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Teams-achievement division (STAD) cooperative learning on mathematics attitudes among secondary school students

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Abstract
This study aims to investigate the effects of Student Teams-Achievement Division (STAD) cooperative learning on Mathematics attitudes in Sarikei, Sarawak. The subject of this study involves 70 Year Five students. A total of 35 students were involved in the experimental group (20 males & 15 females) and 35 students were involved in the control group (19 males & 16 females). Data collection was conducted two times in the pretest and posttest that lasted for four weeks each after pretest. Mathematics attitude was measured using 19 items adapted from Arsaythamby and Rosna Awang Hashim (2009). Data were analyzed using *mixed between-within-subjects* ANOVA. The findings shown that the use of STAD techniques in Mathematics learning can increase Mathematic attitude among school students. Additionally, this study has its main and interaction effects in attitude in post-test between the experimental and control groups. This suggests that STAD cooperative learning plays an active pedagogical role to improve Mathematic attitude among the students. STAD cooperative learning increases interest, motivation and Mathematics knowledge sharing among students as compared with conventional learning. Using STAD in the classroom shows that student-student and student-teacher interaction is strengthened. STAD encourages students and teachers to be innovative and creative in improving the teaching and learning of Mathematics in the classroom and this can be advantageous for Sarikei students to compete with town area students' in Mathematics.

Keywords: Attitude, Cooperative STAD

Introduction

Malaysia needs to produce more experts in the field of Science and Technology whom plays a crucial role that contributes and strives for progress of our nation towards a develop country in the 21st century. Therefore, schools play an important role in realizing the vision of the Ministry of Education, Malaysia in order to achieve the ratio of 60:40 for Science and Art stream (KPM, 2014). In addition to that, it is also the wish of the Ministry to form citizen hood with good social skill, responsible and with demeanour that practise the culture of Science and Technology and able to comprehend and overcome the issues and problems with a more rational thought.

In the National Key Result Area (NKRA) of education, the government will focus on four sub-NKRAs in order to broaden the access to a more quality and capable education. One of the sub-NKRA is Literacy and Numeracy where every child needs to master the basic skill of literacy and numeracy after following three years of level 1 in primary education at the end of year 2012. At the same time, LINUS Programme *(Literacy and Numeracy Screening)* is executed by the Ministry of Education, Malaysia. This programme is a remedial programme created to ensure that the students can master the basic skills of literacy and numeracy after a three-year education for level 1. LINUS also focuses on students with reading, writing and calculating difficulties (PPPM, 2013-2025) [11]. Hence, as an educator, we need to continue the effort of our government when the students enter the level 2 (Year 4), so that the performance of the students can be sustained by planning suitable and effective strategies in teaching Mathematic.

Through the effort of the Ministry, the identified students with Mathematic learning difficulties are given another chance to attend the remedial class conducted by a remedial teacher. Students who enter the level 2 will no longer be able to take part in this programme. Thus, teachers of level 2 need to plan more specific lessons to maintain or improve the students' performance so that they are able to keep up with the curriculum.

This particular situation were not solved and brought forward to secondary school. It causes the students to be dispirited, low interest and motivation to learn. The issues in secondary school increase due to unsolved problems occurred during primary school. (Shamsudin, Jamil dan Siti Rahayah, 2010) [18].

Teachers play an important role in ensuring the achievement of the mission of the education. Therefore, teachers need to put more effort to be aware, to commit oneself and to have high enthusiasm in carrying out the initiative and approach as well as to take the challenges throughout the profession including the alteration of teachers' function and role. The role of a teacher as the main source of knowledge for students had changed to teacher as a facilitator in learning process, transformation agent and a source of inspiration for the students. Teachers need to be creative and innovative at all time to make the deliverance of teaching and learning more effective, interesting and fun. (Ministry of Education, Malaysia, 2006) [12].

In the effort of realizing the vision of our nation, teachers must be quick and dynamic in motion in order to confront the challenges of the new world of education and to place the

status of Malaysia's education at the level of the First World. These challenges must be bear by all parties as the borderless of global economy requires all the citizens with high knowledge, discipline and commitment.

The culture of knowledge is the catalyst of progress for a race and in order to accomplish the glory of a nation, people must show appreciation of it starting from schools. In this context, teachers are the first and foremost to enliven the culture and outstanding of knowledge (PPPM 2013-2025) [11].

Learning process involves the mastering of concept, understanding information, gaining knowledge and recalling information learned, henceforth the application of knowledge in daily live. (Hargreaves, 1996) [9]. Learning process involves the effort of mastering skills and knowledge henceforth shapes the attitude. Learning process is a way of a person to find, save and use the knowledge obtained. (Feider & Henriques, 1995) [8]. Hence learning is an effort of an individual student to obtain knowledge and skills.

Humans are born with different potential and abilities which develop throughout the life by learning and experiencing. Ways and learning methods of a student are also a factor to build up the potential and abilities. Therefore the result of the research proves that if the ways and methods of learning are based on a student's interest, it will definitely influence the achievement of his or her studies and an increment of positive attitude towards every subject. (Norasyidkin, 2011) [15].

Cooperative learning is an approach of teaching introduced at schools in America at the early year of 1800. Colonel Francis Parker who was invited by Quincy Education Committee, Massachusetts is the pioneer of the cooperative learning in order to develop the unorganized school education system. Parker had introduced and developed the 'Quincy Plan' based on the learning of students and carrying out group activities with learning responsibilities towards the members of the group. (Melihan dan Sirri, 2011) [13].

Cooperative learning is a student-centered method which manages the group activities in the classroom according to certain procedures (Johnson & Johnson, 2005). Cooperative learning is heading towards a teaching method where students cooperate in a small group and help one another during the learning process (Johnson & Johnson, 2008). It encourages the students to interact actively and positively in a group. It enables the change of ideas and to identify the ideas of oneself in an unthreatened condition, suitable with the philosophy of constructivism (Tran & Lewis, 2012) [24]. *Student Teams-Achievement Division (STAD*) is one of the cooperative learning. The process of cooperative teaching and learning developed by Slavin is a learning method that unites the learning group to increase the achievement of Mathematic in the comprehension of concept and communication. (Melvin & Silberman, 2006) [14].

Student Teams-Achievement Division (STAD) cooperative learning is the easiest, most popular and most used in the learning cooperative (Slavin, 2011) [19]. Slavin had proposed the *STAD* technique as the best module for teachers using the cooperative approach in the classroom. *STAD* consists of four main activities which are teacher's performance and deliverance, cooperation in group, test or quiz and group recognition. In execution of the *STAD,* teacher needs to explain to the students about the flow of an activity, why this technique is used and what is the learning objective that needs to be achieved (Slavin, 2011) [19]. Therefore, students are assigned to work in a heterogeneous group consists of five people and they are encouraged to help others to master the learning content. After carrying out the activity, every group member will sit for test or quiz individually. The addition of every member's marks will be the group's marks. Students must help and encourage one another if they wanted to be recognised or rewarded. (Effandi Zakaria, 2005) [7].

Mathematic is the best medium to expand the proficiency of one's intellect in making logical thinking, space visualizing, analysis and abstract thinking. Students expand the skills of numeracy, thinking, way of thinking and solving problems through Mathematical learning and application. Mathematical learning gives opportunities to the students to carry out a creative task and feel the joy and excitement when they learned something new. The experience increases their interest in learning Mathematic outside the class and at the higher level of education. (KPM, 2014).

The aim of Kurikulum Standard Sekolah Rendah (KSSR) for Mathematic subject is to build the pupils' comprehending of the concept of numbers, basic skills of calculating and to understand the simple idea of Mathematic as well as to apply knowledge and skills of Mathematic effectively and responsibly in daily lives. The process of teaching and learning Mathematic gives the priority to master the knowledge and understanding which enables the students to apply the Mathematical concept, principle and process. The emphasis to the aspect of students' mathematically developed thinking was built and developed through the process of teaching and learning in the class based on the principles of solving problems, communication, thinking, relating, making representative and the usage of technology in Mathematic (KPM, 2014).

The attitude of Mathematic also influences the students' academic achievement. Negative attitude towards the Mathematic subject, indirectly influences students' achievements in Mathematic (Scott & Curtis, 2009; Zainudin & Ibrahim, 2009; Tran & Lewis, 2012) [17, 23, 24]. Attitude is the evaluation based on the discussion of an object, situation and concept. (Kamus Dewan, 1996) [10]. According to Arsaythamby dan Sitie Chairhany (2012) [3], attitude is an effective element in the effort to increase students' achievement in Mathematic and plays a fundamental role to help increase the performance of the students in Mathematic.

Methodology

This research is implemented with quantitative approach. The subjects of this research are seventy-five Year Five students in a primary school in Sarikei, Sarawak. 35 students acted as experimental group and another 35 students acted as control group. Data gathering is done twice – pre-test and post-test. The time duration for this research is four weeks. Mathematics attitude was measured using 19 items adapted from Arsaythamby and Rosna Awang Hashim (2009). The data is analysed using mixed between-within subjects ANOVA.

Findings

STAD Cooperative learning with student's mathematics attitude analysis

H_0: There is no significant difference between STAD cooperative learning with student's Mathematics attitude.

Descriptive Statistic

Table 1 shows the results of the experimental and control groups in mathematics attitude. The findings of pre-test mean scores for both the experimental (mean = 58.46, SD = 7.88) and control (mean = 58.20, SD = 7.84) groups showed similar means values based on Levene's test. This shows no significant difference in mean scores for the both groups. The findings of the Post Test mean score for mathematics attitude in the experimental group were higher than the control group.

Table 1: Experiment and control group mathematics attitudes test

Mathematic Attitude Test	Experimental Group			Control Group		
	N	Mean	SD	N	Mean	SD
Pre	35	58.46	7.88	35	58.20	7.84
Post	35	64.00	7.20	35	58.00	7.89

The assumption of homogeneity of variance for the experimental group and the control group

Table 2 shows the Levene's test was not significant (P >.05) in both pre and posttest for the experimental and control groups. Results of the Levene's test shows that the assumption of the equality of variance in pre and Post Test for the experimental and control groups are the same.

Table 2: Levene's Test Results for the Experimental and Control Group

	Experimental Group		Control Group	
	F	Sig.	F	Sig.
Equal variance assumed	0.657	0.420	0.006	0.937
Equal variance not assumed				

Next, table 3 shows the result of Box's Test of Equality of Covariance Matrices is not significant (p >.05). Results from Levene's test and Equality of Covariance Matrices have met the assumption of homogeneity of variance for the experimental and control groups are the same.

Table 3: Box's Test of Equality of Covariance Matrices

	Results
Box's M	5.042
F	1.654
dk_1	3
dk_2	3427920.000
Sig. (p)	.175

Interaction Effects

Table 1.4 shows the results of multivariate testing that shows the effect of the interaction between factors 1 and groups. The effect of interaction showed significant results (*Wilks's Lambda* = 0.960, p <.05). This shows there is an interaction effect between experimental and control groups to test the attitude of mathematics. The interaction effect in the experimental group is disordinal interaction type because STAD techniques cooperative teaching can improve Mathematics attitudes and this relationship is positive (pre to post).

Main Effects

Table 4 shows mathematics attitude factor 1 in pre and Post Test was significant (Wilks' Lambda = 0.016, p <.05). These findings demonstrate STAD Cooperative method increased the mathematics attitudes of the students in the experimental group. Although there were significant differences of mathematics attitude between the experimental and control groups, size of effects must be obtained from a partial eta squared test that been conducted. According to Cohen (1998), the result of the test shows the size of effects is large (λ=0.984).

Table 4: Tests for Multivariate Experimental and Control Group

Effects		Score	F	Df	Df error	P	λ
Factor 1	Pillai's Trace	.984	4191.852[a]	2.000	137.000	.000	.984
	Wilks' Lambda	.016	4191.852[a]	2.000	137.000	.000	.984
	Hotelling's Trace	61.195	4191.852[a]	2.000	137.000	.000	.984
	Roy's Largest Root	61.195	4191.852[a]	2.000	137.000	.000	.984
Factor 1 Group	Pillai's Trace	.040	2.824[a]	2.000	137.000	.043	.040
	Wilks' Lambda	.960	2.824[a]	2.000	137.000	.043	.040
	Hotelling's Trace	.041	2.824[a]	2.000	137.000	.043	.040
	Roy's Largest Root	.041	2.824[a]	2.000	137.000	.043	.040

Effect between Subjects

The results in Table 5 shows the pre and post for Mathematics attitude was significant (p <.05). This suggests there are significant differences in the main effect of the attitude of Mathematics for the experimental and control groups. Effects of control subjects showed the effect size (λ = 0.983) support the significant research results.

Table 5: The effects of subject for the experienmental dan control group

	Total Power of Two	df	Mean square	F	p	λ
Intercept	498375.779	1	498375.779	8035.837	.000	.983
Groups	342.579	1	342.579	5.524	.020	.038
Error	8558.643	138	62.019			

Data were analyzed using ANOVA mixed between-within subjects reveled an interaction effect between the experimental and control group attitude of Mathematics was significant (*wilks' Lambda* = 0.016, p < 0.05) and the main effect of the Attitude of Mathematics was significant (*wilks' Lambda* = 0.960, p < 0.05). Results of the main effects of Mathematics

Attitude of the experimental and control groups was also significant F = 8035.837, p <.05, λ = 0.983.

Figure 1 shows the mean scores of pre experimental group (mean=58.46) and control group (mean=58.20) test assumed to be equal based on Levene's test. The results showed mean score for mathematics attitude post experimental group (mean=64.00) test was higher than the control group (mean=58.00) test, which shows there is a significant impact on the attitude of Mathematics test from both pre and posttest of the experimental group.

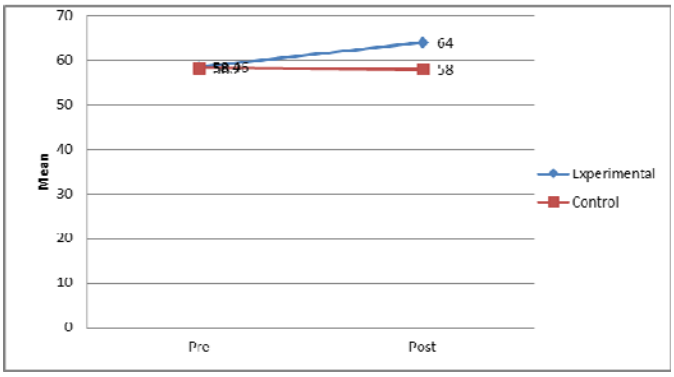

Fig 1: Profile mean score attitudes towards Mathematics experimental and control group

Discussion

The findings showed the impact of STAD cooperative learning in the students' mathematics attitudes. Results showed from the mean score of Mathematics attitude of STAD cooperative learning is higher compared to conventional learning. Findings also showed increased pupils interaction when pupils carry out the group activities. These activities encourage more fun and meaningful learning environment thus helps to develop the pupil's cognitive. From interviews with the participants of the study, five pupils have indicated that they are excited with learning in groups. Implementation of group's activities can embed positive attitudes towards mathematics. Kagan (1992) supports this study by stated cooperative learning encourages students to interact with each other enables them to arrange their thinking such as summarizes, elaborate and give examples. Cognitive restructuring can help to increase higher thinking skills.

The findings also the same with study conducted by Briana (2010) [5] and Arsaythamby and Sitie Chairhany (2012) [3] stated the cooperative learning have positive effects on mathematics attitude of the pupils. When this kind of learning occurs, discussion in groups provided more opportunities for students to speak, act actively and work together to solve mathematics problem. A study conducted by Abdul Rahim (1999) [1] also stated ability to think, work together, discussion in groups and positive attitude of teachers was demonstrated during the process of teaching and learning while motivated students to achieve more success in their learning. Akinsola (2007) [2]. And Cara Flynn (2013) [6]. Also stated cooperative learning can increase pupil's mathematics attitude because the role the teachers played as a facilitator and motivator to the pupil's academic performance.

Besides that, cooperative learning can be a domain in promoting a positive attitude towards learning mathematics. In a study conducted by Whicker, Bold and Nunnery (1997), cooperative learning improves the social skills of the students. Obtaining this skills enable the students to share their ideas and information during the learning process. Similarly, Barnero (2000) [4]. Found that students who learn mathematics can became frustrated while learning mathematics individually but increases their self-confidents when given opportunity to learn in groups. According to Supian (2009) [21], STAD cooperative learning is a strategy based on constructivism approach of teaching and learning. Through students- based activities, STAD cooperative learning can incorporate self-feelings and be applied in the real world, synthesis and discussion ongoing in the process of teaching and learning. Rationally this differs to learning process that only focuses on facts that can lead to boredom because students only learn, remember and apply (Spence, 2010) [20].

This study showed pupils found it easier to interact and discussed when solving problems while learning. This same as the research conducted by Woolfook (1995) [22] and Savin-Baden (2010) [16] which asserts more interaction between students when involved in problems solving activities compare to their teachers.

Conclusion

Cooperative learning STAD advanced the affective growth of a sample of Sarikei, Sarawak primary students because it provided an interactive approach for learning. The study claims that the frequent reciprocal interaction among participants in the treatment group stimulated and enhanced positive attitudes toward learning. This research supported the findings of previous studies from difference cultures, and claims that cooperative learning STAD is an effective teaching approach. In this research, the effectiveness of cooperating learning STAD on students is compatible with the requirements of teaching innovation in Sarikei, Sarawak. The findings also provide Sarikei's teachers with more empirical support for promoting productive changes in teaching methods to improve student learning and their attitudes toward learning. Therefore, cooperating learning STAD in highly recommended as an alternative instructional pedagogy in the current wave of educational reform in Sarikei's school, especially in relation to the aim of making the learning enviroment more stimulating for students. In order to identify radical changes in students'attitudes, a more prolonged and extensive be needed. The attitudes of students towards cooperative learning STAD can be detected not only by means of questionaires but also by means of observations and interviews to achieve more conclusive findings. As only a few research studies have investigated the effectiveness of cooperative learning in Sarawak primary school. The findings of this study are not sufficient to decide on the optimal use of cooperative learning at this level of education in Sarawak. Thus, a series of further studies on cooperative learning at the primary levels of Sarawak education should be conducted.

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