test Learning Results And Students Completeness Of Cycle III

Value	Student	Score	Percentage
≥ 65	35	2755	87,50%
< 65	5	295	12,50%
Average		**74,25**	

Increased teacher activity from cycle I to cycle III can be seen in the following graph:

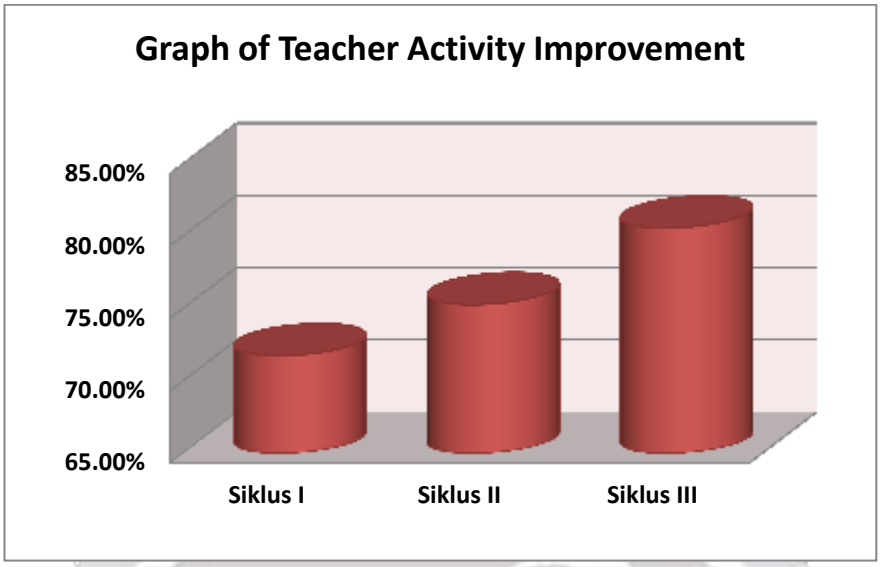


Figure 6. Teacher Activity From Cycle I To Cycle Iii

2. Student Activity

The increase of student activity in the presentation of Phytagoras theorem material through the application of cooperative learning model of jigsaw type in class VIII State Junior High School of 34 Medan Maimun is based on observation result. In cycle 1 the percentage of students who do activity equal to 63,21% (equal 25 person) this when compared with the criterion of success rate of action, so it turns out the average of student doing activity are on enough criteria. In the second cycle increased to 70.00% (equivalent to 28 people), when compared with the criteria of the success rate of the action, the average student activity is in enough criteria, while in cycle III, the average score of student activity increased to 80.00% Equivalent to 32 people) which, when compared with the criteria of the success rate of action, then it turns out the average student who performs activities of 80.00% is in good criteria.

The result of observation of student activity based on indicator of student activity aspect observed can be seen in the following table:

Table 8. Observations of Student Activities

Number	Indicator of Student Activity	Cycle 1			Cycle 2			Cycle 3		
		1	2	3	4	5	6	7	8	9
1	A focus on teacher explanation	10	10	15	11	10	14	11	12	15
2	Ask when needed	7	8	8	11	15	10	11	13	15
3	Answering teacher questions	5	11	8	7	8	10	10	9	13
4	Dare to express his opinion in the discussion	9	10	12	10	9	13	10	12	16
5	Actively discussing while doing group work	8	8	16	11	8	15	10	12	15
6	Become a model when asked the teacher	3	4	4	3	3	3	4	6	7
7	Can do the exercises / tests correctly	8	10	12	9	8	13	11	10	14

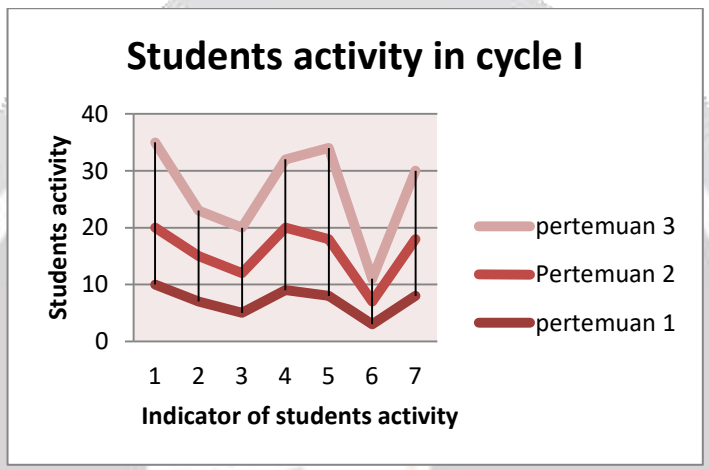
From the table above can be seen the increase in student activity of each indicator. In the first indicator, the focus on teacher explanation was increased in the third meeting on cycle 1 of 15 people. In the

second cycle of 2 meeting decreased to 11 students who then increased again at the meeting VI as many as 14 students. Then with the same thing in cycle 3 also seen increased again at the meeting to IX as many as 15 students.

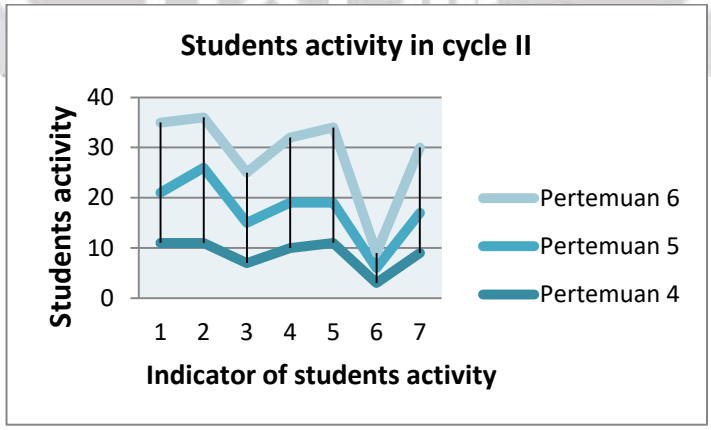
In the activity indicator the students who asked when needed continued to increase at each meeting, and seen decreased at the meeting VI in cycle 2 which at meeting V as many as 15 students who asked, decreased to 10 students who asked at the meeting VI on cycle 2.

The greatest increase occurred in the activity indicators of students who dared to express their opinions in the discussion. The largest increase occurred in cycle 3, where at the VII meeting as many as 10 people, meeting VIII increased again to 12 people and meeting IX increased again to 16 students.

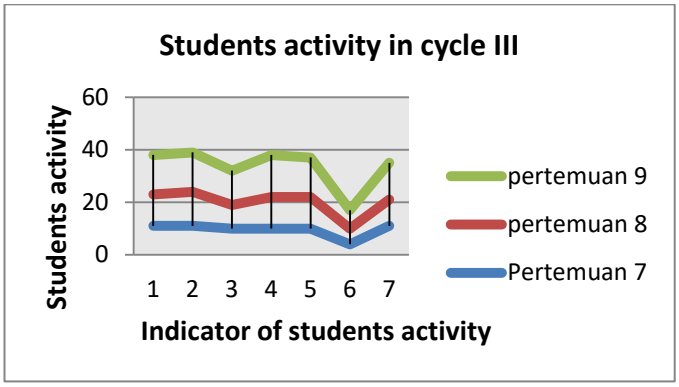
Increased student activity on each student activity aspect indicator can be seen in the following graph:



(Figure 7. Students Activity Cycle I)



(Figure 8. Students Activity Cycle II)



(Figure 9. Students Activity Cycle III)

In general, student activity continues to increase in every jigsaw learning cycle. Can be seen from the percentage of student activities per cycle in the following table:

Table 9. Observation of Student Activities

Information	Cycle 1	Cycle 2	Cycle 3
Student activities	177	196	224
Ideal	280	280	280
Percentage	63,21%	70,00%	80,00%

From the table above can be seen the increase in student activity on the subject of mathematics, especially on the material theorem phytagoras. The highest increase is 10.00% from cycle II to cycle III, while the lowest increase in cycle I to cycle II is 6.79%.Increased Student Learning OutcomesThe improvement of students' learning outcomes in the presentation of material of Phytagoras theorem in class VIII of VIII State Junior High School of 34 Medan Maimun is based on the Learning Result Test (THB) consisting of three tests, THB-1, THB-2 and THB-3. Then about the learning outcomes and percentage of students' learning mastery can be seen in the following tables and graphs:

Table 10. Student Learning Results And Learning Liability

Information	THB-1	THB-2	THB-3
Average	57,50	66,62	74,25
Completeness	62,50%	77,50%	87,50%

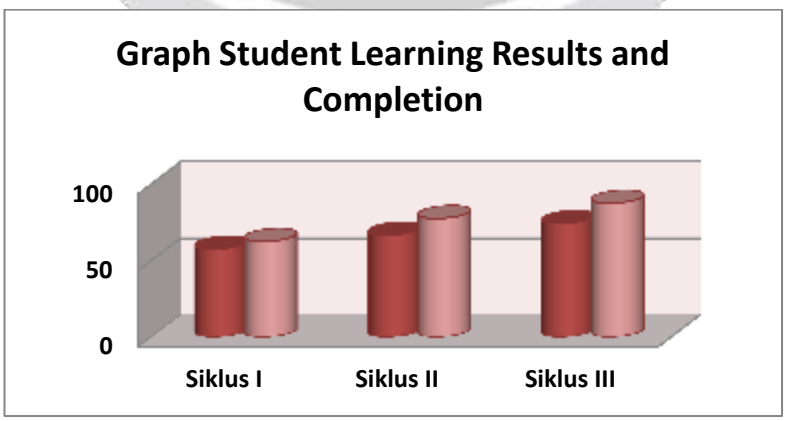


Figure 10. Student Learning Result and Completion

From the tables and graphs can be explained the development of student learning outcomes and mastery learning from cycle I to cycle III, through the average test results of student learning is THB-1, THB-2 and THB-3. From cycle I to cycle II student learning outcomes increased from 57.50 to 66.62 up by 9.12 as well as from cycle II to cycle III increased from 66.62 to 74.25 up again by 7.63. Logically from cycle I to cycle III goes up by 16,75.

Likewise, the completeness of student learning in the first cycle of students who complete the study of 62.50%, when compared with the criteria of learning completeness is in the criteria less. Then rose to 77.50% in cycle II. In the third cycle of learning completeness has reached 87.50%, when compared with the criteria of learning completeness is in good criteria. This situation has become the target of this research.

The results of this study are consistent with the findings of previous in Whicker, at al (2010) The results obtained from a repeated-measures multivariate analysis of variance (with pretest scores as the covariate) showed a significant Group × Time interaction. Students in the cooperative learning group had increasingly higher test scores than students in the comparison group and significantly outscored the comparison group.

References

1. Abdurrahman, M. (1999). *Pendidikan Bagi Anak Kesulitan Belajar*, Jakarta: Rineka Cipta
2. Arikunto, S. (1986). *Dasar Dasar Evaluasi Pendidikan*, Yogyakarta; Bumi Aksara
3. Aroson , dkk. *www . ppp . pembelajar . cooperative .co.id*, Jakarta
4. Azka, F, (2005). *Keefektifan Model Pembelajaran Kooperative Type Stad dan Jigsaw Terhadap Hasil Belajar Matematika Pokok Bahasan Teorema Phytagoras Pada Siswa Kelas VIII Semester 1 SMP Negeri 10 Semarang Tahun Ajaran 2004/2005,* Skripsi, Semarang
5. Dahar, R.W, (1984). *Teori Teori Belajar,* Bandung : IKIP Bandung.
6. Djamarah, S.B. (1995). *Strategi Belajar Mengajar,* Jakarta: Rineka Cipta.
7. Fakultas *Matematika dan Pengetahuan Alam Universitas Negeri Medan, (2005), Buku Pedoman Penulisan Skripsi dan Proposal Penelitian Kependidikan, FMIPA UNIMED*
8. Hamalik, D. (1983). *Pengantar Pendidikan* UNIMED, 2002. UNIMED, Medan
9. Mersinar, P. (2010). *Perbedaan Hasil Belajar Matematika Siswa yang Diajar Menggunakan Pembelajaran Kooperative Type Jigsaw dengan Type STAD pada Pokok Bahasan Himpunan Kelas VII SMP Swasta Karya Pembagunan Deli Tahun Ajaran 2009/2010* Skripsi, Medan
10. Mas'ud, M. (2008). *Ayo Menggunakan Teorema Phytagoras,* Klaten: Intan Pariwara
11. Roestiyah NK. (1989). *Strategi Belajar Mengajar*, Jakarta: Bina Aksara.
12. Siberlman, M. (2002). *Active Learning: 101 Strategi Pembelajaran Aktif,* Edisi Bahasa Indonesia, Yayasan Pengkajian dan Pengembangan Ilmu-Ilmu Pendidikan Islam (Yaspendis), Yogyakarta
13. Suhendra B. (2006). *Kurikulum Tingkat Satuan Pendidikan (KTSP 2006). Jakarta. BP. Dharma Bakti*
14. Syafitri, A. (2005). *Penerapan Pembelajaran Matematika Realistik pada Pokok Bahasan Keliling dan Luas Persegi Panjang dengan Menggunakan LKS di kelas VI SDN 054906 Stabat T.A 2003/2005, Skripsi, Medan*
15. Turmudi, D. (2001). *Strategi Pembelajaran Matematika Kontemporer*, Pendidikan Matematika FMIPA UPI
16. Whicker, Kristina M, Linda Bol & John A. Nunnery. (2010). *Cooperative Learning in the Secondary Mathematics Classroom.* The Journal of Educational Research. April 2010, Volume 91, 1997 - Issue 1.
17. Winkel, W.S. (1996), *Psikologi Pengajaran,* Penerbit Gramedia Widya Sarana Indonesia, Jakarta