



INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT



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To Link this Article: <http://dx.doi.org/10.6007/IJARPED/v6-i2/2934>

DOI: 10.6007/IJARPED/v6-i2/2934

Received: 12 April 2017, Revised: 16 May 2017, Accepted: 27 May 2017

Published Online: 24 June 2017

In-Text Citation: (Khun-Inkeeree et al., 2017)

To Cite this Article: Khun-Inkeeree, H., Omar-Fauzee, M. S., & Othman, M. K. H. (2017). The Effect of Students Confidence Level toward Mathematics Performance among Southern Thailand Primary School Children. *International Journal of Academic Research in Progressive Education and Development*, 6(2), 23–37.

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Vol. 6(2) 2017, Pg. 23 - 37

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www.hrmars.com

ISSN: 2226-6348

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Abstract

This study investigates the relationship between self-confidence and mathematic achievement among students on grad 6th in Southern Thailand. This study conducted by quasi-experimental research design used cooperative learning by STAD technique. A sample of 72 primary school students (36 treatment group; 36 control group) was employed for this intervention study. The attitude toward mathematic inventory (ATMI) was employed over 15 weeks. The result found that cooperative learning by STAD technique improving students' self- confidence in mathematic class. The student's studies in a small group have to interact with each other in the group and each member has their role to play in the group to improve their social interaction.

Keywords: Self-Confidence, The STAD Technique, Cooperative Learning, Southern Thailand.

Introduction

There is a common perception that mathematics is a very difficult subject. As much as possible students tend to avoid taking mathematic courses. Avoiding mathematic courses severely restricts the fields from certain student, while students that study mathematic can easily find a job. However, many people have realised the importance of mathematics, not only from the point of view of getting an academic qualification at school or college but is also a subject that prepares one for the future as well, irrespective of which walk of life one chooses to be a part of (Espinosa et al., 2016). Therefore, students have to perform their full potential towards mathematics courses in their school and beyond.

Over the past decades, Thailand has faced alarming rates of underachievement in mathematics among students of all ages (Shaikh, 2013). According to Thailand ranks failing in Programmed for International Student Assessment (Pisa, 2016). The result of PISA test on 2015 shows Thai students' scores sharp falls in mathematics (Armstrong & Laksana, 2016). Thai students are underperforming their peers in several Asian countries as their scores were below the

international average in mathematic subjects (Mala, 2016). The mathematic outcome is lower than mean scores, Thailand got 415 scores from mean scores of 490, and it was ranked the 54th out of a total of 70 countries (Pholphirul, 2016). Therefore, mathematics is a subject included in the international test and the compulsory in education in every country. Thus, Thailand has to improve mathematic performance, absolutely Thailand Ministry of Education need semantic research to rectify situation.

Mann et al (2017) mentioned that mathematics is the cradle of all creations, without which the world cannot move an inch. Therefore, we can say mathematics is an important discipline, especially in the formal education system as it develops cognitive of the students that could help them for their future field of work. On the other hand, Anderson (2013) stated that low mathematic achievements in many areas are now the concern for all academic and government institutions. Alzhanova-Ericsson et al (2017) mentioned that the students' achievement in mathematic very poor, it may be a lack of practice, teaching methods, teaching facilities such as game, computer or instructional media. However, the teacher quality and teaching methods became a national priority in addressing the quality of education learners receive (Mann et al., 2017). Therefore, it can be seen that mathematic is necessary to learn to apply in daily life and precious to national development.

Thailand had many factor effect of mathematic performance. Thien et al (2015) stated that Thai students may the most anxiety-provoking subject taught in a classroom and the effective is often referred to students' emotions or feelings towards mathematics. According to Khun-Inkeeree, Omar-Fauzee, and Othman (2016) found the insignificant positive relationship between self-confidence and value in mathematic achievement. Furthermore, Zan, and Di Martino (2014) mentioned that if the self-confidence toward mathematics is low it will defeat the purpose of learning in mathematics. Thus, self-confidence toward mathematic was an important part to successes in mathematics achievement. In addition, Belin (2016) had suggested that attitude is also will further enhance students' performance throughout their schooling and will able to boost student's self-confidence, values, enjoyment and motivation to learn. Therefore, developing student's self-confidence may enhance student mathematics' achievement. However, Shaikh (2013) confirmed that students' mathematic confidence probably learned from their own parents or elementary school teachers who also felt incompetent when it came to working with numbers. This is agreed by Das, Das and Kashyap (2016) mentioned that parents and schools are facing problem in terms of the performance of students in mathematics as it considered low. If the student's self-confidence towards mathematics is low, it makes it difficult to the student, they will find it boring and not interesting that may affect their mathematic performance. Thus, the positive attitudes among students towards mathematics will improve students' outcome that confirmed by Akinbobola (2009); Brookstein et al (2014); Mata et al (2012); Tran (2014) have been conducted on the relationship between attitude, achievements and performance of students in mathematic., the relationship between these variables are significant

The Thailand Ministry of Education had stated that studying mathematics plays a very important role in developing human thinking to be more creative, reasonable, and able to analyse problems

and to forecast the future. On the other hand, Prakitipong and Nakamura (2006) mentioned that Thai education had been emphasising the textbooks and its memorization rather than nurturing critical analysis. This trend is thought to obstruct students to develop mathematical skills. Shaikh (2013) also reported that Thai education process in school has centred on memorising textbook materials rather than developing self-learning abilities. Sangpom et al (2016) mentioned that the examination relies mostly on memorization of knowledge, and those results in drawbacks like students' low capability in thinking, analysing, synthesising, innovating, and problem-solving. Perhaps one of the reasons why so many lack confidences in mathematic is a failure to recognise that mathematic is about finding real solutions to real problems. All too often, we can perceive something to be a mathematical problem and then seek to apply some half-remembered process.

However, Thai students had low attitudes towards mathematics (Nenthien & Loimanda, 2016). This due to lack of self-confidence to learn, they don't understand the value in mathematics, the teacher is unable to motivate the student to learn or some problem of communication between teacher and student in mathematics class. Hence, teaching method, teaching the material and classroom management are crucial factors to successfully to learn mathematics (Fax & Murray, 2004).

Moreover, different approaches in teaching have been tried by many schools especially in Thailand to improve the student's attitude and achievements in mathematics. However, Katwibun, (2000) suggested that studies on the influence of attitudes towards mathematics are still scant. Sriwongchai et al (2015) stated that most of the studies were limited to the investigation in mathematics learning process. Therefore, Thailand needs to investigate teaching approach to improving students' attitude toward mathematic achievement.

As a matter of fact, the Thai educational reformed, which is initiated 18 years ago in 1999 is being the most important strategy in the Thai education reform efforts by the ministry (Black & Nanni, 2016). Thai education reforms advocated learner-centered methods such as the CIPPA model method, cooperative learning method and demonstration technique model. Thus, this is in line with the western approaches. However, it was not widely implemented in southern Thailand. Consequently, Thailand has to examine the effectiveness of corporative learning of teaching mathematics. Capar and Tarim (2015) reported that student study in a small group same with cooperated learning is an effective method for enhancing attitudes and achievements, the student can share an opinion, discussed and describe in group activities to more understand the knowledge. Thereby, this study will investigate cooperative learning by Student Team Achievement Division technique (STAD) influence on attitudes (self-confidence) towards mathematics achievement.

Therefore, which were mainly focused on mathematics achievement, despite the fact that mathematics confidence has been identified in the literature as a problem on the mathematical achievement of students. So, this study it is necessary to find out the teaching method which affects the mathematics confidence of the students in Southern Thailand.

Objectives

To investigate whether there is a difference in the test scores of the treatment and control groups after exposure to the cooperative learning STAD techniques, an intervention program in mathematics in term of self-confidence toward mathematics.

Research Methodology

The quasi-experimental was used to examine the effect relationship between STAD technique and self-confidence on control and treatment group. In this study, STAD technique will be implemented for within 15 weeks in control and treatment groups. From the first to twelfth weeks used teaching module for the treatment group was developed and certified validate by an expert lecturer from Thailand University. However, the achievement teaching module using the Thailand Ministry of Education curriculum provided to the school. At the end of the session, the test was run on both groups. However, the different test will be conducted for rewrite the same content after 12 weeks. On the contrary, the traditional teaching method will be employed in the control group. In addition, the control group employed the traditional teaching methodology without any treatment of STAD techniques. The sample of quasi-experimental design is as follows:

Table 1
Experimental Research Design

Group	Pre-test	Treatment	Postest-1	No treatment	Post-test-2
treatment	Y1	X	Y2	-----	Y3
Control	Y1	-----	Y2	-----	Y3

Quasi-Experimental NEGD Design & Single Subject Design: (Ary, Jacobs, & Razavieh, 2005)

Where:

- Y1 Pre-test
- Y2 Post-test 1
- Y3 Post-test 2
- X Treatment (STAD technique)
- No Treatment

The duration of STAD technique program is designed for twelve weeks with final re-test will be conducted after three weeks. Both treatment and control groups employed the same period of time. The purpose of this STAD program is to enhance their attitude. The followings are the hypotheses of the study:

Sampling

This study used simple random sampling in identifying a sample of 72 students from one of the schools in Songkhla Thailand. Permission to conduct this research was obtained from the parents by signing the informed consent letter. The school under the government and student in grade 6th more than one classroom, the O-NET scores in 2015 lower than mean scores, after selecting the 72 students, this study had conducted a fishbowl random sampling method. The researcher had written every name of 72 students on a rolled small piece of paper and put in a container. Before picking a piece of rolled paper one by one, the container must be shaken first. To make it

random, the first rolled paper picked-up will be placed in an experimental group. Whereas, the second rolled paper will be placed as a control group member. The procedure was repeated until all 72 rolled piece of paper being distributed into respective groups. Thus, this fishbowl sampling technique will ensure equal opportunity for each sample to be selected randomly in the respective groups.

Instrumentation

Questionnaire: Attitude toward Mathematics Inventory (ATMI)

The Attitude toward Mathematics Inventory (ATMI) had to be employed to evaluate different underlying perspective of students' attitudes toward mathematics (Tapia & March, 2004). Forty items of ATMI consists of four scales: 15 items of self-confidence, 10 items of value, 10 items of enjoyment, and 5 items of motivation (Khine & Afari, 2014). The respondents were asked to rate each statement using 5-point liker scale: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree was used (Tapia & Mash, 2004). Moreover, based on the empirical findings of Kramarski and Gutman (2006), the instruments adopted was found to be reliable during pre-test and post-test with a Cronbach alpha of 0.71 and .86 respectively. Therefore, the reliability and discriminatory power of both tests used in the pilot test are good. In addition, the detail of ATMI questionnaires translation in Thailand language is certified by two English lecturers' expert in Thailand.

Procedure

After all the 72 students were selected randomly, they were put in their respective group, the researcher explained the details of the program for them to understand the flow of the activities as well as their role and responsibility. The STAD techniques are run five times per week within fifteen weeks, therefore, each treatment group has to participate in that period of time. Similarly, the traditional teaching method is also conducted for the control group in five times a week within the period of fifteen weeks. Thus, this will ensure that the control group would not receive any information regarding the STAD technique.

In the pre-test, both control and treatment group respondents will be tested the attitude toward mathematics functions test focusing on self-confidence, value, enjoyment and motivation. The questionnaires were given during the period of Mathematics lesson. The student took 40 minutes to finish the attitude questionnaires. After the results obtained, using pre-test score the students in the treatment group will divide students into groups 3 or 4 students and mixability per group for STAD technique. Then, both control and treatment groups will run the same mathematics lessons but difference methodology.

During the week 12th, a post-test 1 is conducted with two types of test. The first test is related to attitudes of the students towards mathematics using the same questions and mechanics during the pre-test. The student was able to finish the test within 40 minutes. Meanwhile, students from both control and treatment group are back to normal classes after 12th week post-test 1 until week 15. Until then, post-test 2 is conducted in week 15 to evaluate the attitude of normal classes between week 12 and week 15 (Abu & Flower, 1997; Van Wyk, 2011).

Data Analysis

The ANOVA Repeated Measured was used to test the significant mean difference in the students' attitude in mathematic for the pre-test, post-test 1, and post-test 2 with 40 items stated in the questionnaire, Therefore, this study involved an intervention period within 15 weeks (week 1, week 12 and week 15). This study used SPSS software package version 22 to run the analysis. A significant level of 0.05 or lesser must be obtained for the test to be significant. The followings were the statistical analysis that used in this study.

Results

Analysis of Variance (ANOVA) repeated measures were used. It is observed from the multivariate result that there was a significant difference between the pre-test, post-test 1, post-test 2 scores of treatment and control group of the result obtain in analyzing attitude of students towards having self confidence in mathematics. Having $F(2, 69) = 48.25$, $p\text{-value} = .00$ ($p < .05$) with eta square = .58 signifying large effect size. Using Cohen (1998) postulation for effect size (.01 = small effect, .06 = moderate effect, .14 = large effect size).

Thus, the result shows that a larger percentage 58% of variability in total score of students' self-confidence was associated with the treatment after the variability caused by individual differences was excluded. Moreover, p value is less than .05, thus, the result concludes that there is a statistically significant difference between pre-test, post-test 1 and post-test 2 scores of treatment and control group.

Also, over the fifteen (15) weeks period of conducting this experiment with the intervention of the treatment group, the evidences from the results observed shows a significant change having $F(2,69) = 30.05$, $p\text{-value} = .00$, ($p < .05$) with eta square = .47 a large effects size. To assist this interpretation, the Table 2 and Figure1 present a significant improvement in the estimated mean of the students' Self-Confidence over the period of fifteen (15) weeks. With the intervention of corporative learning on the control group subjected to traditional teaching method were observed to have similar significant differences. However, the differences in the estimated mean do fluctuate (that is, increasing, decreasing and increasing) not consistence in progression.

Furthermore, reports from the within-subject effect scores among the treatment and control group testing the interaction between the two groups was also found to be statistically significant with $F(2, 140) = 42.98$, $p\text{-value} = .00$ ($p < .05$) having a large eta square=.38. Thus, the result concludes that the result for the between group was statistically significant meaning that there was a statistical difference between students' attitude towards having self-confidence in mathematics.

In addition, to test further the above results, pairwise comparison table present a statistical significant difference among the students' attitude having self-confidence towards mathematics subject for pre-test, post-test 1 and post-test 2 scores of treatment and control group. With the results generated from the ANOVA repeated measures, it is therefore concluded that there is a

statistical significant different in students' attitude towards having self confidence in mathematics.

This is presented in the Table 4.3 below. The three trials (with Bonferroni adjustment); the Bonferroni adjustment is often seen as been somehow too conservative, nevertheless, it protects against the danger of over claiming the number of significance differences between groups in the process of multiple follow up comparisons, however, it does so at the expense of under claiming. For the time variable, the results at the paired product (control and treatment) of pre-test, post-test 1, it is indicated that the mean difference of (M= -.31*) that is significant at ($p < .05$).

Furthermore, paired post-test 1 and post-test 2, it is indicated that the mean difference of (M= -.41*) that is significant at ($p < .05$) and the mean difference between post-test 2 and pre-test is (M = -.72*) found to be significance at ($p < .05$). The Table 4.3 depicted the results clearly while Figure 4.1 provides the experimental data effect of time on students' self-confidence towards achieving in mathematics.

Therefore, this study there is significant different between the pre-test, post-test 1, and post-test 2 scores of the treatment and control groups on attitude towards mathematics (Self-confidence). The results discussed are therefore presented in the Table 2 below:

Table 2
Result of Repeated Measure ANOVA for Self-confidence

Effect	N	Mean	SD	F	Sig.	Eta sq.	Mean Differ
Time*Group				48.25	.00	.58	
Treatment Group							
Pre-test	36	2.63	.46	30.05	.00	.47	
Post-test1	36	3.42	.48				
Post-test2	36	3.92	.36				
Control Group							
Pre-test	36	3.63	.59				
Post-test1	36	3.45	.49				
Post-test2	36	3.77	.38				
Treatment*Control				42.98	.00	.38	
Pre-test	72	3.12	.72				
Post-test1	72	3.43	.47				
Post-test2	72	3.84	.37				
Pairwise Comparison							
Pre-test*Post-test1	72				.00		-.31*
Post-test1*Post-test2	72				.00		-.41*
Pre-test *Post-test2	72				.00		-.72*

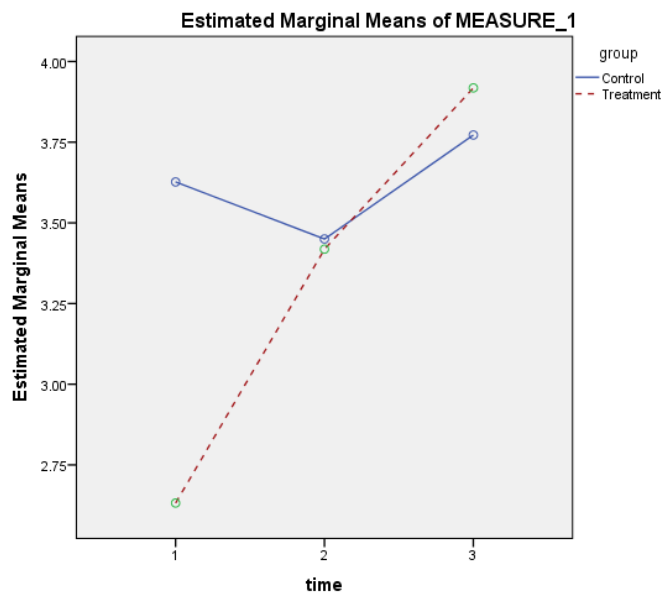


Figure1. Estimated Marginal Means of Students' Self-Confidence in Mathematics

Discussions

The findings from the analysis of the hypothesis one found that $F(2, 69) = 48.25$, $p\text{-value} = .00$ ($p < .05$). These results posit positive findings for the first hypothesis. From the one-way ANOVA repeated measure result, it is observed that there is a significant shift among the mean value of the treatment groups. With the intervention of treatment (cooperative learning) group, it was found that there is a progress of mean value having pre-test ($M = 2.63$), with a progression of post-test 1 ($M = 3.42$) and post-test 2 ($M = 3.92$) accordingly through the 15 weeks of experimentation. The mean difference observed from the graphs' of the treatment group present steady increase of self-confidence mean scores.

The treatment group graph (Figure1) illustrated that over fifteen weeks period the student's attitude toward self-confidence significantly increased. This result was found to be in conformity with the previous findings where it was concluded that the introduction of cooperative learning boosts the attitude (self-confidence) of students towards learning mathematics (Morgan, Whorton, & Gunsalus, 2000). Furthermore, they also argued that the introductions of cooperative learning among students have improved their social interaction. Thus, this finding shows that with cooperative learning style using "STAD" technique student will study in a group where they have to interact with each other in the group and each member has their role to play in the group. For example, everyone must take part in the group activities, such as sharing ideas, asking questions, discussing and describing the answers, and changing knowledge between the group members. These activities create positive encouragement that will improve their confidence level toward mathematics. Moreover, they also have to learn to listen to others' opinion which will make them more confidence person. Furthermore, Booker, Bond, Sparrow and Swan (2015) also indicated that the cooperative learning technique involved students to work together in a group in order to help their team member to understand better. Thus, this

strategy will create a more positive attitude among group members. In other words, the cooperative learning technique helps the students to be more confidence in learning mathematic.

Hence, it can be observed that cooperative learning by STAD technique can contribute to the new learning system in learning mathematics for primary school children in Southern Thailand. In particular, the intervention of corporative learning method used also helps the teacher to understand step by step procedure which at the same time had improved the student attitude of self-confidence towards learning mathematics. This is agreed by Razak, (2016) who suggested that the cooperative learning should be formulated to students with motivating activities that encourage student to learn mathematics. This also had been shown from the result that the cooperative learning module used has been able to encourage and teach diverse activities making the class more interesting.

Similar to this, the retention (post-test2) of the treatment group was seen to be improved as well. This was found to be synonymously to the findings of (Koppenhaver and Shrader, 2003; Arends, and Kileher, 2010). They disputed that by introducing the cooperative learning technique to students will give the student autonomy to device their own ways of learning. The students will used their creativity by sharing with friends in the group to make the learning experience more meaningful. It is an informal innovative ways that also helps to improve their long-term memory. Moreover, the cooperative learning intervention module used in this research had assisted the students to share their learning activities that might help to retain their long-term memory. Likewise, Herrmann, (2013) also agreed in this favor, claiming that through their empirical findings of cooperative learning, students would be able teach and share knowledge among themselves in such a way that boost the short and long term memory in them. Thus, also suggest that cooperative learning should be explored by others in Thailand.

On the other hand, the control group had experienced a drop in self-confidence after being taught with traditional ways of teaching. The low confidence feeling among students in the control group might be due to the fact that the students cannot absorbed what was taught by their teacher in the traditional ways. This is admitted by Di Martino and Zan (2015) where he found that the teachers' attitude, knowledge of teacher teaching mathematics and teaching pedagogy may cause student poor attitude towards mathematic. Perhaps, the traditional way of teaching may cause decrease in student attitude because the teaching is restricted to the textbook content with little to no innovative ways of learning. On the other hand, the one way communication employed by traditional teaching methods also deprived the students from asking questions which may lead to uncomfortable learning condition that demoralize and decrease learning attitude. Conceivably, the traditional ways of teaching mathematic need a new revisitation (Joseph Rowntree Foundation, 2009).

Additionally, the treatment group has progressively improved the score on retentions over the period of 15 weeks as compare to control group. The result of this study is to be in line with Johnson and Johnson (1989) where they concluded that the retention of students is influenced

by the ability to interact in classroom. This may be due to the module employed in the classroom which has created free interaction chances for the students to interact during the class activities. With this, student feels happy to talk to each other and has created more decisive relationship among them. Thus, this situation has created a positive attitude toward learning mathematics. Likewise, the students also are able to share their ideas and knowledge in the group. The important point is that poor students can catch up faster because they are given the chances to learn informally with cleverer students. They also will not feel bored in a mathematics class with cooperative learning technique. Thus, cooperative learning method has improved their confidence level in learning mathematics (Thousand et al., 2002). However, the retention results for control group increase over three week time period. Perhaps, the increase is not due to the fact of good traditional teaching but may be because of the random sampling of the student in the group. In this case, the control group sample was selected of random who already had high scores as the pre-test. While, the random sampling student at pre-test of treatment group score much low ($M=2.63$) than the random sampling of control group ($M=3.63$). Of course, when tested again at post-test 2 their confidence level almost the same as initial score as their pre-test. This is not because of the traditional teaching but because of the initial confidence level of the student itself.

Therefore, this empirical study has supports the stance that the introduction of cooperative learning into the current academic curriculum in Thailand is a necessity. The result shows that the student confidence level improves as compared to the traditional way of teaching. Moreover, it also showed that these students can retain their memory better over 15 week's period. Hence, this is to conform to the deductions of Thousand, Villa & Nevin (2002) where the engagement in STAD will encourages group participation and boost in students self-confidence as compared to those who were taught with the traditional way of teaching.

This study had contributed to the development of cooperative learning theory in the context of teaching and learning mathematics in Thailand. It is suggested that to improve students' confidence and it should be frequently used in teaching and learning mathematics.

Limitation

The study only conducted for student in government school in southern Thailand and perhaps they are comfortable to learn mathematic with their teacher. For further study should be an experiment to another private primary school in Thailand.

Suggestion and Future Investigation

It could be suggested that a student discourse in mathematic class to in-depth study should also be employed in the future research. Thus, this helps to explore the perceptions of the respondents.

Conclusion

In conclusion, this study reveals that cooperative learning strategy through STAD helps that student to develop and increase self-confidence over twelve and fifteen weeks. Therefore, it is suggested that cooperative learning should be implemented in other primary schools in Thailand.

Furthermore, a future researcher could study to investigate the retention period over the allocated five to ten weeks after the intervention.

Acknowledgement

I am greatly indebted to all those who in one way or the other make this journal a successful one. Special thanks to Prof Mohd Sofian Omar-Fauzee and Dr Mohamad Khairi Haji Othman for support and ideas at every stage and initiated me to carry out this research work in the right track to successfully in time. I also thank you to director, teacher and students at experiment school to allowed me to conducted my experimental work.

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