Journal of Educational Sciences
Journal homepage: https://ejournal.unri.ac.id/index.php/JES

P-ISSN 2581-1657
E-ISSN 2581-2203

Improvement of Mathematical Problem Solving and Disposition Ability of MTs Students through StrategiesThink Talk Write in Cooperative Learning in Kuantan Singingi Regency

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ARTICLE INFO

Article history:

Received: 26 June 2019
Revised: 19 August 2019
Accepted: 29 August 2019
Published online: 24 Sept 2019

Keywords:

Cooperative Learning
Improvement
Mathematical Problem Solving Ability
Mathematical Disposition
Think Talk Write Strategy

A B S T R A C T

This research is motivated by the low both Mathematical Problem Solving Ability (KPMM) and Mathematical Disposition (DM) in solving problems of grade VII MTs students. This study aims to see an increase in KPMM and DM MTs students in Kuantan Singingi Regency. The form of research was quasi-experimental with pretest-posttest control group design. The population of the study was MTs students in Kuantan Singingi District with the sample being Grade VII students from 3 MTs in Kuansing. Data collection instruments in this study were KPMM tests and DM questionnaires. Data were analyzed using t-test, Mann-Whitney U test, one-way Anova. The results obtained were an increase in KPMM for students who treated with Think Talk Write (TTW) strategies in cooperative learning. They were higher than students who obtained learning with a scientific approach (g_TTW = 0.75> 0.61 = g_PS). So it appears that the increase in KPMM and DM students who get the TTW Strategy in Cooperative Learning is higher than students who get learning with a scientific approach.

1. Introduction

In the 2013 curriculum, it was stated that one of the objectives of learning mathematics is students solving problems, including the ability to understand problems, design mathematical models, solve models, and interpret the solutions obtained. It can be seen that the ability to solve mathematical problems (KPMM) is a very important part of students in learning mathematics. The importance of KPMM that is owned by students (Nahor, et al, 2013), the KPMM is a general

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Doi: https://doi.org/10.31258/jes.3.3.p.377-389

goal of learning mathematics, even as the heart of mathematics, KPMM includes methods, procedures, and strategies. KPMM is the core and main process in the mathematics curriculum. KPMM is a basic ability in learning mathematics. This shows that KPMM is an ability that must be possessed by students and is one of the factors that determine student mathematics learning outcomes.

Noting the importance of KPMM in mathematics learning, KPMM must be improved. The reality in the field shows that KPMM students are still low. The low KPMM of students explained by Sumartini (2016) states that the achievement of vocational students in learning mathematics is still relatively low, especially in terms of KPMM. From the data obtained, 75% of students still have a relatively low KPMM. This is caused by several things including lack of interest in mathematics, the learning process that still relies on the teacher as the provider of all information, and the learning facilities are still lacking.

Besides KPMM, mathematics learning in mathematical disposition (DM) is also very important to be developed. This is because through a mathematical disposition, students can be confident, resilient in solving mathematical problems. Syaban (2009) states that instilling an attitude of appreciating the usefulness of mathematics in life, an attitude of curiosity, attention, and interest in learning mathematics, as well as being tenacious and confident in solving mathematical problems. Mathematical disposition is one of the factors supporting the success of students in learning mathematics. Students need a mathematical disposition to survive in the face of problems, take responsibility, and develop good habits in mathematics. Noting the importance of DM in mathematics learning, the mathematical disposition must be improved. The reality in the field shows that the desire of students to find answers to the questions given by the teacher is still low. Not many students work on problems given by the teacher. When students have difficulty in working on problems, students will quickly give up and consider mathematics a difficult subject.

Noting the importance of KPMM and DM, it is necessary to strive for a learning strategy with approaches that provide opportunities and encourage students to practice KPMM and their mathematical disposition. The reality in the field shows that in general learning is still centered on the teacher, meaning that learning is dominated by the teacher; students lack an active role in learning (both individually and in groups); and students are not given the opportunity to see the relationship between what is learned with the real world experienced by students, so the learning process is less meaningful. According to Andri (2019), the essence of cooperative learning is the positive development and interdependence of group members

One learning strategy that can increase active and meaningful student involvement is the Think-Talk-Write (TTW) Strategy in cooperative learning. This is because in the TTW strategy students think individually about the problems that exist, discuss with friends in a group, and can rewrite the results of what has been discussed. This strategy has a syntax in accordance with the order in it, namely think, talk, write. To improve KPMM and DM, students are given the opportunity

to practice solving problems, understanding and solving mathematical problems. Then students also practice self-confidence, diligently working on mathematical assignments, and flexibility in investigating mathematical ideas and trying to find alternative methods for solving problems. In addition, through the TTW strategy in cooperative learning, students can express their opinions, express ideas in solving problems and dare to present the results that have been obtained. Furthermore, the steps of the TTW strategy in cooperative learning can provide opportunities for students to think freely, creatively, share opinions, rewrite the results of their own ideas and the results of their discussions. The teacher acts more as a facilitator and mediator to encourage students to carry out their own learning activities in class. As TTW strategy steps in cooperative learning that is processed through mathematical problem solving.

Noting the importance of KPMM and DM students in mathematics learning, the improvement of KPMM and mathematical disposition must be improved. For this reason, it is necessary to conduct research on improving the problem solving ability and mathematical disposition of MTs students in Kuantan Singingi Regency with the material of Quadrilateral and Triangle. The aim of this research is; (1) Seeing the improvement of students' mathematical problem solving abilities that obtain Think Talk Write strategies in cooperative learning is higher than students who obtain learning with a scientific approach? (2) Seeing an increase in the mathematical disposition of students who get a Think Talk Write strategy in cooperative learning is higher than students who obtain a scientific approach?

2. Methodology

This type of research was a quasi-experimental study, which aims to see the causal relationship that we do on the independent variables and the results are seen from the dependent variable (Ruseffendi, 2005). The experimental design used Non-equivalent Control Group Design. The schols were from high, medium, and low school and groupped to the experimental and control classes. Both classes were both given a pretest and posttest. The experimental class was given with the TTW strategy treatment in cooperative learning and the control class was given the learning treatment with a scientific approach. The study population was all MTs students in Kuantan Bay City, Kuantan Singingi Regency. Based on data on the results of the national mathematics examination, the population of this study was 12 MTs students in Kuantan Singingi District who took the national exam. The research sample was MTs grade VII MTs students from 3 MTs in Kuansing District. The sample in this study amounted to 135 students with an experimental class of 69 students and a control class of 66 students.

3. Results and Discussion

To obtain data in this study was to use a test instrument (KPMM) consisting of 6 question items to measure student KPMM, and (questionnaire) to measure

students mathematical disposition before and after learning activities. Data were analyzed through the following stages:

a. Calculate the increase in KPMM using the N-gain score with the formula

$$\text{N-gain} = \frac{\textit{posttest score} - \textit{pretest score}}{\textit{maximum score} - \textit{pretest score}}$$

The results of the n-gain calculation are then interpreted using the criteria in Table 1.

Table 1. N-Gain Criteria

Gain Coefficient (g)	Interpretation
$\geq 0{,}7$	High
$0{,}3 \leq N - Gain < 0{,}7$	intermediate
$< 0{,}3$	Low

b. Test the necessary statistical requirements as a basis for testing hypotheses, namely the normality test using the Kolmogorov-Smirnov test and the variance homogeneity test using the Levene-Test.
c. Test the presence or absence of the average difference between the two experimental and control classes using the Independent Sample T-test. Data analysis was performed with the help of SPSS Version 21 for Windows software.

Findings and Discussion

1. Description of Students Mathematical Problem Solving Ability

Data on students mathematical problem solving abilities were obtained through preliminary data and posttest data. The table below is a description of the pretest, posttest, and N-gain data of students' mathematical solving abilities in the TTW class and the overall scientific class.

Table 2. Student Pretest, Posttest, and N-gain KPMM Descriptive Statistics

Class	*Pretest*			*Postest*		N-gain	
	N	$\bar{X}$	STD	$\bar{X}$	STD	$\bar{X}$ (g)	STD
Experiment	69	24,65	2,68	51,32	5,54	0,75	0,16
Control	66	24,52	2,50	46,08	4,24	0,61	0,12
SMI				60			

Based on the results of table 2, the students mathematical problem solving abilities increased higher after learning with the TTW Strategy.

a) Analysis of Pretest Data Ability to Solve students mathematical problems

Normality Test

A summary of the pretest data normality test result is presented in Table 3.

Table 3. Student KPMM Pretest Normality Test Results Data

Class	Shapiro-Wilk			Conclusion
	Statistic	*Df*	*Sig.*	
Experiment	0,981	69	0,359	H_0 received
Control	0,965	66	0,056	H_0 received

Based on the decision making criteria, the data from Table 3 shows that the significance value of the learning class with the TTW Strategy 0359≥α = 0.05 and the learning class with the scientific approach 0.056≥α = 0.05α = 0.05 so that H0 is accepted.

Homogeneity Test

A summary of the pretest homogeneity test results is presented in Table 4.

Table 4. Data Variance Homogeneity Test Results

Lavene Statistic	df1	df2	Sig	Conclusion
0,162	1	133	0,688	H_0 received

Refering to the decision making criteria, the data from Table 4 shows that the significance value for both classes is 0.688 α = 0.05 so H0 is accepted. This means that the population variance of pretest data mathematical problem-solving abilities between students who obtain learning with the TTW strategy and students who obtain learning with a scientific approach is homogeneous. Because the variance of both classes is homogeneous, it is continued with t test.

Test of Similarity of Two Average Pretest Students Mathematical Problem Solving Ability

Decision making is based on the test criteria used ie if the Sig. (p-value) <α (α = 0.05), then H_0 is rejected and Sig. (p-value) ≥ α (α = 0.05) then H_0 is accepted. A summary of the results of the average difference in the pretest data is presented in Table 5.

Table 5. Data Similarity Test Results for Student KPMM Pretest

t-test for equality of means			Conclusion
t	*df*	Sig. (2-tailed)	
0,307	133	0,759	H_0 received

In the table 5, the Sig. (2-tailed) 0.759≥α = 0.05, meaning that H_0 is accepted. This shows that there is no difference in the average pretest of the mathematical problem solving ability of students who obtain learning with the TTW strategy with students who obtain learning with a scientific approach.

b) Posttest Data Analysis Students Mathematical Problem Solving Ability

Normality Test

A summary of the posttest data normality test result is presented in Table 6

Table 6. Student KPMM Posttest Normality Test Results Data

Class	Shapiro-Wilk			Conclution
	Statistic	*df*	*Sig.*	
Experiment	0,957	69	0,019	H_0 rejected
Control	0,971	66	0,123	H_0 received

Based on the decision making criteria, the data from Table 6 shows that the significance value of the learning class with the TTW strategy is $0.0129 < \alpha = 0.05$ so H_0 is rejected. This means that the final ability (posttest) mathematical problem solving of students in class learning with TTW strategy comes from populations that are not normally distributed.

Test the Difference of two Posttest Mean Mathematical Problem Solving Abilities for Students

A summary of the posttest average difference test result is presented in Table 7.

Table 7. Student Difference Test Results Data Posttest KPMM

	Posttest	**Conclution**
Mann-Whitney U	999.000	
Z	-5,635	H_0 rejected
Asymp. Sig. (2-tailed)	0,000	

In table 7, the Sig. (2-tailed) 0,000 <0.005 then H_0 is rejected. This means that at the 95% confidence level, there is an average difference between students learning with the TTW strategy and students learning with a scientific approach.

c) Improved Data Analysis (N-Gain) Students' Mathematical Problem Solving Ability

Testing the difference in increasing students' mathematical problem solving abilities in both classes as a whole can be done with the following steps:

N-Gain Normality Test

A summary of the normality test result for N-gain data is presented in Table 8.

Table 8. Student KPMM N-gain Normality Test Result Data

Test	Class	Sig	Information
N-gain	Experiment	0,012	Abnormal
	Control	0,216	Normal

The data in the Table 8 shows that the significance value of the experimental class is 0.012 $<\propto$ = 0.05 so H_0 is rejected. This means that the increase (N-gain) of students' mathematical problem solving abilities based on All Levels in class learning with the TTW strategy in cooperative learning is not normally distributed and the class learning scientifically comes from a normally distributed population. Therefore, the next step is to carry out a non-parametric test using the Mann-Whitney U test.

N-Gain Difference Test

A summary of the results of the difference test (N-gain) of the mathematical problem solving abilities of students of the TTW strategy class in cooperative and scientific learning is presented in Table 9.

Table 9. Data of Test Results of the Difference in Average N-gain of KPMM Students

Aspect	Class	Mann-Whitney U	Z	Sig.
N-gain	Experiment Control	994,000	-5,648	0,000

In the table 9, the Asymp value is obtained. Sig. (2-tailed) of 0,000, then H_0 is rejected. This means that at the 95% confidence level, an increase in the mathematical problem solving ability of students who obtain learning with the TTW strategy in Cooperative Learning is higher than students who obtain learning with scientific learning.

2. Description of Student's Mathematical Disposition

In addition to knowing the difference in the increase (N-gain) of students 'mathematical problem solving, the difference in the increase (N-gain) of students' DM is also analyzed.

Table 10. Descriptive Statistics of Responses, Postresponses, and N-gain of DM Students

Class	*Preresponse*			*Postresponse*		N-gain	
	N	$\bar{X}$	STD	$\bar{X}$	STD	$\bar{X}(g)$	STD
Experimentation Class	69	56,07	5,36	96,06	8,43	0,48	0,10
Control class	66	57,42	5,29	80,23	7,80	0,27	0,10

Refering to the Table 10, it can be seen that the average pretest of students' mathematical disposition as a whole in the experimental class is lower than the control class with a difference of 1.35. The average posttest overall mathematical disposition of students in the experimental class was higher than the control class with a difference of 15.83. Then for the average increase (N-gain) mathematical disposition overall students are higher than the control class with a difference of 0.21.

a) Analysis of Students' Mathematical Disposition Pretest Data

Normality Test

A summary of the pretest data normality test result is presented in Table 11.

Table 11. Data on the Test Results of Students' Mathematical Disposition Normality Pretest

Class	Shapiro-Wilk			Conclution
	Statistic	*Df*	*Sig.*	
Experiment	0,967	69	0,067	H_0 accepted
Control	0,976	66	0,226	H_0 accepted

Table 11 shows that the significance value of the experimental class is $0.067 \geq \alpha = 0.05$ so that H_0 is accepted, while the significance value of the control class is $0.226 = \alpha = 0.05$ so that H_0 is also accepted. This means that the initial ability (pretest) of the mathematical disposition of students in class learning with the TTW strategy and students learning with a scientific approach come from populations that are normally distributed, then proceed with homogeneity tests.

Homogeneity Test

A summary of the pretest homogeneity test result is presented in Table 12.

Table 12. Data Results of Data Variance Homogeneity Tests

Lavene Statistic	df1	df2	Sig	Conclution
1,132	1	44	0,289	H_0 accepted

Refering to the decision making criteria, the data from Table 12 shows that the significance value for both classes is $0.0289 \geq \alpha = 0.05$ so H0 is accepted. This means that the population variance of mathematical disposition pretest data between students who obtained learning with the TTW strategy and students who obtained learning with a scientific approach was homogeneous.

Test of Similarity of Two Average Mathematical Disposition Pretest Students

A summary of the average difference in the pretest the result is presented in Table 13.

Table 13. Data Results of Similarity Tests of Mathematical Student's Pretest Disposition

t-test for equality of means			Conclution
t	*df*	Sig. (2-tailed)	
-1,474	133	0,143	H_0 accepted

In table 13, the Sig. (2-tailed) of $0.143 \geq \alpha = 0.05$, meaning that H0 is accepted.

b) Posttest Data Analysis of Students' Mathematical Disposition

Normality Test

A summary of the posttest data normality test result is presented in Table 14.

Table 14. Posttest Normality Test Result Data for Mathematical Disposition of Students

Class	Shapiro-Wilk			Conclution
	Statistic	*df*	*Sig.*	
Experiment	0,971	69	0,105	H_0 accepted
Control	0,980	66	0,378	H_0 accepted

Based on decision making criteria, the data from Table 14 shows that the significance value of the experimental class is $0.105 \geq \alpha = 0.05$ so that H_0 is accepted, as well as the significance value of the control class $0.378 \geq \alpha = 0.05$ so that H_0 is accepted. This means that the final ability (posttest) mathematical disposition of students in class learning with the TTW strategy and students learning with a scientific approach come from populations that are normally distributed, then proceed with a homogeneity test.

Homogeneity Test

A summary of the pretest homogeneity test result is presented in Table 15.

Table 15. Data Results of Data Variance Homogeneity Tests

Lavene Statistic	df1	df2	Sig	Conclution
0,042	1	133	0,838	H_0 accepted

Based on the decision making criteria, the data from Table 15 shows that the significance value for both classes is $0.838 \geq \alpha = 0.05$ so H0 is accepted. This means that the population variance data postest mathematical disposition between students who get learning with the TTW strategy and students who get learning with a scientific approach is homogeneous. Because the variance of both classes is homogeneous, it is continued with t test.

Test of Similarity of Two Postest Average Mathematical Disposition of Students

In the results of the normality and homogeneity test, it was found that the posttest data of the class learning with the TTW strategy in cooperative learning and the class learning with the scientific approach were normally distributed and homogeneous in variance. Furthermore, to see the difference in the average posttest mathematical disposition data students do data processing using the t test.

Table 16. Data Results of Testament Similarity Postest Mathematical Disposition of Students

t-test for equality of means			Conclution
t	*df*	Sig. (2-tailed)	
11,317	133	0,000	H_0 rejected

In table 16, the Sig. (2-tailed) of 0,000 <α = 0.05, meaning H0 is rejected. This shows that there are differences in the average posttest mathematical disposition of students who get learning with the TTW strategy with students who get learning with a scientific approach.

c) Analysis of Student Mathematical Disposition (N-gain)

N-Gain Normality Test

A summary of the normality test for N-gain result is presented in Table 17.

Table 17. Data Results of N-gain Normality Test for Student's Mathematical Disposition

Test	Class	Sig	Information
N-gain	Experiment	0,02	Abnormal
	Control	0,752	Normal

Based on the decision making criteria, the data from Table 17 shows that the significance value of the experimental class is 0.012 <∝ = 0.05 so H0 is rejected. This means that the increase (N-gain) of mathematical disposition of students based on All Levels in class learning with the TTW strategy in cooperative learning is not normally distributed and the class learning scientifically comes from a normally distributed population.

N-Gain Difference Test

A summary of the results of the difference test (N-gain) mathematical disposition of TTW strategy class students in cooperative and scientific learning is presented in Table 18.

Table 18. Data Results of the Difference Test Average N-gain of Mathematical Disposition of Students

Aspek	Class	Mann-Whitney U	Z	Sig.
N-gain	Experiment Control	390,500	-8,304	0,000

In table 18, the Asymp value is obtained. Sig. (2-tailed) of 0,000, then H0 is rejected. This means that at the 95% confidence level, an increase in the mathematical disposition of students who obtain learning with the TTW strategy in Cooperative Learning is higher than students who obtain learning with scientific learning.

Based on the results of previous studies, it can be stated that the TTW strategy in cooperative learning can improve KPMM and DM students. The results of this study reinforce and complement the research of Hanifah (2016), Neka (2014) which states that learning with the TTW Strategy is better than learning with a scientific approach to improve KPMM and DM students.

Mathematical Problem Solving Ability

Overall KPMM students at an overall level has increased. Previous studies related to the TTW Strategy in Cooperative Learning that complement the results of this study are Asep (2011), Arina, (2014), and Mika (2016) which provides learning outcomes that using the TTW strategy in cooperative learning can provide influence and improve KPMM students so that students' learning achievement is better compared to students who study with a scientific approach. Based on the results of the study, the mathematical problem solving ability of students in class learning with the TTW strategy in cooperative learning increased significantly significantly compared to students learning with a scientific approach this can be seen in the TTW strategy class in cooperative learning on average improvement (N-gain) of 0.75 and the scientific class of 0.61.

Student Mathematical Disposition

Another finding from the results of this study is that the increase in mathematical disposition of students who learn with the TTW strategy is significantly better than the mathematical disposition of students who learn with a scientific approach, overall based on school level (high, medium, low) students. This improvement can occur because in learning with the TTW strategy, students are given learning situations and conditions that are tailored to what is good for learning. Students are invited to initiate learning with fun activities so as to form positive perceptions of students towards learning, besides students are also given learning experiences to be actively involved during the learning process. This can help improve students' mathematical confidence (disposition) to succeed in learning.

Previous studies related to TTW and DM strategies of students who complement the results of this study are Sumirat (2014), Hanifah Nurus Sopiany (2016) which gives the result that using the TTW Strategy in cooperative learning can improve student DM to be better than students who learn by approach scientific. Based on the results of the study, the mathematical disposition of students in class learning with the TTW strategy in cooperative learning experienced a significantly higher increase compared to students learning with a scientific approach it can be seen in the TTW strategy class in cooperative learning average increase (N- gain) of 0.48 and the scientific class of 0.27.

4. Conclusion

Based on the results of the study it was seen that an increase in KPMM and DM students who obtained learning with the TTW strategy were significantly higher than students who obtained learning with a scientific approach.

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How to cite this article:

Guswinda, Yuanita, P. & Hutapea, N. M. (2019). Improvement of Mathematical Problem Solving and Disposition Ability of MTs Students Through StrategiesThink Talk Write in Cooperative Learning In Kuantan Singingi Regency. *Journal of Educational Sciences*, *3(3)*, 377-389.