IMPROVING MATHEMATICAL PROBLEM SOLVING BY IMPLEMENTING TEAMS GAMES TOURNAMENT MODEL ON SIMILAR TRIANGLES TOPIC IN IX GRADERS OF MTs NEGERI 2 MEDAN

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ABSTRACT

The aim of this research is to know the improvement of students' mathematical problem solving ability through the implementation of Teams Games Tournament model on similar triangles topic. Type of this research is Classroom Action Research. The subjects were 35 students in IX graders. The object of this research is the ability of mathematical problem solving and the model that has been implemented is Teams Games Tournament. This research consisted of two cycles, and each cycles consists of two meetings. Mathematical problem solving ability was tested at the ending meeting. The results of this research could be shown : (1) The process of implementation Teams Games Tournament was running well. (2) The average value of initial test of students' problem solving ability is 61.50, the classical completeness is 31.43% and mathematical problem solving ability of students categorized as low, (3) The average value of students' problem solving ability test in the Cycle I is 69.43, the classical completeness is 42.86% and mathematical problem solving ability of students categorized as medium. But the gain of this cycle is 0.20, and it is lower. (4) The average value of students' problem solving ability test in the Cycle II is 79.14, the classical completeness 88.57% and mathematical problem solving ability of students categorized as medium. The gain of this cycle is 0.32, and it is medium. Finally, we concluded that the implementation of Teams Games Tournament model can improve students' problem solving ability. The recommendation to other researcher is able to use this model as an alternative in the learning process that can improve students' problem solving ability.

Keywords*: Mathematical Problem Solving, Teams Games Tournament.*

ABSTRAK

Tujuan dari penelitian ini adalah untuk mengetahui peningkatan kemampuan pemecahan masalah matematika siswa yang dilakukan dengan mengimplementasikan model Teams Games Tournament (TGT) pada topik kesebangunan segitiga. Tipe penelitian ini adalah Penelitian Tindakan Kelas (PTK). Subjek dari penelitian ini adalah siswa kelas IX yang berjumlah 35 siswa. Objek dari penelitian ini adalah kemampuan pemecahan masalah matematika siswa dan model yang digunakan adalah Teams Games Tournament (TGT). Penelitian ini terdiri dari dua siklus, dan setiap siklus terdiri dari dua pertemuan. Kemampuan pemecahan masalah matematika telah dilakukan tes pada setiap akhir pertemuan. Hasil dari penelitian ini menunjukkan: (1) Proses pengimplementasian Teams Games Tournament (TGT) berjalan dengan baik, (2) Rata- rata nilai tes awal kemampuan pemecahan masalah matematika siswa adalah 61.50, ketuntasan klasikal 31.43% dan kemampuan pemecahan masalah matematika siswa dikategorikan rendah, (3)Rata- rata nilai tes kemampuan pemecahan masalah

matematika siswa pada Siklus I adalah 69.43, ketuntasan klasikal 42.86% dan kemampuan pemecahan masalah matematika siswa dikategorikan menengah. Nilai gain pada siklus ini adalah 0.20, dan masih rendah, (4) Rata- rata nilai tes kemampuan pemecahan masalah matematika siswa pada Siklus II adalah 79.14, ketuntasan klasikal 88.57% dan kemampuan pemecahan masalah matematika siswa dikategorikan menengah. Nilai gain pada siklus ini adalah 0.32, dan sudah dikategorikan menengah. Sehingga, dapat simpulkan bahwa pengimplementasian model Teams Games Tournament (TGT) dapat meningkatkan kemampuan pemecahan masalah matematika siswa. Rekomendasi kepada peneliti yang lain agar dapat menggunakan model ini sebagai alternatif dalam kegiatan pembelajaran yang dapat meningkatkan kemampuan pemecahan masalah matematika siswa.

***Keywords**: Mathematical Problem Solving, Teams Games Tournament (TGT).*

INTRODUCTION

The development of science and technology has given such a huge impact on many aspects of life, this is evidenced by the presence of new inventions such as science or technology. One such impact is the emergence of competitive issues and complex life. The impact of these developments need to be faced rather than avoided, to face it needs qualified human resources and have a good life skill to compete. Therefore, it is necessary to increase the quality of human resources in solving the problems.

National Council of Teachers of Mathematics (NCTM) (in Purnomo, 2014: 25) define problem solving as one of the five standard mathematical abilities in school, that are the mathematical communication, mathematical reasoning, mathematical problem solving, mathematical connection, and mathematical representation.

Barca (in Wahyuni, 2013: 4) states the importance of mathematical problem solving, that are: (1) problem solving ability is the main purpose in study mathematics; (2) problem solving consist of method, procedure, and strategy was a main process in curriculum of mathematics; and (3) problem solving is a basic ability in study mathematics.

Based on the observations that have been done show that the mathematical problem solving ability is still low and needed an increase in problem solving. An increased ability to solve a problem, it means the student has experienced a change in behavior, thus in mathematics learning problem solving ability are very important. In accordance with the views expressed by (Soejadi, 2001: 15) that in mathematics, problem solving ability for someone of students will help the student success in everyday life.

The efforts to improve the ability of students optimally at this time is necessary because we are aware that the development of science and technology now allows us to obtain a lot of information quickly and easily. However, it is impossible to study the overall information and knowledge that exist, because so many and not all necessary. In order to face these challenges required human resources that are reliable and able to compete globally, ie human resources that have the capabilities and high skills involving critical thinking, creative, systematic, logical, and effective collaboration capabilities.

Students' problem solving ability can improve by the teacher. The teacher can choose and implement a more effective learning strategies to improve students' ability to solve the problems in the form of problem solving. Based on the results of studies that have been conducted on learning strategies, one of the strategies that can effectively improve students' problem solving abilities are cooperative learning (Suryadi, 1999:67).

Duren and Cherrington (1992: 26) states that students who work cooperatively always remember and apply problem solving strategies than students who work

individually. In addition, Lie (2008: 56) states that learning in group, problem solving has the advantage, among others: (1) problem solving strategies, which are arranged more powerful and complex. Problem solving in groups give students the opportunity to practice the strategy; (2) the group can resolve more complex problems than individuals; (3) each member can practice planning and monitoring capabilities they need to make himself a better problem solver; (4) in the discussion, each member of a turn in the opinion and can double check their misconceptions; (5) when it got into trouble, the students are not so afraid to deal with it, because basically they do not independent but in groups.

In this research used a cooperative learning model that is Teams Games Tournament. The reason the researchers chose team games tournament, because in this team games tournament consist of tournament activities that require students to compete with other students. So that learning does not seem monotonous and students are expected to be motivated to participate actively in learn mathematics. Slavin (2005: 170) suggests four main steps in learning with teams games tournament techniques which are regular cycle of learning activities, as follows:

- Step 1: Teaching,
- Step 2: Teamwork,
- Step 3: Games tournament,
- Step 4: Reward,
-

Therefore, by using cooperative learning model team games tournament is expected that students are more motivated to learn mathematics and be able to understand mathematical concepts easily. Because team games tournament designed using academic game, so that students are required to be active in the learning process and can make the learning process is not boring.

Through cooperative learning model team games tournament, researcher expect to be able to make changes the ability of the students of MTs Negeri 2 Medan that is mathematical problem solving ability can be improved. Based on the background that the author is interested in conducting research with the title "Improving Mathematical Problem Solving by Implementing Teams Games Tournament (TGT) Model on Similar Triangles Topic in IX Graders of MTs Negeri 2 Medan" expected can answer that problems.

RESEARCH METHOD

The type of research that is used in this study is Classroom Action Research (CAR). Classroom action research is consist of a series of activities such as plan, implementation act, observe, and reflect.

In this research that become subject research is student Grades IX-8 of MTs Negeri 2 Medan in the odd semester academic year 2015/2016 with the number of students are 35 students, consisting 19 boys and 16 girls. The object research in this research are the effort to improve the mathematical problem solving by implementing Teams Games Tournament model on Similar Triangles topic in IX Graders of MTs Negeri 2 Medan.

The level of students' mathematical problem solving ability can be seen from the percentage of achievement with the following formula:

$$PSA = \frac{Score\ Obtained}{Maximum\ Score\ Given} x100\%$$

where *PSA* is Percentage of Student's Achievement

According to Tiona (2013: 14) that the student mastery categories are as follows:

Table 1. Criteria of Student Problem Solving Ability Level

Percentage	Criteria
90% - 100%	Very High Ability
80% - 89%	High Ability
65% - 79%	Medium Ability
55% - 64%	Low Ability
0% - 54%	Very Low Ability

In the guidance of learning process implementation, the Department of Education (in Aspar, 2014: 45) stated that there are criteria for individual learning completeness and classical learning completeness namely:

1. To know the individual learning completeness, used the formula:

$$PLC = \frac{Score\ Obtained\ by\ A\ Student}{Maximum\ Score\ Given} x100\%$$

where *PLC* is Percentage of Learning Completeness
A student said to be completed in learning if the student's *PLC* has reached a score of ≥ 70%

2. To know the classical learning completeness, used the formula:

$$PCC = \frac{The\ Number\ of\ Students\ Pass\ The\ Criteria}{The\ Number\ of\ All\ Students} x100\%$$

where *PCC* is Percentage of Classical Completeness
A class is said to be completed in learning if there is 85% of students who have achieved at least medium level.

The data analysis will be done in this research is quantitative. Quantitative data analysis was conducted to determine the magnitude of the result of improvement mastery of concepts for each group based on calculations using gain score. Improvement can be calculated using the N-Gain formula that according to Hake (1998). The formula is as follows:

$$N-Gain = \frac{\text{Post Test Score} - \text{Pretest Score}}{\text{Maximum Score} - \text{Pretest Score}}$$

Table 2 Criteria of N-Gain Scores

Interval	Criteria
g ≥ 0,70	High
0,30 ≤ g < 0,70	Medium
g < 0,30	Low

Source : Hake (1998)

Observation sheet towards teacher by giving score 0 – 5 appropriate with descriptors appear during teaching-learning process takes place, from very bad until very good, along with short note.

Scores obtained from each observer is converted in the form of percent namely:

$$SR = \frac{Sum\ of\ Score}{Maximum\ Score}$$

Table 3 Criteria of Assessment Learning's Observation Sheet

Interval	Criteria
4.6 - 5.0	Very Good
3.6 – 4.5	Good
2.6 – 3.5	Enough
1.6 – 2.5	Bad
1.0 – 1.5	Very Bad

RESULT AND DISCUSSION

From the implementation result of initial test known that mathematical problem solving ability of students is lower. The average value obtained by the students in doing this initial test is 61.50 and only 11 students who achieve the individual learning completeness because 11 students has reached score of ≥ 70%. The classical learning completeness is 31.43% it means the value has not yet reached classical learning completeness because has not yet reached at least 85% of students who pass the learning completeness criteria.

From 35 students, there is 1 student who received interval 90- 100 or very high level, 3 student who received interval 80-89 or high level, 8 student received interval 65-79 or medium level, 9 students received interval 55-64 or low level and 14 students received interval 0-54 or very low level.

The results of student mastery level calculation for initial tests can be seen in the table below:

Table 4 Description of Problem Solving Ability Levels In Initial Tests

Interval	Ability Level	Number of Students	Percentage of Students
90% - 100%	Very High	1	2.86%
80% - 89%	High	3	8.57%
65% - 79%	Medium	8	22.86%
55% - 64%	Low	9	25.71%
0% - 54%	Very Low	14	40%

From the initial tests given, the result it can be seen from the following diagram:

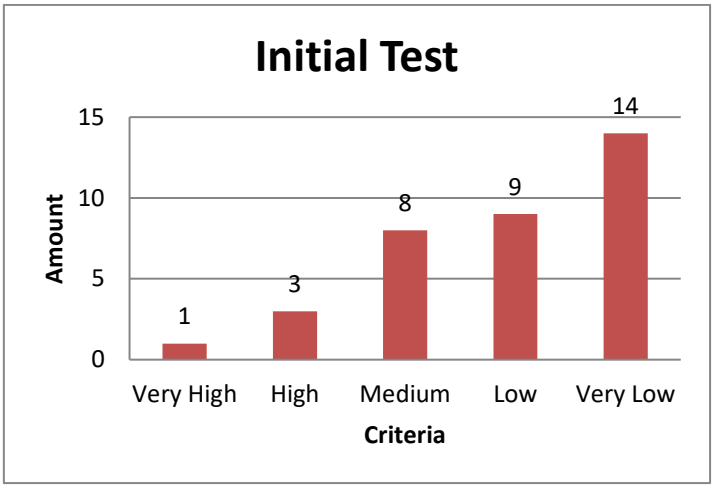

Figure 1. The Diagram of Initial Test result

The implementation of the first cycle test after learning using Teams Games Tournament **(**TGT) learning model that has been implemented that followed by 35 students, overall the students' ability to solve problems, 2 student got very high level, 7 students got high level, 14 students got medium level, 9 students got low level and 3 students got very low level. Results can be seen from the following table:

Table 5 Description of Problem Solving Ability Levels In Cycle I

Interval	Ability Level	Number of Students	Percentage
90% - 100%	Very High	2	5.71%
80% - 89%	High	7	20%
65% - 79%	Medium	14	40%
55% - 64%	Low	9	25.7%
0% - 54%	Very Low	3	8.57%

From the first problem solving ability test given to 35 students, obtained 15 students or 42.86% has reached learning completeness. It means that less than half of students reach the learning completeness. The description can be seen from the following diagram :

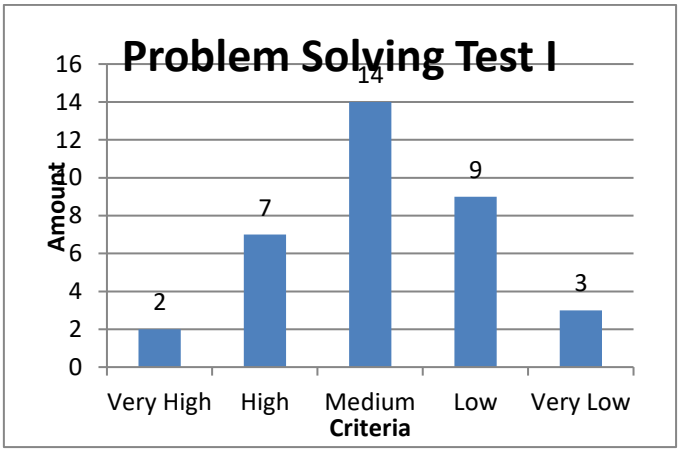

Figure 2. The Diagram of Problem Solving Test I

The implementation of the second cycle test after learning using Teams Games Tournament (TGT) learning model that has been implemented and followed by 35 students, overall the students' ability to solve problems, 5 student got very high level, 8 students got high level, 19 students got medium level, 3students got low level and nothing students got very low level. Results can be seen from the following table:

Table 6 Description of Problem Solving Ability Levels In Cycle II

Interval	Ability Level	Number of Students	Percentage
90% - 100%	Very High	5	14.29%
80% - 89%	High	8	22.86%
65% - 79%	Medium	19	54.29%
55% - 64%	Low	3	8.57%
0% - 54%	Very Low	0	0%

From the second problem-solving ability test given to 35 students, obtained 31 students or 88.57% has reached learning completeness, and the class is said to be completed in learning because the percentage ≥ 85%. The description as follows :

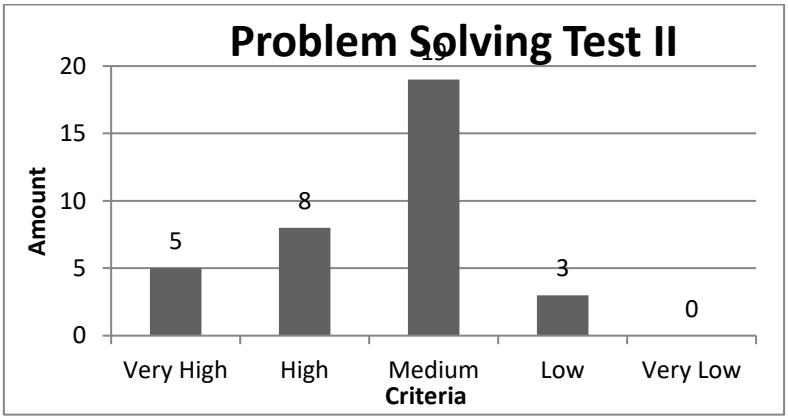

Figure 3. The Diagram of Problem Solving Test II

Student's ability in solving problems also improved. It can be seen from the improvement of average score in each test and also the comparison of gain between Intial Test with Problem Solving Test I and between Problem Solving Test I and Problem Solving Test II. The description is described as follows :

Table 7. The Comparison of Average Score, Classical Completeness, Observation and Gain in Each Test

Test	Average Score	Classical Completeness	Teacher Observation	Compared Gain	
				IT–PSA I	PSA I–PSA II
IT	61.50	31.43 %	-	0.20 (Low)	
PSA I	69.43	42.86 %	4.07		0.32 (Medium)
PSA II	79.14	88.57 %	4.44		

Note :

IT : Initial Test
PSA I : Problem Solving Ability Test I
PSA II : Problem Solving Ability Test II

CONCLUSION

Based on the result of research from the analysis of data, then can be concluded some conclusions as follows :

1. The level of problem solving ability in the initial test is averagely very low. It can be seen from the average score which is below the completeness criteria. After given the action in the cycle I with the cooperative learning model of Teams Games Tournament (TGT), the level of problem solving ability improved become medium level. Furthermore, after the action in the cycle II with the same action, the level of problem solving ability improve become high level and has reached the classical completeness.
2. A class is said to be completed in learning if there is 85% of students who have achieved and a student said to be completed in learning if the student's *PLC (*Percentage of Learning Completeness) has reached a score of ≥ 70%. From initial test, we got 11 students have pass PLC. In Cycle I we got 15 students have pass PLC. And In Cycle II we got 31 students have pass PLC.
3. Based on the analysis of data, it indicates that there is the change of learning outcome improvement namely mathematical problem solving ability of students after using learning model of Teams Games Tournament (TGT) which is done in Grades IX MTs Negeri 2 Medan on the similar triangles topic.

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