International Journal of Humanities and Social Science Research
ISSN: 2455-2070, Impact Factor: RJIF 5.22
www.socialresearchjournals.com
Volume 2; Issue 4; April 2016; Page No. 30-35

The effectiveness of student teams-achievement division (stad) cooperative learning on mathematics comprehension among school students

Wong Nguok Ling, Mohd Izam Ghazali

Universiti Utara Malaysia, Sintok, Kedah

Abstract
This research aims to identify the effectiveness of Student Teams-Achievment Division (STAD) cooperative learning techniques towards Mathematics comprehension in Sarikei District, Sarawak. The number of subjects involved this research is seventy students from Year Five in Sarikei District, Sarawak. 35 students were in the experimental group – 20 males and 15 females – while another 35 students were in the control group – 19 males and 16 females. Data collection was done twice which were the pretest and the post test. The gap between the exam was four weeks. The Mathematics test has consisted of 10 comprehension items. The questions were adapted from Ujian Pencapaian Sekolah Rendah (Primary School Assessment Test). The data was analysed with mixed between-within subjects ANOVA. The findings of this research have shown that STAD techniques in Mathematics learning can increase Mathematics comprehension. This research has also shown main effect and direct interaction in students' Mathematics comprehension in the posttest between the experimental group and the control group. This shows that STAD cooperative learning techniques play important roles as an active pedagory to increase Mathematics comprehension. STAD encourages the students and teachers to be innovative and creative to improve teaching and learning of Mathematics in the classroom. This benefits the students in Sarikei District and enable them to compete healthily with the other students from urban areas in Mathematics.

Keywords: Mathematic comprehension, STAD cooperative

Introduction

Teachers play a significant role in ensuring the achievement of national mission in education. Therefore, teachers need to put a lot of effort to be aware, to be committed and to have high enthusiasm in implementing initiatives and approaches as well as facing challenges in the teaching profession which includes the alterations of teachership. Teachers as the main source of knowledge for students has transformed into a facilitator in the process of teaching and learning, transformation agent as well as the source of inspiration for the students. Teachers need to be creative and innovative to make the system of delivering the process of teaching and learning to be more effective, interesting and fun (Kementerian Pelajaran Malaysia, 2006) [15].

Humans are born with different potentials and capabilities which expand throughout the process of learning and experiencing. The learning method of a student is also a factor of building potentials and abilities. Thus, the result of previous research indicates that an appropriate learning method based on the liking of a student has a tremendous impact on the student's performance and a positive increment of result (Norasyidkin, 2011) [19].

Corporative learning is a learning method that urges the students to have distinctive abilities to interact and cooperate with one another in order to master a concept or skill not just for oneself but also among friends. This particular group is assembled by students with distinctive abilities. It means that every group consists of students with different level of intelligence. By going through the corporative learning, students are able to master and practise scientific skills, thinking skills, social skills, scientific behaviours and moral values (Rahil Hj. Mahyuddin & Sharifah Mohd Nor, 1993) [20].

According to Siegel (2005) [21], corporative learning method emphasizes on the behaviours of students coorperating and helping one another in a group. Suherman (2001) [26] suggests that students need to have consciousness of their respective responsibilities within the group in order to achieve the same goal. Furthermore, every students need to be aware of the fact that problems faced by each group has to be resolved together. They need to discuss with one another to find the solutions for each problem and they must realize that actions or decisions made by every single one of them will eventually influenced the impact or result in achieving their goals.

According to Slavin (1995) [22], corporative learning can change the understanding of the students in increasing their capabilities in academic. Corporative learning is also essential in contributing and influencing achievements and positive attitude among students. Corporative learning method can be differentiated in groups of peer learning by considering the prerequisite to build a positive reliance among group members throughout the discussion. Every group member is responsible for the learning of others and the obligation of every individual. Meanwhile, teacher is responsible in ensuring the effectiveness of corporative learning method by giving a proper guidance to the students during the activites for each lesson. And by this means teacher is a guider or facilitator and not as a contributer or main source of information for the students (Slavin, 2009). Corporative learning is different with group learning. During group learning, a teacher usually separates the students into three groups with the same level of intelligence, namely, advance group, intermediate group and remedial group. Then, teacher will distribute a tasksheet or an

exercise to each student based on their capabilities. They are required to complete the work individually but free to discuss with one another. This method is not categorized as corporative learning because there's no positive reliance among students and the accountability of each individual during group activity (Johnson & Johnson, 1988). Corporative learning needs the students to coorperate with one another in order to achieve success as a group and tokens will be given away to the winning group (Sri Anitah, 2009).

According to Slavin (1990) [25], practising corporative learning method in class is definitely better than the traditional learning method. According to Johnson & Johnson (1987) [13], traditional teaching is a passive way of teaching because this kind of method will eventually cause the students to feel bored and not interested to learn especially when they don't understand the learning content. Hence, traditional learning technique needs to change by involving the students to interact with one another. Teachers must always have the desire to improve their teaching and learning technique in order to make the students interested to learn and they must find the best way or solution to help the students. This technique is introduced by Slavin in year 1990 from University of John Hopkins in America (Slavin, 1990) [25].

STAD is one of the easiest and flexible corporative learning techiques. It is widely used in different subjects, from primary school to college (Balkcom, 2005) [4]. According to Slavin (1995) [22], *STAD* is suitably use in lessons with clear objectives such as calculation and application in Mathematic. By using this strategy, students are required to coorperate in a group consisting of four or five students with different achievements, male and female from different races. *STAD* starts with teacher's performance and deliverance of a topic. Then, students will discuss and work in a group. Advance students will help other students to master the learning topic. If the students want to get tokens, every student in each group must help the group members (Gunter *et al.,* 1995) [10]. Test or quiz for each individual will be held and group recognition is based on the increment of achievement for every individual. Marks obtained by every individual in each group will be the marks for each group and tokens will be giving away to group which fulfil certain criteria (Cruickshank *et al.,* 2005). Two main principles of *STAD* are positive reliance and individual responsibility. *STAD* technique can motivate students to encourage and help one another.

According to Ernawati (2003) [8], understanding or comprehending is a process shown by students through learning and by discussing certain concept and formula verbally. Therefore, students are said to understand a concept in a learning process when they are able to present or discuss a concept verbally. Then, students are also able to check and profoundly relate a concept with another. Students can solve problems by relating concepts involving thinking abilities analytically to obtain answers.

Understanding or comprehending (Matlin, 1994) [17] among students towards a Mathematical concept can be seen from the aspect of students' capabilities to define a concept orally and in written, identifying and making question and non-question, using model, diagram and symbol to convey a concept, changing a form of symbol to another form, knowing different meanings and interpreting concept, identify the characteristics of a concept and to identify the condition that determines the concept by comparing and differentiate a concept *(The National Council of Teacher of Mathematics,* 2006).

Ali (2010) [2] said that Mathematics is the basic knowledge obtained by education which starts from primary to secondary education. According to Elizabeth dan Conroy (2009) [7], one of the objectives in learning Mathematic is to give an opportunity to the students to expand and intergrates knowledge, skills and practises in the comprehension of Mathematic.

Literature Review

Ansari (2004) [3] had done research that is related to the application of cooperative learning on a small group of students with the Think-Talk-Write (TTW) technique. It was discovered that TTW technique motivated students to have an early knowledge in Mathematics and that ability strengthens Mathematics comprehension among the students compared to conventional learning. Besides, the result from the research has shown that the better the application of TTW technique in exposing basic Mathematics skills to the students, the higher the effects on students' ability in Mathematics comprehension.

Charalampos (2004) [5] had also done a research on cooperative team in a Mathematics classroom. The outcomes of the research had shown that students' participation in cooperative team activities can help to increase Mathematics concept comprehension among students. Students are motivated to acknowledge the importance of Mathematics concept comprehension, attitude, attendance, task completion and willingness of the student to take part in the classroom have improved.

Besides that, Linda (2004) [16] had done a research on the effectiveness of Jigsaw method on Science learning. Her research had shown that Mathematics comprehension and achievement among students when using Jigsaw technique were higher in comparison with conventional learning method. This research is parallel with Kariadinata research (2001) [14] that did a cooperative learning research in STAD group. It had shown that students' quality of Mathematics comprehension had improved from weak quality to moderate quality. Kariadinata stated that cooperative learning creates a more active learning environment for the students – half of the learning time is used to complete assignment questions through discussion between students and teacher.

Graceful and Raheem (2011) [9] research was about the comparison of cooperative learning techniques – Think-Pair-Share (TPS) and Reciprocal Teaching (RT) – with the conventional methods and their effects on student performance in Mathematics comprehension. The findings had shown that RT cooperative learning technique was the most effective method for Mathematics comprehension and followed by TPS technique. Cooperative method is the most effective method to improve student performance in Mathematics comprehension.

Furthermore, Slavin (1997) [23] and Whicker (1997) [29] had also stated that students' attitudes were more positive in cooperative learning techniques because of idea-sprouting application process, problem solving and group interaction. The findings of the research had shown that the ability to understand Mathematics concept had improved due to group task sharing. Students can also learn to think in completing complex Mathematics task and capable of giving logical explanation.

Joseph Njogu Njorenge and Bernard Nyingi Githum (2013) had done a research using the STAD cooperative learning technique in Kenya. 323 respondents were involved to determine the effectiveness of STAD cooperative learning towards mastery in Mathematics concept comprehension 'Scale Drawing'. The findings of the research had shown that the mastery in Mathematics concept comprehension has significant positive correlation with STAD cooperative learning. Other than that, the findings had also shown that both male and female respondents obtain better achievement in the mastery of Mathematics comprehension when they were exposed to STAD cooperative learning. This research is parallel to past research. Effandi Zakaria (2003) did a research on the effectiveness of cooperative learning towards the mastery of skills in solving Mathematics problems. This research supports that cooperative learning brings significant positive effects towards student achievement in understanding how to solve problems as compared to conventional learning.

Other than that, a research by Institute of Education Sciences (2010) [11] was related to Cooperative Integrated Reading and Composition (CIRC) learning towards students' ability to reading comprehension and writing. The findings of the research showed that there is a significant relationship between the CIRC method application in learning. This research is parallel with a research by McGlaughin, Knoop and Holiday (2005) [18]. In this research, it was discovered that task memory, Mathematics fluency, reading comprehension and weakness in nonverbal ability were the main causes of difficulties in learning Mathemtics among the students. The findings of the reaseach showed that cooperative learning application can increase students' ability in Mathematics concept comprehension and other needed skills.

Another research by Agus Alim, St. Y. Slamet and Mg. Dwijiastuti (2014) [1] was related to the influence of STAD cooperative learning towards students' comprehension on the concept of fraction in se-Kecamatan Colomadu. Overall, the research had proved that STAD cooperative learning was more effective in Mathematics fraction concept comprehension compared to direct learning.

Based on all the stated researches above, it is clear that cooperative learning can bring positive effects on the mastery of students' Mathematics comprehension. In this research, the research attempts to determine the effectiveness of using STAD cooperative learning technique towards students in primary schools in Sarikei District, Sarawak in Mathematics subject.

Methodology

This research is implemented with quantitative approach. The subjects of this research are seventy Year Five students in a primary school in Sarikei, Sarawak. 35 students are in the experimental group while 35 students are in the control group. Experimental group are exposed to STAD cooperative learning, while the control group is given the traditional teaching method. The teacher who implemented the STAD cooperative learning underwent training on the use of cooperative learning in order to ensure that it would be implemented as planned. Upon completion of instruction, post-tests are to be conducted to determine the difference between the groups. Instruments used in this study are the mathematics comprehension tests which is measured using performance test tools. The test consists of ten items of open-ended questions cover the syllabus of fraction in year five and adapted from Prmary School Assessment Test. The reliability coefficient of the test was found to be 0.81. The researcher in collaboration with the mathematics teachers have developed the questions. The content of the tests is validated by a group of experts in mathematics education. This test is given to both groups before and after instruction is completed. Data gathering is done twice – pre-test and post-test. The time duration for this research is four weeks. The data is analysed using mixed between-within subjects ANOVA.

Findings

Analysis of STAD Technique Cooperative Learning based on Student Comprehension in Mathematics

H_0: There is no significant difference between STAD cooperative learning with student comprehension in Mathematics.

Descriptive Statistics

Table 1.1 shows that the score of Mathematics comprehension test in experimental group and control group. The mean score for pre-test shows that the experiemental group (mean = 8.17, SD = 3.38) and control group (mean = 8.37, SD = 3.21) have similar mean score in Levene's test. The mean score is similar and there is no significant difference. The test results from post-test show that the findings from the experimental group (mean = 14.23, SD = 3.28) is higher than the findings in the control group (mean = 12.31, SD = 3.32). This shows that the experimental group has shown higher implication in comparison to the control group.

Table 1.1: Mathematics Comprehension Test for the Experimental and the Control Group

Mathematics Achievement Test	Experimental Group			Control Group		
	N	*Mean*	*SD*	*N*	*Mean*	*SD*
Pretest	35	8.17	3.38	35	8.37	3.21
Posttest	35	14.23	3.28	35	12.31	3.32

The Assumption of Homogeneity of Variance for the Experimental Group and the Control Group

Table 1.2 shows that Levene's test is not significant (p>.05) in the pretest for the experimental group and the control group. The result from Levene's test shows that the assumption of equal variances in the pretest for the experimental group and the control group is the same.

Table 1.2: Levene's Test Results for the Experimental Group and the Control Group

	Experimental Group		Control Group	
	F	*Sig.*	*F*	Sig.
Equal variances assumed	0.000	0.987	0.409	0.524
Equal variances not assumed				

Next, Table 1.3 shows the resulf for Box's Test of Equality of Covariance Matrices is not significant (p>.05). The results from Levene's Test and Equality of Covariance Matrices have fulfilled the assumption of homogeneity of variance for the experimental group and the control group and are the same.

Table 1.3: Box's Test of Equality of Covariance Matrices

	Results
Box's M	3.625
F	1.189
dk_1	3
dk_2	3427920.000
Sig. (p)	.312

Interaction Effect

Before looking at the main effect of the test, first, one should know the effect of interaction. Table 1.4 shows that the test result for multivariant has shown the interaction effect between factor 1 and group. The interaction effect shows a significant result (*wilks'Lambda* = 0.983, $p<.05$). This shows that there are interaction effects between experimental group and control group on Mathematic comprehension test. The interaction effect in the experimental group is disordinal interaction type because STAD techniques cooperative teaching can improve Mathematics comprehension and this relationship is positive (pre to post).

Main Effect

Table 1.4 also shows factor 1 in Mathematics achievement in the pretest and the posttest is significant (*wilks' Lambda* = 0.091, $p<.05$). This result shows that STAD cooperative method has an impact towards improvement in Mathematics comprehension for students in the experimental group. Although there is a significant difference in Mathematic comprehension between experimental group and control group, the result of the study is ascertained by obtaining the size effect from partial eta squared test. It is discovered that the result for size effect is big (λ=0.909) according to Cohen (1988).

Table 1.4: Multivariate Test for Experimental Group and Control Group

Effect		Score	F	Df	Error df	P	Λ
Factor 1	Pillai's Trace	.909	684.024[a]	2.000	137.000	.000	.909
	Wilks' Lambda	.091	616.024[a]	2.000	137.000	.000	.909
	Hotelling's Trace	9.986	616.024[a]	2.000	137.000	.000	.909
	Roy's Largest Root	9.986	616.024[a]	2.000	137.000	.000	.909
Factor 1	Pillai's Trace	.017	1.159[a]	2.000	137.000	.317	.017
Group	Wilks' Lambda	.983	1.159[a]	2.000	137.000	.317	.017
	Hotelling's Trace	.017	1.159[a]	2.000	137.000	.317	.017
	Roy's Largest Root	.017	1.159[a]	2.000	137.000	.317	.017

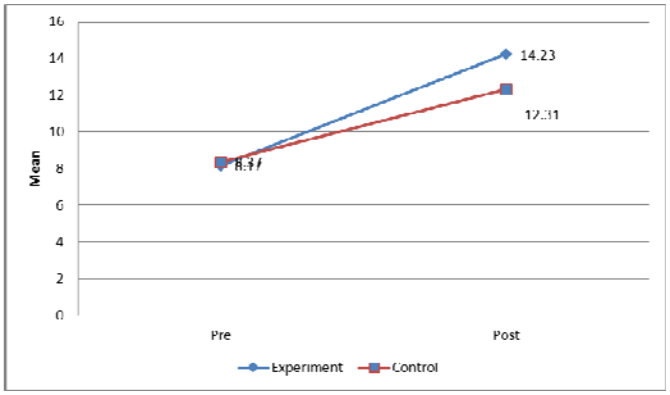
Between-subjects effects

The outcome from the analysis on between-subjects effects in Table 1.5 has shown that Mathematics comprehension in the pretest and posttest is significant ($p<.05$). This matter clearly shows that there is a significant difference in the main effect in Mathematics comprehension for the experimental group and the control group. The effects between control subject show large size (λ = 0.872) that supports the signifianct results of this study.

Table 1.5: Between-subjects effects for Experimental Group and Control Group

	Total Power of Two	Df	Mean Power of Two	F	P	λ
Intercept	16243.314	1	16243.314	935.952	.000	.872
Group	25.714	1	25.714	1.482	.226	.011
Error	2394.971	138	17.355			

The data was analysed using mixed between-within subjects ANOVA method. There are interaction effects between the experimental group and the control group towards Mathematics Comprehension Test is significant (*wilks' Lambda* = 0.091, $p<.05$), and the main effect of Mathematic comprehension in the pretest and posttest is significant (*wilks' Lambda* = 0.983, $p<.05$). The main effect of Mathematic comprehension results towards the experimental group and the control group is also significant. (F=935.592, $p<.05$, λ=0.872). Picture 1.1 shows the mean score for pretest – the experimental group (mean=8.17) and the control group (mean=8.37) assumed the same based on Levene's Test. The mean score results for Mathematics Comprehension Test in the posttest for the experimental group (mean=14.23) outperform the control group (mean=12.31). This shows that there are significant differences in the Mathematic Comprehension Test results for students in the experimental group for both pretest and posttest.



Picture 1.1: Mean Score Profile on Mathematics Understanding by Experimental Group and Control Group

Discussion

The results of this study appear to be parallel with the other findings of several studies that have been done before. This study found out that STAD cooperative learning technique is

effective to understand mathematics. The score mean of understanding mathematics using STAD cooperative learning technique is higher than conventional learning.

This findings are parallel to previous research by Graceful and Raheem (2011) [9] who did a study on the effectiveness of Think-Pair-Share (TPS) and Reciprocal Teaching (RT) cooperative learning methods on students' achievement in Mathematics comprehension. The research had discovered that RT learning technique is the most effective method in the application of Mathematics comprehension on students' achievement, followed by TPS cooperative learning method.

Meanwhile findings also showed that conventional learning method is the least effective for Mathematics comprehension among the students. Besides that, students can exchange information and do discussion in group while incorporating STAD cooperative learning methods in their classroom. In addition, students also help each other and share opinions among themselves, get instant feedback on matters during discussion and can encourage as well as support each other's while in groups. These discussions encourage students to interact and communicate with each other in groups as well as to encourage students to explain ways and methods of Mathematics ideas in languages and students' own words during the process of Mathematics comprehension learning.

This kind of situation is similar with a study by Charalampos (2004) [5]. In the study, it found out that student's participation in cooperative learning encouraged them to understand the mathematics concepts. In addition, this particular type of cooperative learning can also motivate students to learn and participate in understanding mathematics together. These findings are also consistent with studies conducted by Tanner and Marr (1997) [27]; Slavin (1997) [23] and Whicker (1997) [29]. Their findings show that students gain the ability to think, gain problem solving and interaction skills when participating in cooperative learning methods. Moreover, results also showed that there is better understanding in mathematics concepts during discussion and sharing within groups. Students tend to think before solving mathematics task and would be able to provide logical explanations with other members in the group.

These findings are also supported by a study by Linda (2004) [16] on incorporating Jigsaw cooperative learning methods in understanding Science concepts. The findings found that teaching using Jigsaw cooperative technique led to higher comprehension compared to conventional learning.

Conclision

The results reveal that cooperative learning can increase mathematics comprehension. Cooperative learning also enhances understanding and self-confidence. These results would imply that incorporating cooperative learning in the mathematics classroom would enchance the learning of mathematics in primary school. Implementation of STAD cooperative learning should be reviewed in terms of knowledge and skills of each teacher. In this case, training and continuous professional development is needed for teahers, and collabration among teachers should be encouraged through holding regular meetings, both formal and informal. Teachers can learn from each other and can examine the strengths and weaknesses of the instruction that has been implemented, and their experience can be shared with each other to produce better work. Besides, findings of this cooperative learning study should be disseminated to all schools in Malaysia to encourage other teacher th consider the instructional approach. A staff development program should focus on the needs of the teachers. Needs analysis study should be done before running any courses. The courses should be hands-on and the rationale for using cooperative learning in schools setting. Although cooperative learning cannot cure all the problems faced by teachers in teaching and learning in mathematics, it may serve as an alternative to traditional method of teaching.

References

1. Agus Alim, St. Y Slamet, Dwijiastuti MG. Pengaruh Pembelajaran Kooperatif Tipe STAD Terhadap Pemahaman Konsep Pecahan. Universitas Sebelas Maret, Surakarta, 2014.
2. Ali M. Madrasah mulai Sejajar dengan Sekolah, 2010. http://www.depag.go.id/index.php/a=detilberita &id=5520
3. Ansari BI. Menumbuhkembangkan Kemampuan Pemahaman dan Komunikasi Matematis Siswa SMU melalui Strategi Think-Talk-Write. PPS UPI Bandung: tidak dipublikasikan, 2004.
4. Balkcom S. Cooperative learning, 2005. http://www.ed.gov/pubs/OR/ConsumerGuides/cooplear.html.
5. Charalampos T. Cooperative study teams in mathematics classrooms. Int. j. math. Educ. sci. Technol. 2004; 35(5):669-679.
6. Effandi Zakaria. Asas Pembelajaran Koperatif Dalam Matematik. Shan Alam: Karisma Publications Sdn Bhd, 2005.
7. Elizabeth A van Es, Conroy J. Using the Performance assessment for California Teacher to Axamine pre-Service Teacher' Conceptions of Teaching Mathematicss For Understanding. Issues in Teacher Education. University of California, Irvine, 2009.
8. Ernawati. Meningkatkan Krmampuan Pemahaman Konsep Matematika Siswa SMU melalui Pembelajaran Berbasis Masalah. Skripsi. Jurusan Pendidikan Matematika FMIPA UPI. Tidak dipublikasikan, 2003.
9. Graceful O, Raheem AL. Cooperative Instructional Strategies and Performance Levels of Students in Reading Comprehension. Int J Edu Sci, 2011; 3(2):103-107.
10. Gunter Mary Alice, Thomas Ester H. Jan Schwab. Instruction A Models Approach. USA: Allyn and Bacon, 1995.
11. Institude of Education Sciences. WWC Intervention Report, Cooperative Integrated Reading and Composition, 2010.
12. Johnson DW, Johnson RT. Cooperative learning and social interdependence theory. Social Psyhological Applications to Social Issues, 1998. http://www..clcrc.com/pages/SIT.html.
13. Johnson RT, Johnson DW, Holubee EJ. Structuring Cooperative Learning: Lesso Plans for Teacher. Edina. Minesota: Interaction Book Company, 1987.
14. Kariadinata R. Peningkatan Pemahaman dan Kemampuan Analagi Matematika Siswa SMU melalui Pembelajaran Koperatif. Tesis PPS UPI Bandung: Tidak diterbitkan, 2001.

15. Kementerian Pengajian Tinggi Malaysia. Modul pembangunan kemahiran insaniah (soft skills) untuk institusi pengajian tinggi Malaysia. Putrajaya, 2006.
16. Linda TM. Satu Kajian Keberkesanan Pembelajaran Koperatif (Kaedah Jigsaw) Dalam Matapelajaran Sains Tingkatan Empat Di Daerah Sibu, Sarawak. Universiti Teknologi Malaysia: Tesis Sarjana Muda, 2004.
17. Matlin MW. Cognition. State University of New York, Genesco, 1994.
18. McGlauglin, Knoop, Holiday. Differentiating Students With Mathematics Difficulty In College: Mathematics Disabilities vs. No Diagnosis. University of Missouri-Columbia, 2005.
19. Norasyidkin Ithnin. Hubungan di antara Jantina dan Gaya Pembelajaran Terhadap Pencapaian Murid Dalam Mata Pelajaran Matematik. Universiti Teknologi Malaysia, 2011.
20. Rahil HJ Mahyuddin, Sharifah Md Nor. Pembelajaran Koperatif Sebagai Alternatif Kepada Amalan Pengelompokan Kini. Pendidik Profesional. Jurnal Penyatuan Pegawai-pegawai Kanan Perkhimatan Pendidikan Malaysia. Bil 1, Jild 1, 1993.
21. Siegel C. Implementing a research-based model of cooperative learning. The Journal of Educational Research, 2005; 98(6):339-349.
22. Slavin RE. Cooperative Learning Theory, Research, and Practice. Second Edition. America: Allyn and Bacon, 1995
23. Slavin RE. When Does Cooperative Learning Increase Students Achievement? In Reading in Cooperative Learning for Undergraduate Mathematics. Dubinsky and D. Mathews (Eds), Washington DC: The Mathematical Association of America, 1997.
24. Slavin RE. Instruction Based on Cooperative Learning. In R. E. Mayer & P. A. Alexander (Eds), Handbook of Research on Learning and Instruction. New York:Taylor & Francis, 2011, 344-360.
25. Slavin RE, Madden NA, Stevens RJ. Cooperative Learning Models for the 3 R's. Educational Leadership, 1989/1990; 47(4):22-28.
26. Suherman E dkk. Strategi Pembelajaran Matematika Kontemporer. Bandung: JICA-UPI, 2001.
27. Tanner K, Marr MB. Cooperative Learning: Brief Review, Reading and Writing Quarterly: Overcoming, Learning Difficulties, 1997; 13:7-20.
28. The National Council of Teachers of Mathematics. Principles and Standards for Schools Mathematics. Reston, VA: NCTM, 2006.
29. Whicker KM. Bol L, Nunnery JA. Cooperative in the Secondary Mathematics Classroom. J Educat Res. 1997; 91:42-48.