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IMPROVED ABILITY OF UNDERSTANDING AND MATHEMATICAL REASONING AND MOTIVATION THROUGH THINK TALK WRITE APPROACH (TTW) JUNIOR HIGH SCHOOL STUDENTS

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Abstract
This study aims to examine the achievement and improvement of the ability of understanding and mathematical reasoning and motivation through Think Talk Write (TTW) approach to junior high school students. The population in this study is all junior high school in West Bandung Regency and the sample is class VIII of SMPS Darun Nasya, The instrument used in the research is a question of understanding and mathematical reasoning and questionaire of learning motivation attitude, then the data obtained is processed through two-way Anova test and correlation and regression test, data processing using IBM Statistics SPSS 21. Results of research involving TTW as independent variables in the experimental class and direct learning in the control class showed: There was a difference in achievement and improvement of mathematical understanding between control and experiment class, There are differences in achievement and improvement of mathematical reasoning between control and experiment class, There is difference of student's learning motivation between control and experiment class.
Keywords: Mathematical understanding, Mathematical reasoning, Learning motivation, Think Talk Write approach.

Abstrak
Penelitian ini bertujuan untuk menelaah pencapaian dan peningkatan kemampuan pemahaman dan penalaran matematis serta motivasi melalui pendekatan *Think Talk Write* (TTW) pada siswa SMP. Populasi pada penelitian ini adalah seluruh SMP se-KBB dan sampelnya dalah kelas VIII SMPS Darun Nasya. Instrumen yang digunakan dalam penelitian adalah soal uraian untuk mengukur pemahaman dan penalaran matematis serta skala sikap motivasi belajar, selanjutnya data yang diperoleh diolah melalui uji stastistik Anova dua jalur serta uji korelasi dan regresi, pengolahan data menggunakan IBM *Statistics* SPSS 21. Hasil penelitian yang melibatkan TTW sebagai variabel bebas pada kelas eksperimen dan pembelajaran langsung pada kelas kontrol menunjukan: Terdapat perbedaan pencapaian dan peningkatan pemahaman matematis antara kelas kontrol dan eksperimen, terdapat perbedaan pencapaian dan peningkatan kemampuan penalaran matematis antara kelas kontrol dan eksperimen, terdapat perbedaan motivasi belajar siswa antara kelas kontrol dan eksperimen.

Kata Kunci: Pemahaman matematis, Penalaran matematis, Motivasi belajar, Pendekatan Think Talk Write (TTW)

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INTRODUCTION

The ability to understand mathematical concepts and mathematical reasoning abilities are two aspects of interconnected ability that must be mastered by students when learning math in the learning process in school. There is a very close relationship between mathematical material, conceptual understanding, and mathematical reasoning (Depdiknas, 2002).

The ability of mathematical understanding is the first level of mathematical ability as a support for students to be able to achieve the next capability, such as reasoning ability, communication, connection, and up to the problem-solving ability. Mathematical ability is a very important part for students to continue to a higher level of ability to arrive at the application in real life. While mathematical reasoning according to Shurter and Pierce can be defined as the process of achieving logical conclusions based on facts and relevant data (Sumarmo, 1987).

Basically in the process of learning mathematics, every student in solving mathematical problems requires the ability of understanding as the basis and reason as a support to solve problems related to mathematics problems. But still many students who fail in mastering the concept of mathematics because it has not possession of understanding and reasoning. One of the tendency of a number of students to fail to master the subjects in mathematics is that students do not use the power of reason in solving mathematical problems given. So it takes the supporting factors of students in developing the learning process including reasoning ability (Wahyudin, 1999).

In this case the supporting factors that can affect students in the learning process that can make students eager or lazy in learning such as there are internal and external factors. Fishter and Fippmentions that "internal factors (students' intelligence, student aptitude, learning ability, and student interest) and external factors (material presentation models, teacher attitudes, learning atmosphere, teacher competence, and the wider community). Furthermore, Fishter suggests that "external factors have a strong enough influence on a person's cognitive development" (Dahlan, 2004). Therefore, these internal and external factors need to be considered, one of the internal factors that have a big influence is the motivation to learn and external factors that also contribute great is the learning, so that required learning that can accommodate the ability of understanding and reasoning and mathematical motivation to learn.

Think Talk Write (TTW) learning is an alternative solution to improve mathematical understanding and mathematical reasoning as well as student learning motivation. TTW itself is a learning approach that can develop the students' understanding and reasoning skills. TTW was developed by Huinker and Laughlin built through thinking, speaking and writing (Yamin & Ansari, 2008). The TTW flow begins with the involvement of students in thinking or dialogue with themselves after the reading process, then talking and sharing ideas with friends and then writing the results of the discussion. TTW stimulates more active students and is expected to contribute positively in improving student learning outcomes. Therefore in this study will be investigated on improving the ability of understanding and mathematical reasoning through learning TTW on prism and limas material in class.

METHOD

This research method is quasi experiment. Researcher take two class as sample of research, that is one class control and one class experiment. The population in this study is all private junior high schools in West Bandung regency and the sample is class VIII Darun Nasya Junior High School. The research design as follows:

O X O

O O

O : Pretest = Postest Ability of Understanding and Mathematical Reasoning
X : Think Talk Write Learning Approach
- - - : The sampling is not a random subject, which means random class.

Instruments in this research are:
1. Mathematical understanding ability test which consists of 4 description questions
2. Mathematical reasoning ability tests of which consists of 4 description questions
3. Questionnaire / attitude scale to measure learning motivation

The research procedure consists of three phases: preparation stage, implementation stage and evaluation stage. In the preparation stage, an instrument test is conducted to test the quality of the instrument on the validity, reliability, difficulty index and differentiating power. The test was conducted on the students of class IX, the test results were then analyzed for improvement on the research instrument. After that the learning device is also prepared and continues at the stage of implementation which begins with the taking of pre test data, then learning begins. The control class gets direct learning and the experimental class gets learning with the TTW approach, the learning is carried out in five meetings with the prism and limas material and at the end of the learning the post test data is taken. After all the data collected the next stage is the evaluation stage of data processing with the help of IBM Statistics SPSS 21 which begins with the test of normality and homogeneity as a prerequisite test and continued using the two-way Anova test to see the significance of differences in ability between control and experimental classes as well as tests of correlation and regression to see associations between research variables in the experimental class.

RESULT AND DICUSSION

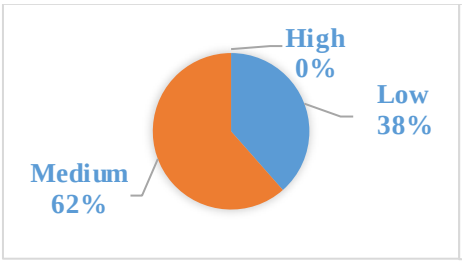
Result For Mathematics Understanding Ability

The average pre test score of mathematical understanding of the control class is 4.42 and the experimental class is 4.56. While the average post test of control class is 8.5 and experiment class is 10.76, it means that after learning both control and experiment class have improvement on students' mathematical understanding score, but is there any significant difference between control and experiment class will be proven through statistical testing and categorization of student N-gain. The following N-gain categories are used:

Table 1. N-gain Categories

N-Gain	**Interpretation**
g<0,3	Low
0,31<g<0,7	Average
g> 0,71	High

Next will be presented a comparison of the distribution of students' mathematical understanding abilities based on N-gain category (low, medium, high) in the control class and the experimental class:



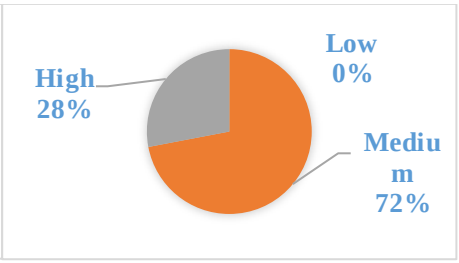


Figure. 1a **Figure.1b**

Student Distribution Based on Mathematical Understanding Ability N-Gain
a. In Control Class b.in experiment class

From the two figures above can be seen if the distribution of mathematical understanding ability N-gain in the experimental class is better because of the students who have high N-gain category. But does the difference in control and experimental N-gain differ significantly, to test it statistical analysis will present, beginning with the Kolmogorov-Smirnov normality test:

Table 2. Normality Test Result Of Mathematical Understanding Ability Improvement

Ability	Learning Approach	Kolmogorov-Smirnov[a]		
		Statistic	df	Sig.
Understanding ability	Direct	,081	26	,200*
N-gain	TTW	,147	25	,170

The hypothesis to be tested is as follows:
H_0 : Data distribution normal
H_1 : Data distribution not normal
With the test criteria: If (Sig.)> 0.05 then accept H_0.

From Table 2 it is known that the mathematical understanding improvement data in the control class as well as the experiments is normally distributed, where the significance of the two classes is greater than 0.05. Because the two data are normally distributed then the homogeneity test is done.

Table 3. Homogenity Test Result Of Mathematical Understanding Ability Improvement

F	df1	df2	Sig.
,648	5	45	,665

The hypothesis to be tested is as follows:
H_0 : Varians of two group homogenous
H_1 : Varians of two group not homogeous

From Table 3 it shows that the value of Sig. is 0.665 or more than 0.05 then H_0 is received or in other words the variance of both classes are homogeneous. Since both classes are homogeneous then proceed to the two-way Anova test.

Table 4. Two-Way Anova Test Result Of Mathematical Understanding Ability Improvement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	,789[a]	5	,158	6,582	,000
Intercept	7,516	1	7,516	313,360	,000
Approach	,349	1	,349	14,543	,000
KAM	,226	2	,113	4,707	,014
Approach * KAM	,012	2	,006	,249	,780
Error	1,079	45	,024		
Total	12,459	51			
Corrected Total	1,869	50			

The hypothesis to be tested is as follows:

H_0 : There is no difference in the improvement of the mathematical understanding between the control classes that get the learning using the direct approach with the experimental class using the TTW approach.

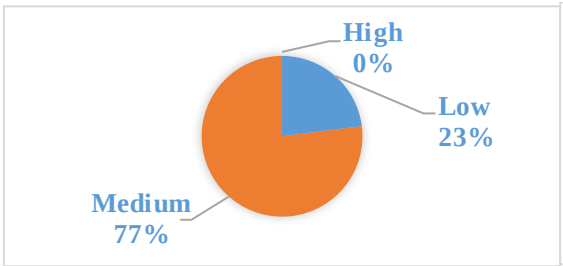
H_1 : Mathematical understanding improvement of experimental classes using the TTW approach is better than control classes that get learning using a direct approach.

With the test criteria: If (Sig.)> 0.05 then accept H_0.

Based on Table 4 can see the significance of the approach of 0.00 or less than 0.05 then H_0 rejected and H_1 accepted or in other words TTW learning effect on improving students' mathematical ability.

Result For Mathematical Reasoning Ability

The average pre test score of mathematical reasoning of the control class is 3,42 and the experimental class is 3,52. While the average post test of control class is 8,38 and experiment class is 10,2, it means that after learning both control and experiment class have improvement on students' mathematical understanding score, but is there any significant difference between control and experiment class will be proven through statistical testing and categorization of student N-gain based on table 1.



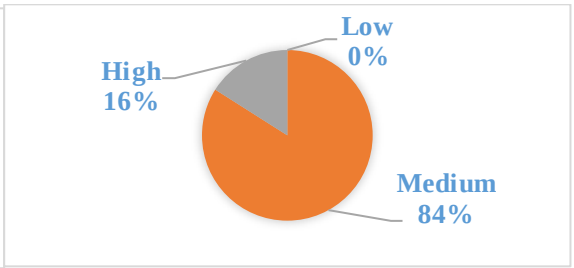


Figure. 2a **Figure.2b**

Student Distribution Based on Mathematical Reasoning Ability N-Gain
a. Control Class b.experiment class

From figure 2 it is seen if the student's N-gain in the experimental class is better, and to test whether there is a significant difference between the control and the experiment class will be tested statistically. The test result will present below:

Table 5. Normality Test Result Of Mathematical Reasoning Ability Improvement

Ability	Learning Approach	Kolmogorov-Smirnov[a]		
		Statistic	df	Sig.
Reasoning ability N-gain	Direct	,128	26	,200*
	TTW	,177	25	,041

Still using the same test criteria as Table 2 then for Table 5 the interpretation results of Kolmogorov-Smirnov normality test of N-gain data on the control class has a significance of 0.200 or greater than 0.05 then H_0 is accepted or in other words the data is normally distributed, whereas for significance of the experimental class the significance value is 0.041 or less than 0.05 so that H_0 is rejected which means the data is not a normal distribution. Then the next test using non parametric statistics. The test result will present below:

Table 6 . ***Mann-Whitney U*** **Test Result Of Mathematical Reasoning Ability Improvement**

Test	N-gain for Reasoning Ability Improvement
Mann-Whitney U	134,000
Wilcoxon W	485,000
Z	-3,602
Asymp. Sig. (2-tailed)	,000

The hypothesis to be tested is as follows:

H_0: There is no difference in the ability of mathematical reasoning between control classes that gain learning using a direct approach with an experimental class using the TTW approach.

H1: The mathematical reasoning ability of the experimental class using the TTW approach is better than the control class that gets the learning using the direct approach.

With the test criteria: If (Sig.)> 0.05 then accept H_0.

Based on Table 6 can seen if the value of Sig. Less than 0.05, it can be concluded if the mathematical reasoning ability of the experimental class using the TTW approach is better than the control class that obtains learning using a direct approach.

Result For Learing Motivation

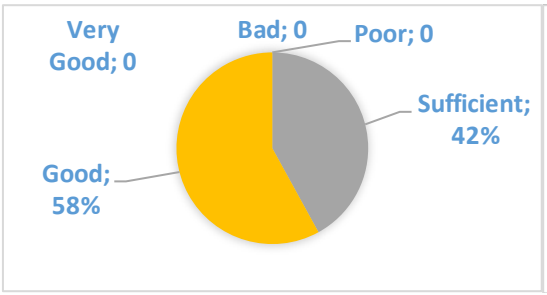
Based on the results of data processing on the attitude scale of students 'learning motivation, the students' learning motivation is classified into several categories as follows:

Table 7. Learning Motivation Categories

Average score	Interpetation
1,00-1,49	Bad
1,50-2,49	Poor
2,50-3,49	Sufficient
3,50-4,49	Good

4,50-5,00	Very Good

Next will be presented comparison of the distribution of students by their motivation categories in the control class and experiment class:



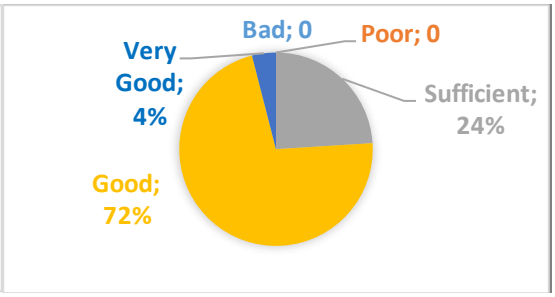


Figure. 3a **Figure.3b**

Student Distribution Based on Learning Motivation Ability N-Gain
a. In Control Class b.in experiment class

From Figure 3 it can be seen if the experimental class study motivation is better than control class and to prove whether the motivation difference between the control class and the experiment is significant it will be tested statistically. The result will present below:

Table 8. Normality Test Result Of Learning Motivation

Ability	Learning Approach	Kolmogorov-Smirnov[a]		
		Statistic	df	Sig.
Motivation	Direct	,116	26	,200*
	TTW	,079	25	,200*

Still using the same test criteria with Table 2 then for Table 8 it is known if the motivation data in the control class as well as the experiment is normally distributed, where the significance of the two classes is greater than 0.05. Because the two data are normally distributed then the homogeneity test is done.

Table 9. Homogenity Test Result Of Learning Motivation

F	df1	df2	Sig.
1,409	5	45	,239

To interpret Table 9 also used the same test criteria as Table 3, from Table 9 it is seen that Sig. of 0.239 or more than 0.05 then H_0 is received or in other words the variance of both classes are homogeneous. Because the data is normal and homogenous next test will proceed is two way Anova test.

Table 10.Two Way Anova Test Result Of Learning Motivation

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6,432[a]	5	1,286	10,286	,000
Intercept	436,100	1	436,100	3487,120	,000
Approach	1,615	1	1,615	12,913	,001

KAM	3,157	2	1,579	12,624	,000
Approach *KAM	,004	2	,002	,017	,983

The hypothesis to be tested is as follows:

H_0: There is no difference in learning motivation between control classes that gain learning using a direct approach with the experimental class using the TTW approach.

H_1: The experimental learning class motivation using the TTW approach is better than the control class that gets the lesson using a direct approach.

With the test criteria: If (Sig.)> 0.05 then accept H_0.

Based on Table 10 can see the value of significance Approach is 0.001 or less than 0.05 then H_0 rejected and H_1 accepted or in other words learning TTW help develop student motivation.

Discussion

Mathematical Understanding Ability

Mathematical understanding is a very important aspect in the principle of mathematical learning and mathematical understanding is more meaningful if built by the students themselves. Therefore, the ability of understanding can not be given by force, meaning that the concepts and logic-mathematical logic is given by the teacher, and when the student forgets the algorithm or formula given, the student can not solve mathematical problems (Sari, Nurochmah, Haryadi, & Syaiturjim, 2016). So that learning is needed that is able to develop students' mathematical understanding, one of them through TTW learning that is able to trigger more active students which can automatically improve their mathematical understanding. This was in accordance with the exposure of the results of the study, initially there was no difference in the comprehension ability between the control class and the experimental class, and after being given treatment where the control class got the direct learning and the experimental class got the TTW learning the statistical test showed better post test score in the experimental class. This is in line with the results of Fatmawati's research which states that the application of TTW can encourage students to think, actively participate in learning, communicate well, be ready to express their opinions, appreciate others, and train students to write the results of their discussion into the form of writing systematically (Fatmawati, Santosa, & Aryanto, 2013). Student activity in learning that can be improved through the implementation of the TTW strategy is the activity of seeing, speaking, listening, writing, mental, and emotional activity. With the increase in learning activities that are able to encourage improving students' mathematical understanding skills.

Mathematical Reasoning Ability

The ability of mathematical reasoning is a higher level of ability than the ability of mathematical understanding, seen from the acquisition value of pre test of the ability of mathematical reasoning lower than pre test of mathematical understanding ability in both control class and experiment class. After a different study was conducted in control and experiment class then post test showed an increase in mathematical reasoning ability both in control class and experiment class, but the achievement of post test value in experiment class better, in line with statistical test which have done show difference a significant increase in post test and N-gain mathematical reasoning ability between control class and experimental class, this means that TTW learning contributes to the development of mathematical reasoning ability better than direct learning.

In addition, the imprvement of reasoning ability is also supported mathematical understanding, because the ability of understanding will support other mathematical abilities one of which is the ability of reasoning. This is consistent with Sugandi's assertion that improving students' ability in understanding can encourage students to draw conclusions from case to case, generalize, similarity, predictability, tendencies and responses to models, facts, traits, or existing pattern relationships, using patterns and relationships to analyze situations, all of which are indicators of mathematical reasoning (Sugandi, 2018).

Learning Motivation

Motivation is important in supporting the development of learning outcomes, assumed if a student who has high learning motivation will obtain good learning results as well. However, motivation not only arises from within but sometimes necessary stimulus and outside support to grow it, appropriate learning is expected to support the increase in motivation to learn that will lead to increased learning outcomes.

When viewed from the results of research, student learning motivation in the experimental class is much better than the students 'learning motivation in the control class, this means that learning TTW in the experimental class affects the students' learning motivation. This is shown through the results of statistical tests that show a significant difference between the results of student learning motivation in the control class and experimental class.

CONCLUSION

Based on the data analysis and discussion presented in the previous chapter, the following conclusions are obtained:

1. Improvement of students' mathematical understanding ability with learning using Think Talk Write approach is better than using direct learning in terms of the overall and the initial ability of the students.
2. Improvement of students' mathematical reasoning whose learning using Think Talk Write approach is better than using direct learning in terms of the overall and initial ability of the students.
3. Student learning motivation learning using Think Talk Writing approach better than those who use direct learning in terms of overall initial ability of the students.

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