

The Effect of Teams Games Tournament on Mathematics Self-Efficacy in Junior High Schools

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Abstract. Teams Games Tournament is one cooperative learning method which actively involves students to solve their problems through an interesting game. The game consists of questions that have content relevant to the main topic and to boost up students' self-confidence in their ability to exert their self-control over motivation, behavior and social environment. This research aims at investigating the effect of Teams Games Tournament toward students' self-efficacy on mathematics. The study was conducted toward 64 seventh graders in Landak Regency on social arithmetic material, selected using cluster random sampling. The experimental design used the one group pretest posttest experimental design that was analyzed by quantitative method. Data collection employed "Mathematics Self Efficacy Questionnaire" and was analyzed by statistical method using SPSS-20. The results show that Teams Games Tournament has a significant effect toward students' self-efficacy on mathematics. The result is drawn from t -value = -12.369 and $\text{sig.}(2\text{-tailed}) = 0.00$. Therefore, it can be concluded that Teams Games Tournament has positive effect toward students' self-efficacy on mathematics. The study implies that teachers should consider the implementation of Teams Games Tournament in classroom teaching.

Keywords: Teams Games Tournament, Self-Efficacy, Mathematics.

1. Introduction

Currently, mathematics is widely used in many areas of life. Mathematics is also taught in every level of education starting from primary, middle and higher levels. Mathematics as a way of thinking, a language of symbols, terms, definitions and principles, does not develop naturally like a mother tongue, but must be learned, and demands cognitive and meta-cognitive effort [1].

However, the decline in mathematics learning achievement is of particular concern to students, teachers and parents. One reason for the decline in mathematics achievement of students in schools is the students' assumptions of mathematics which is a difficult and tedious lesson. This occurrence should be addressed immediately by the teacher. Teachers should pay attention to the needs of each student. In order to achieve success in learning mathematics, students must be given the opportunity to communicate mathematically, reasoning mathematically, develop self-confidence to solve mathematics problems. One of the ways this is through cooperative learning.

Further, cooperative learning helps students to foster their more complex thinking and problem-solving skills which are demonstrated by groups of students taught using cooperative learning [2, 3]. Cooperative learning is achieved by dividing the class into small groups that work together to achieve the best group results by means of mutual assistance among the group members to create powerful learning opportunities [4, 5]. In a cooperative learning context, there are many interactive tasks that would naturally stimulate the students' cognitive, linguistic, and social abilities.

There are some advantages of cooperative learning approaches, especially for mathematics learners, including: 1) promotion toward deep learning of materials, 2) achievement of better grades as compared to competitive or individual learning, 3) better

learning of social skills and civic values, 4) acquisition of higher-order and critical thinking skills, 5) promotion of personal growth and 6) development of positive attitudes toward autonomous learning [5, 6, 7, 8].

One of cooperative learning techniques widely used by teachers is Teams-Games-Tournaments (TGT). The purpose of TGT is to create an effective classroom environment in which students are actively involved in teaching process and are consistently receiving encouragement for successful performance [10]. TGT has three basic elements: 1) teams, students are assigned to equal teams categorized by equivalent academic levels, 2) games, skill exercises relating to content material are played during weekly tournaments, 3) tournament, students represent their teams and compete individually against students from other teams. The winnings are brought back to their teams. Total winnings are counted and team champions are announced.

TGT technique evidently provides several positive influences toward student achievement [11, 12, 13]. Among them are to bring more practice, to create greater and earlier awareness of learning outcomes, to give extra motivation for students and to build a more enjoyable learning experience. Besides, the use of TGT can enhance students' motivation, learning outcomes and especially self-efficacy [12].

Self-efficacy is a person's self-confidence about their ability to accomplish a task [14]. Self-efficacy is strongly related to learners' expectation about what they can actually accomplish within their learning. The outcomes people expect are largely dependent on their judgments of what they can accomplish [15]. Researchers reveal that students' self-efficacy in their academic capabilities is closely related to academic motivation and performance outcomes in domains that include science, mathematics, and language arts [16, 17].

There are several previous studies which have been carried out on the effectiveness of cooperative learning toward junior high school students' self-efficacy, such as technique jigsaw [18], Think Pair Share [19] and Group Investigation [20]. Teams Game Tournament itself has been widely used in some studies. However, most of the studies are not specifically addressing the issue of TGT effect toward self-efficacy [11, 12, 13]. Therefore, this present study is conducted to investigate the effect of TGT toward mathematics self-efficacy of junior high school students.

This research aims at investigating the effect of the use of Team Games Tournament toward students' self-efficacy on mathematics. The specific objectives of the study are: 1) How are mathematics self-efficacy scores of 7th grade junior high school students before and after applying TGT technique?; 2) Is there any significant difference between the pretest and posttest mathematics self-efficacy scores of 7th grade junior high school students to whom the TGT has been applied?.

2. Methodology

This research was a quantitative research with experimental design of one group pretest posttest experimental design. The population in this study was 7th graders in a public junior high school in Landak Regency, Indonesia in the academic year 2016/2017 with total number of 94 students (47 men and 47 women). The sample in this research was the students of grade 7A and 7C in that school as many as 64 students (31 men and 33 women). The study employed cluster random sampling. The study was conducted to the students who were currently receiving social arithmetic material. The materials were taught using the TGT technique. The learning activities were conducted in 5 classroom meetings.

To measure students' mathematics self-efficacy scores, a "Mathematics Self Efficacy Questionnaire" (MSEQ) developed by May [21] was used. This 14 item questionnaire used Likert scale with 5 options as follows: (1) Never, (2) Seldom, (3) Sometimes, (4) Often, (5) Usually. Test reliability for MSEQ using Alpha Cronbach and Alpha Cronbach coefficient

of 0.93 was obtained. Therefore, MSEQ was reliable to be used to measure students' mathematics self-efficacy scores. The maximum value that can be obtained by students in filling the MSEQ was 70 and the minimum value was 14. In this study, the interval of Likert scale was calculated to be $(5-1)/5 = 0.80$.

In the early stages of data collection, seventh grade students of SMP were given the MSEQ to measure the students' mathematics self-efficacy score before to treatment. Then, it was followed by teaching social arithmetic material using TGT technique. After completion of the teaching, the students were asked to complete the MSEQ again to measure the post-test value of students' mathematics self-efficacy score as the final stage of data collection.

Descriptive statistics methods and paired samples t-test were applied for the analysis of data. For all of the statistical decoding, .05 significant level was taken as the basis. The data were analyzed using the SPSS 20.0 software.

3. Result and Discussion

Table 1 exhibits students' mathematics self-efficacy scores of 7th grade junior high school students before and after the implementation of TGT technique. The table is used to understand the mean score of each student's self-efficacy.

Table 1. Students' mathematics self-efficacy scores before and after the treatment

No.	Items	Mean	
		Before	After
1.	I feel confident enough to ask in my mathematics class	2.625	3.344
2.	I believe I can do well on a mathematics test	3.141	3.516
3.	I believe I can complete all of the assignments in a math course	3.266	3.578
4.	I believe I am the kind of person who is good at mathematics	3.234	3.656
5.	I believe I will be able to use math in my future career when needed	3.203	3.625
6.	I believe I can understand the content in a mathematics course	2.953	3.625
7.	I believe I can get an "A" when I am in a mathematics course	3.250	3.719
8.	I believe I can learn well in a mathematics course	3.203	3.609
9.	I feel confident when taking a mathematics test	2.813	3.531
10.	I believe I am the type of person who can do mathematics	3.406	3.656
11.	I feel that I will be able to do well in future mathematics courses	2.906	3.531
12.	I believe I can do the mathematics in a mathematics course	3.125	3.594
13.	I believe I can think like a mathematician	2.938	3.500
14.	I feel confident when using mathematics outside of school	2.922	3.641

Based on the above table, before the implementation of TGT technique, it is noted that item 10 (I believe I am the type of person who can do mathematics) has the highest mean score. And item 1 (I feel confident enough to ask in my mathematics class) has the lowest mean score. The finding shows that students generally believe that they are the learner type who can learn mathematics, yet they are not confident to ask question in mathematics class.

However, after the implementation of TGT, it is seen that item 7 (I believe I can get an "A" when I am in a mathematics course) has the highest mean score and item 1 (I feel confident enough to ask in my mathematics class) has the lowest mean score. This finding shows that the students believe that they can get a good score in mathematics but they are still not confident to ask question in mathematics class

Table 2. Frequencies and percentages values related to average scores of students.

Interval of Likert Scale	Average Points Before and After Study									
	Between 1.00-1.80 points		Between 1.81-2.60 points		Between 2.61-3.40 points		Between 3.41-4.20 points		Between 4.21-5.00 points	
Frequencies and Percentages	f	%	F	%	f	%	f	%	f	%
Before	0	0	15	23.44	31	48.44	16	25.00	2	3.13
After	0	0	1	1.56	22	34.38	36	56.25	5	7.81

Based on Table 2, before TGT is applied, no student has responded "never". Students' self-efficacy on mathematics response before applying TGT shows that there are 15 students (23.44%) respond "seldom", 31 students (48.44%) respond "sometimes", 16 students (25%) respond "often" and 2 students (3.13%) respond "usually". The result shows that the majority of students choose "sometimes" as their response to MSEQ. Students still have anxiety in finishing their mathematics assignment in class.

After TGT is applied, no student has responded "never" in filling MSEQ. Students' mathematics self-efficacy scores response after applying TGT shows that 1 student (1.56%) respond "seldom", 22 students (34.38%) respond "sometimes", 36 students (56.25%) respond "often" and 5 students (7.81%) respond "usually". The result shows that majority of students choose "often." The students are able to decrease their anxiety and they are more confident in finishing their mathematics assignments after receiving TGT.

The responses of students vary in four items, namely "seldom", "sometimes", "often" and "usually". However, based on the table, it can be concluded that the students' self-efficacy after having TGT is improving. The students have better confidence in finishing their assignments of mathematics in class and the students also receive better score. The analysis of pretest and posttest scores shows the positive change toward students' self-efficacy. The finding is in accordance with several previous studies on the effect of cooperative learning toward students' self-efficacy which reveal that cooperative learning has positive effect toward students learning achievement, attitude and self-efficacy in mathematics [3, 8, 19, 20, 22].

Related to the significant difference between the pretest and posttest mathematics self-efficacy scores of 7th grade junior high school students after TGT is applied, the is presented in table 3.

Table 3. Results of the paired samples t-test of students' mathematics self-efficacy scores.

	N	Mean	Std	df	Correlation	t-value	Sig. (2-tailed)
Pretest	64	42.984	8.08	63	0.823	-12.369	0.000
Posttest	64	50.125	6.15				

Based on table 3, it can be concluded that there is a significant difference between the value of pretest and posttest of self-efficacy mathematics of 7th grade junior high school students after the TGT technique is applied. The result is drawn from t-value = -12.369 and p-value < 0.05. In addition, there is a strong and positive linear relationship (0.823) between the pretest and posttest valued students' mathematics self-efficacy scores. The average students' mathematics self-efficacy score before the TGT technique is applied is 42,984. The average students' mathematics self-efficacy score after TGT technique is applied is 50.125.

The result shows that TGT has significant effect toward self-efficacy. The finding is in accordance with several studies which show that TGT has several positive features in improving students self-efficacy, among them are 1) fostering the role of students as a group to improve their team performance, 2) creating a fun and attractive learning environment [11], 3) improving students' motivation to work harder in winning the tournament [23, 12, 24]. Such features will generally lead them to be more successful, more deserving of reward, and happier about their team outcome and learning process.

4. Conclusion

In conclusion, there is an increasing number of students' mathematic self-efficacy score after applying TGT. The results indicate that TGT gives positive effect toward students' self-efficacy in studying mathematics. The performance of groups who win the games makes the students to be more confident. Besides, the students from the winning team also show better individual performance in finishing their individual work. The improvement is because TGT has several positive features such as cooperative game playing and interpersonal competitive game playing.

As a suggestion, teachers should consider using TGT technique in their classrooms to improve their students' self-efficacy in mathematics which has positive correlation with their learning achievement. The present study only investigates the effect of TGT toward students' self-efficacy in mathematics without further analyzing what factors which causes such effect. Future research is suggested to start considering and investigating such factors to gain more precise understanding of TGT effect toward students' self-efficacy.

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6. References

1. Katz, Sara. Enhancing Self-efficacy of Elementary School Students to Learn Mathematics. *Journal of Curriculum and Teaching*. **4**, 42-55. (2015).
2. Kirik, Ozgecan Tastan & Markic, Silvija. The Self-efficacy of pre-service Elementary Teachers Using Cooperative Learning in Science Teaching. *Procedia Social and Behavioral Sciences*, **46**, 5005-5009. (2012).
3. Gillies, Robyn M. The Effects of Cooperative Learning on Junior High School Students' Behaviours, Discourse and Learning During a Science-Based Learning Activity. *School Psychology International*. **29**. 328-347. (2008).
4. Johnson, D.W., & Johnson, R.T. *Learning Together And Alone*. London: Allyn and Bacon. (1994).
5. Azizinezhad, Masoud., Hashemi, Masoud., & Darvishi, Sohrab. Application Of Cooperative Learning In EFL Classes To Enhance The Student's Language Learning. *Procedia Social and Behavioral Sciences*. **93**, 138 – 141. (2013).
6. Shimazoe, J. & H. Aldrich. Group Work Can Be Gratifying: Understanding And Overcoming Resistance To Cooperative Learning. *Journal College Teaching.*, **58**, 52-57. (2010)
7. Aziz, Zahara & Hossain, Md. Anwar. A Comparison of Cooperative Learning Anf Conventional Teaching on Students' Achievement In Secondary Mathematics. *Procedia Social and Behavioral Sciences*. **9**, 53-62. (2010).

8. Hossain, Anowar., & Tarmizi, Rohani Ahmad. Effects Of Cooperative Learning On Students Achievement And Attitudes In Secondary Mathematics. *Procedia Social and Behavioral Sciences*. **93**, 473 – 477. (2013).
9. Zakaria, Effandi., Chin, Lu Chung., & Daud, Md Yusoff. The Effects of Cooperative Learning on Students' Mathematics Achievement and Attitude towards Mathematics. *Journal of Social Sciences*. **6**, 272-275. (2010).
10. Veloo, Arsaythamby., Md-Ali, Ruzlan., & Chairany, Sitie. Using Cooperative TGT in 11 Religious School to Improve Mathematics Understanding and Communication. *Malaysian Journal of Learning and Instruction*. **13**, 97-123. (2016).
11. Gonzales, Arturo., Jennings, Davis., & Manriquez, Loreto. Multi-Faceted Impact Of A Team Game Tournament On The Ability Of The Learners To Engage And Develop Their Own Critical Skill Set. *International Journal of Engineering Education*. **30**(5), 1213-1224. (2014).
12. Frianto., Soetjipto, Budi Eko., & Amirudin, Achmad. The Implementation of Cooperative Learning Model Team Game Tournament and Fan N Pick To Enhance Motivation and Social Studies Learning Outcomes. *IOSR Journal of Humanities and Social Science*. **21**, 74-81. (2016).
13. Salam, Abdus., Hossain, Anwar., & Rahan, Shahidur. Effects Of Using TGTs (TGT) Cooperative Technique For Learning Mathematics In Secondary Schools of Bangladesh. *Malaysian Online Journal Of Educational Technology*. **3**, (2015).
14. Bandura, A. *Self Efficacy: The Exercise of Control*. NY: Freeman & Company. (1997).
15. Usher, Ellen L, & Pajares, Frank. Sources of Self-efficacy in Mathematics: A Validation Study. *Contemporary Educational Psychology*, **34**. 89-101. (2009).
16. Lavasani, Masoud Gholamali., & Khandan, Farah. The Effect Of Cooperative Learning On Mathematics Anxiety And Help Seeking Behavior. *Procedia Social and Behavioral Sciences*. **15**, 271-276. (2011).
17. Hossain, Anowar. and Tarmizi, Rohani Ahmad. Effects of Cooperative Learning On Students' Achievement and Attitudes In Secondary Mathematics. *Procedia Social and Behavioral Sciences*. **93**, 473 – 477. (2013).
18. Sengul, Sare., & Katranci, Yasemin. Effect Of Jigsaw Technique On Mathematics Self-Efficacy Perceptions Of Seventh Grade Primary School Students. *Procedia Social And Behavioral Sciences*. **116**, 333 – 338. (2014).
19. Nuyami, N. M. S., Suastra, I. W., & Sadia, I. W. Pengaruh Model Pembelajaran Kooperatif Tipe Think-Pair-Share Terhadap Self-Efficacy Siswa SMP Ditinjau Dari Gender. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha*. **4**. (2014).
20. Anita, N. M. Y., Karyasa, I. W., & Tika, I. N. Pengaruh Model Pembelajaran Kooperatif Tipe Group Investigation (GI) Terhadap Self-Efficacy Siswa. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha*. **3**. (2013).
21. May, Diana. K. *Mathematics Self Efficacy and Anxiety Questionnaire*. A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree. Doctor of Philosophy. Georgia. The University of Georgia. (2009).
22. Tran, Van Dat. The Effects of Cooperative Learning on the Academic Achievement and Knowledge Retention. *International Journal of Higher Education*. **3**. 131-140. (2014).
23. Pangestuti, Ardian Anjar., Mistianah., Corebima A D., & Zubaidah, Siti. Using Reading Concept Map-TGT (Remap-TGT) to Improve Reading interest of Tenth Grade Student of Laboratory Senior High School State University of Malang. *American Journal of Educational Research*. **3**. 250-254. (2015).
24. Zimmerman, Barry J. Self-Efficacy: An Essential Motive to Learn. *Contemporary Educational Psychology*, **25**. 82-91. (2000).