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Mathematical Communication Ability Through Learning the Read Think Talk Write (RTTW) Model with a Scientific Approach in Terms of Self Efficacy

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ABSTRACT

This research is a mixed methods study with a sequential explanatory design which aims to test the effectiveness of the RTTW learning model with a scientific approach to mathematical communication ability in terms of self-efficacy and to describe students based on mathematical communication abilities in terms of self-efficacy on the RTTW learning model with a scientific approach. The research was conducted at SMP Negeri 13 Semarang with class VIII F as the experimental class and VIII H as the control class and the research subjects were 6 students from the experimental class. This research data collection technique with tests and non-tests. The results of this study are that the application of learning using the RTTW learning model with a scientific approach is declared effective. This is indicated by: (a) Mathematical communication ability with the application of RTTW learning with a scientific approach achieves the classical criteria, namely 75%, (b) Mathematical communication ability in the experimental class has a higher proportion of final test results than the control class, (c) Average the final test results of students' mathematical communication abilities given the RTTW model learning with a scientific approach achieve KBM, (d) The average final test of students' mathematical communication abilities in the experimental class is better than the average final test results of students' mathematical communication abilities in class control, (e) There is an effect of self-efficacy on mathematical communication ability in class by applying learning with the RTTW learning model with a scientific approach. In the RTTW learning model with a scientific approach in terms of self-efficacy, it was obtained that students in the high self-efficacy category were able to fulfill all three indicators of mathematical communication ability well, students in the moderate self-efficacy category were able to fulfill indicator 1, sufficient on indicator 2 and lacking on indicator 3, and participants students in the low self-efficacy category are less able to fulfill all indicators.

Keywords: Mathematical Communication Ability, Read Think Talk Write Model, Scientific Approach, Self Efficacy

INTRODUCTION

Mathematics is referred to as the queen of science or the mother of science, which is basic knowledge from the development of other sciences such as science, economics, and others which are very useful for human life (Afsari et al., 2021). Proper and thorough mastery of mathematics is needed by students so that students can apply mathematics well according to the fields they will be studying respectively. In learning mathematics, students have an understanding and identification of what will be done and understand certain mathematical statements or where the rules of mathematics come from (Simons, 2017). The objectives of learning mathematics are based on the Permendikbud RI No. 58 of 2014, one of which is that

students can communicate ideas and are in line with NCTM (2014) which says that mathematical communication is an essential competency of mathematics and mathematics education. But in fact, the ability of mathematical communication in Indonesia is still relatively low. Based on the TIMMS survey in 2015, Indonesia was ranked 45th out of 50 countries and on the PISA results Indonesia was ranked 64th out of 72 countries. This is because students still have difficulty expressing everyday events in mathematical language and connecting graphs with mathematical ideas (Ihdayani et al., 2021).

Based on the preliminary study, students still have difficulty using their own language, modelling mathematical problems and reflecting images into mathematical ideas. This means that students' mathematical communication ability needs to be improved. Therefore, a learning model is needed to improve students' mathematical communication ability, namely the Read Think Talk Write (RTTW) model. The Read Think Talk Write (RTTW) model is a learning model that includes the development of reading, thinking, speaking and writing. In this model, students are actively involved through the process of reading and thinking about the material presented in teaching materials, then students communicate it in front of the class (Pratiwi et al., 2019).

In addition to learning, to develop students' self-potential so that they can survive in existing conditions, high self-efficacy is needed for students in their ability to organize and carry out a series of actions to achieve the set results. With self-efficacy students can combine academic learning and self-control according to their abilities (Mufida et al., 2018). Students are given the freedom to study independently to build learning goals and a sense of responsibility in students so that students are not pressured by the learning provided by the teacher but feel the flexibility of learning.

The purpose of this study was to test the effectiveness of the Read Think Talk Write learning model with a scientific approach to mathematical communication ability in terms of self-efficacy and to describe students based on mathematical communication ability in terms of self-efficacy on the scientific approach to Read Think Talk Write learning models.

LITERATURE REVIEW

This research refers to several relevant studies. One of the results of research by Pane et al (2018), that students with low mathematical abilities generally have mathematical communication ability at a lower level than students with high and medium mathematical abilities. Students have not been able to express their mathematical ideas through writing well, have not been able to understand, interpret, and evaluate mathematical ideas, and have not been able to use terms, notations, symbols and structures to present mathematical ideas properly. In addition, research by Handayani et al (2021) shows that the PjBL model with a realistic approach is effective in mathematical communication ability with classical mastery reaching 75% and the effect of self-efficacy is 39.1%, the PjBL model with a realistic approach assisted by web video is effective on the ability mathematical communication with classical completeness reached 75% and the effect of self-efficacy was 53.6%, the average mathematical communication ability of the two experimental classes was the same, it's just that the average value of mathematical communication ability in the PjBL model with a realistic approach assisted by web video was higher, namely 74 .81, while the average mathematical communication ability in the two experimental classes with different control classes had the lowest average score in the three categories, namely on the written text indicator, writing conclusions in their own language. The findings in this study are that there are students with moderate mathematical communication abilities in the high self-efficacy category and there are students with high mathematical

communication abilities in the medium self-efficacy category.

MATERIALS & METHODS

This research is mixed methods research, namely a combination of qualitative research and quantitative research. In this study using a sequential explanatory design. Explanatory sequential design aims to study research problems by starting a study with a series of quantitative research then collecting and analysing data and continuing with qualitative research which aims to explain quantitative research. This research was conducted at SMP Negeri 13 Semarang in class VIII F as the experimental class and VIII H as the control class with 6 students from the experimental class as research subjects.

Data collection techniques in the form of tests and non-tests. In the test technique, students are given mathematical communication ability test questions that have measured validity, reliability, level of difficulty and discriminating power. Data analysis on the mathematical communication ability test consisted of two prerequisite tests (normality test, homogeneity test and average similarity test) and hypothesis testing (test-*t* and simple regression test). In the non-test technique, students are given a questionnaire *self-efficacy*, interviews to find out the results of the communication ability test in terms of *self-efficacy* and documentation.

RESULT

At this stage the researcher measured quantitatively by providing students' initial data based on the circle material initial test. Researchers used the initial knowledge test to determine the minimum learning completeness (KBM) score. The researcher determined the minimum learning completeness score based on a test of mathematical communication ability in circle material with a value of 66. Then, the researcher gave a final test of mathematical communication for the experimental group and the control group.

The Effectiveness of the Read Think Talk Write (RTTW) Learning Model with a Scientific Approach to Mathematical Communication Ability in terms of Self Efficacy

Preliminary data analysis was carried out to find out whether the experimental class and the control class had the same variance or not. Preliminary data in this study used the results of an initial test of mathematical communication ability which had been calculated for the normality test, homogeneity test and average similarity. The final data is obtained from the results of the final test of mathematical communication ability. The final data analysis is used to test the research hypothesis.

Proportion Adequacy Test

Proportion mastery test is used to determine the achievement of classical mastery in the final test of mathematical communication ability in circle material. The proportion completeness test is carried out by comparing the proportion of experimental class students who have completed the KBM with the specified classical percentage, that is 75%. The test performed is the left-sided proportion test with a significance level of 5%. The test criteria are if $z \geq z_{0,5-\alpha}$ then the proportion of students in the experimental class who achieved the KBM has reached 75%, obtained from $z_{0,5-\alpha}$ the standard normal list (table z) with probability $(0,5 - \alpha)$ and significance level 5%. For $z < z_{0,5-\alpha}$ then the proportion has not reached 75%. The summary of the results of the proportion adequacy test calculations can be seen in Table 1.

Table 1 Proportion Mastery Test Results

Class	(x)	(n)	(π_0)	Z_{hitung}	$Z_{tabel}\ (0,45)$
Experiment	31	25	0,75	0,726	0,174

Based on Table 1, value $Z_{hitung} > Z_{tabel}$, so the proportion of students who are given a Scientific Approach Read Think Talk Write

(RTTW) learning that achieves KBM in the final test of mathematical communication ability has reached 75%.

Proportion Difference Test

The different proportion test is used to determine the difference in the proportion of students who achieve KBM with the RTTW model with a scientific approach compared to the proportion of students who achieve KBM with the PBL model with a scientific approach. The test used is the left side proportion difference test. The criteria used are $z < z_{\alpha}$then the proportion of mathematical communication ability students who are taught with the RTTW with a scientific approach are more than the proportion of mathematical communication abilities of students who are taught with the Problem Based Learning (PBL) model with a scientific approach. Values z_{α} obtained from the table z with a significance level 5%. The calculation results can be seen in Table 2.

Table 2 Proportion Difference Test Results

Class	(n)	(x)	(p)	Z_{hitung}	$Z_{tabel}(0,45)$
Experiment	31	25	0,806	2,654	0,174
Control	31	15	0,484		

Based on Table 2, value $Z_{hitung} > Z_{tabel}$, so the mathematical communication ability of students who are given a Scientific Approach Read Think Talk Write (RTTW) learning are more than the proportion of students' mathematical communication ability who are given Problem Based Learning (PBL) learning with a Scientific approach.

Average Completeness Test

The completeness test was carried out to find out the average final test of students' mathematical communication ability using the RTTW model with a scientific approach to reach the KBM determined by the researcher, which was 66. To analyse the average completeness test using the left-sided student's t-test. The test criteria used are if sig. (2-tailed) $< 0,05$ then the average final result of student's mathematical communication ability in the experimental class has reached the KBM and vice versa. The SPSS output results can be seen in Table 3.

Table 3 Average Completeness Test Results

One-Sample Test						
	Test Value = 66					
	t	df	Sig. (2-tailed)	Mean Differences	95% Confidence Interval of the Difference	
					Lower	Upper
Experiment Class Final Test Value	3,555	30	001	9.32258	3.9664	14.6787

Based on output results, obtained sig. (2 tailed) is 0,001. The test used is a one-party test, the sig. (2-tailed)$\times \frac{1}{2} = 0,001 \times \frac{1}{2} =$ 0,0005. Because of the significance value $<$ α or $0,0005 < 0,05$, the average final test results for students' mathematical communication abilities in the experimental class have reached the KBM.

Average Difference Test

The average difference test was carried out to find out the average difference between the results of the final test of the mathematical communication ability of the experimental class and the control class on circle material. The test criteria are if sig. (2-tailed) $< 0,05$ then the average final test result of students' mathematical communication ability who are given RTTW learning with a scientific approach is more than the average mathematical communication ability of students who are taught with the Problem Based Learning (PBL) model with a scientific approach and vice versa. The SPSS output results can be seen in Table 4.

Table 4 Final Data Average Difference Test Results

Independent Samples Test										
		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Differences**	**std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	**Upper**
Communication Ability Final Test Scores	Equal variances assumed	3,053	086	2,999	60	.004	12.37903	4.12812	4.12156	20.63650
	Equal variances not assumed			2,999	57,851	.004	12.37903	4.12812	4.11525	20.64282

Based on the output results, the sig. (2 tailed) is 0,004. Because of the significance value $<$ α or $0{,}004 < 0{,}05$, the average final test results for students' mathematical communication abilities who are given the Read Think Talk Write (RTTW) model with a Scientific Approach are more than the average mathematical communication abilities of students who are taught with the Problem Based Learning (PBL) model with a scientific approach.

Simple Regression Test

The regression test is used to determine the effect of self-efficacy on mathematical communication ability in the experimental class using the RTTW model with a scientific approach. The following results of the regression test calculation output using SPSS can be seen in Table 5.

Table 5 Regression Test Results

Coefficients						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**std. Error**	**Betas**		
1	(Constant)	15,768	27,829		.567	.575
	Self Efficacy	.837	.390	.371	2,149	040
a. Dependent Variable: Experiment Class Final Test Value						

Based on the Coefficients Table, the value $a = 15{,}768$ and $b = 0{,}837$, so the regression equation is $\hat{y} = 15{,}768 + 0{,}837X$, then this value b will be tested. To see if there is an effect, it is known by reading the ANOVA table from the SPSS output.

Table 6 Regression Test Results (ANOVA)

ANOVA						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	878,443	1	878,443	4,616	.040b
	Residual	5518331	29	190,287		
	Total	6396774	30			
a. Dependent Variable: Experiment Class Final Test Value						
b. Predictors: (Constant), Self Efficacy						

Based on the ANOVA regression test with a significance level 5%, sig value is obtained $0{,}040 < 0{,}05$, then there is the influence of self-efficacy on mathematical communication ability. To see the influence of self-efficacy on mathematical communication ability can be seen in Table 7.

Table 7 Regression Test Results (*R Square)*

Summary models				
Model	**R**	**R Square**	**Adjusted R Square**	**std. Error of the Estimate**
1	.371a	.137	.108	13.79447
a. Predictors: (Constant), Self Efficacy				

Based on the model summary table, the R square value is obtained or R^2 equal to 0,137 or 13,7%. This means that self-efficacy affects students' mathematical communication abilities as much as 13,7% and there is still 86,3% variables that affect or can be explained by variables other than self-efficacy variables.

Description of Students Based on Mathematical Communication Ability in View of Self Efficacy in the Scientific Approach Read Think Talk Write Learning Model

The research subjects will be analysed for their mathematical communication ability in terms of high, medium, and low self-efficacy which are categorized based on the results of the self-efficacy questionnaire. Each research subject will describe his mathematical communication ability based on the results of tests of mathematical communication ability and interviews.

Students' mathematical communication abilities based on research subjects, namely SE08, SE15, SE24, SE31, SE12, and SE14. The profile of the research subject's mathematical communication abilities can be seen in Table 8 below.

Table 8 Final Mathematical Communication Proficiency of Research Subjects

Research subject	Indicator of Mathematical Communication Ability		
	1	2	3
SE08	Good	Good	Good
SE15	Good	Good	Good
SE24	Good	Not good	Pretty good
SE31	Good	Good	Good
SE12	Not good	Good	Good
SE14	Pretty good	Not good	Not good

DISCUSSION

Analysis of the Learning Effectiveness of the Read Think Talk Write (RTTW) Model with a Scientific Approach

Quantitative research was conducted to determine the effectiveness of learning the RTTW model with a scientific approach to mathematical communication ability. This research was conducted on circle material for class VIII even semester at SMP Negeri 13 Semarang. The class taken by the researcher as the experimental class was class VIII F and the control class was class VIII H. Classes VIII F and VIII H were given an initial test of mathematical communication ability on elementary circle material, namely regarding the radius, diameter, area and circumference of a circle as prerequisite material. This initial test of mathematical communication ability serves as a calculation of KBM (Minimum Learning Completeness) which will be used in the final test of mathematical communication ability and to determine the average completeness of mathematical communication abilities in the experimental class. Based on the calculation of the initial test of mathematical communication ability, the normality test is obtained with a value sig. 0,069 and homogeneity test with sig. 0,465. Means indicate that class VIII F and VIII H are normally distributed and have the same variance. The similarity of class VIII F and VIII H averages with sig. $0{,}099 > 0{,}05$, meaning that the average initial test results for mathematical communication ability in class VIII F and VIII H are the same.

After obtaining the initial data, the researcher gave treatment to the experimental class using the Read Think Talk Write (RTTW) model with a scientific approach and the control class used the Problem Based Learning (PBL) model with a scientific approach. At the last meeting, a final test of mathematical communication ability was carried out. The final test questions for mathematical communication ability have been tried out in the trial class. Based on the results of the final test of mathematical communication ability, the normality test was obtained with a sig. 0,054 and homogeneity test with sig. 0,086. It means that the results of the final test of mathematical communication ability in class

VIII F and VIII H are normally distributed and have the same variance. For the proportion adequacy test, namely the value $Z_{hitung} > Z_{tabel} 0{,}726 > 0{,}174$, then means that the proportion of students with the RTTW model learning with a scientific approach who achieve KBM in the final test of mathematical communication ability has reached 75% . For the different proportion test, namely the value $Z_{hitung} > Z_{tabel}$, $2{,}654 > 0{,}174$ then means that the mathematical communication ability of students using the RTTW model learning with a scientific approach are more than the proportion of students' mathematical communication abilities using PBL learning with a scientific approach. For the average completeness test, namely the sig. $0{,}0005 < 0{,}05$ then means that the average final test results for students' mathematical communication abilities in the experimental class have reached the KBM. For the average difference test, the sig value is obtained. $0{,}004 < 0{,}05$ then means that the average final test results for the mathematical communication ability of students who are given the RTTW model learning with a scientific approach are more than the average mathematical communication ability of students who are given learning with the PBL model with a scientific approach. For the simple regression test, the sig. $0{,}040 < 0{,}05$ then means that there is an effect of self-efficacy on mathematical communication ability of 13.7%.

Based on the results of the research that has been carried out, obtained (1) the final test results of the experimental class mathematical communication ability achieve the set classical completeness, namely 75%; (2) the proportion of students who pass the final test of mathematical communication ability in the experimental class is more than that of the control class students; (3) the average final test results for students' mathematical communication ability in the experimental class have reached the specified KBM, namely 66; (4) the average result of the final test of students' mathematical communication abilities in the experimental class was more than that of the control class; and (5) there is an effect of self-efficacy on mathematical communication ability in class by applying learning with the RTTW model with a scientific approach. So, from what has been said, it was concluded that learning the RTTW model with a scientific approach was effective on mathematical communication ability. This is in accordance with research Khoerunnisa et al (2016) which shows that the average mathematical communication ability of class VII students who use TTW learning assisted by independent props achieves a minimum value of 75; the average mathematical communication ability of class VII students using TTW learning assisted by independent teaching aids is better than the average mathematical communication ability of students using conventional learning; and the confidence scores of students in class VII using TTW learning assisted by independent teaching aids are higher than the confidence scores of students using conventional learning.

Mathematical Communication Ability Analysis in terms of Self Efficacy

In the analysis of mathematical communication ability in terms of self-efficacy will be described based on self-efficacy categories, namely high, medium and low. Mathematical communication ability in this study are based on NCTM indicators which consist of 3 indicators, including: Indicator 1, namely the ability to express mathematical ideas through oral, written, and demonstrating them and depicting them visually; Indicator 2, namely the ability to understand, interpret, and evaluate mathematical ideas both orally, in writing, and in other visual forms; Indicator 3, namely the ability to use terms, mathematical notations and structures to present ideas and describe relationships with situation models.

Determining the profile of mathematical communication ability in terms of self-efficacy seen from the research results in Table 9. The research subjects were

represented by 2 students based on self-efficacy categories. There are 2 decision-making criteria that researchers use to conclude how well the mathematical communication abilities of each SE category are: 1) if 2 research subjects in the same SE category get the same ability results, then the results of these abilities are used as a conclusion, 2) if 2 subjects research on different SE categories, then the results of the lowest ability become a conclusion. Following is the profile of the final ability of mathematical communication in terms of students' SE, which can be seen in table 9.

Table 9 Final Mathematical Communication Proficiency Viewed from Self Efficacy

SE category	Indicator of Mathematical Communication Ability		
	1	2	3
Tall	Good	Good	Good
Currently	Good	Not good	Pretty good
Low	Not good	Not good	Not good

Based on Table 9, it can be seen that students with high SE categories have the best mathematical communication abilities than medium and low SE categories. This is because students in the high category have achieved good criteria on all indicators of mathematical communication ability. Medium category students have better communication ability than low category students.

Profile of High Category Students' Mathematical Communication Ability

This analysis of mathematical communication ability aims to determine the characteristics of the mathematical communication abilities of research subjects with high self-efficacy. In indicator 1, SE08 and SE15 have been able to express mathematical ideas through writing and demonstrate them and describe them visually. In indicator 2, SE08 and SE15 are able to understand, interpret, and evaluate mathematical ideas in writing. In indicator 3. SE08 and SE15 have been able to use terms, mathematical notations and structures to present ideas and describe relationships with mathematical models. Based on the results of the analysis for each indicator for the two subjects, namely SE08 and SE15, it can be concluded that subjects with high self-efficacy are able to fulfil the three indicators of mathematical communication ability very well. This is in accordance with Rapsanjani and Teni (2021) that subjects with high self-efficacy are better at solving mathematical communication ability questions.

Profile of Medium Category Students' Mathematical Communication Ability

This analysis of mathematical communication ability aims to determine the characteristics of the mathematical communication abilities of research subjects with moderate self-efficacy. In indicator 1, SE24 and SE31 were able to express mathematical ideas through writing and demonstrate them and describe them visually. In indicator 2, SE24 and SE31 are less able to understand, interpret, and evaluate mathematical ideas in writing. In indicator 3, SE24 and SE31 are quite capable of using terms, mathematical notations and structures to present ideas and describe relationships with mathematical models.

Profile of Low Category Students' Mathematical Communication Ability

This analysis of mathematical communication ability aims to determine the characteristics of the mathematical communication abilities of research subjects with low self-efficacy. In indicator 1, SE12 and SE14 have not been able to express mathematical ideas through writing and demonstrate them and describe them visually. In indicator 2, SE12 and SE14 are less able to understand, interpret, and evaluate mathematical ideas in writing. In indicator 3, SE12 and SE14 have not been able to use terms, mathematical notations and structures to present ideas and describe relationships with mathematical models. Based on the results of the analysis for each indicator for the two subjects, namely SE12 and SE14, it can be concluded that subjects with low self-efficacy are less able to fulfil all indicators. SE12 and SE14 have answered

the questions, but there are still many errors and mistakes so that they still do not meet the indicators of mathematical communication ability. This is in accordance with Liawati (2020) stating that subjects with low self-efficacy only have one idea in solving the problem and appear confused and need to read the problem repeatedly to understand the meaning of the problem.

CONCLUSION

Based on the results of the analysis and discussion of this research, it has the following conclusions.

1. The application of learning using the RTTW learning model with a scientific approach is declared effective. This is indicated by: (a) Mathematical communication ability with the application of RTTW learning with a scientific approach achieves the specified classical criteria, namely 75%, (b) Mathematical communication ability with the RTTW learning model with a scientific approach has a proportion value of the final test results which is more than PBL model learning with a scientific approach, (c) The average final test results for students' mathematical communication ability given the RTTW model learning with a scientific approach achieve KBM,
2. In learning the RTTW model with a scientific approach in terms of self-efficacy, the following conclusions are obtained.

a. Students with high self-efficacy category
Students with high self-efficacy categories are able to fulfil the three indicators of mathematical communication ability well. In indicator 1, the subject is able to express mathematical ideas through writing properly and correctly and draw conclusions from questions. In indicator 2, the subject is able to understand, interpret, and evaluate mathematical ideas in writing. And in indicator 3, the subject is able to use terms, mathematical notations and structures to present ideas and describe relationships with mathematical models.

b. Students with medium self-efficacy category
Students in the moderate self-efficacy category are able to fulfil indicator 1, namely the ability to express mathematical ideas through writing and demonstrate them and describe them visually. Whereas in indicator 2, subjects with moderate self-efficacy are less able to understand, interpret, and evaluate mathematical ideas in writing. And in indicator 3, subjects with moderate self-efficacy are quite capable of using terms, mathematical notations and structures to present ideas and describe relationships with mathematical models.

c. Students with low self-efficacy category
Students with low self-efficacy categories, subjects with low self-efficacy are less able to fulfil all indicators. The subject has answered the questions, but there are still many errors and mistakes so that they still do not meet the indicators of mathematical communication ability.

Declaration by Authors

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