Contribution of Learning Independence and Think Talk Writing Learning Model Toward Student Mathematical Communication Skill

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Abstract: Mathematical communication skills are important part of mathematics, both in writing and verbally. Students can express their idea, describe, and discuss mathematical concepts through mathematical communication. Therefore, to develop mathematical communication fluency needed the independence personality and TTW Learning Model. The aim of this research is to reveal contribution of student learning independence and think talk writing (TTW) as learning model toward mathematical communication. The method of this research was quasi experimental research which used regression analysis. The population of this research was grade VII Junior High School in Central Lombok, West Nusa Tenggara. Sampling technique used was stratified cluster random sampling. Three variables measured were two independent variables and one dependent variable. Independent variable was learning independence (X_1) and TTW (X_2) and dependent variable was student mathematical communication (Y). The data collecting technique used instruments. They were questionnaire and essay question test. The research results showed that (1) learning independence contributed significantly toward student mathematical communication (2) TTW contributed significantly toward student mathematical communication; furthermore both student learning independence and TTW contributed significantly toward student mathematical communication. In conclusion, both student learning independence and TTW contributed significantly toward student mathematical student. It means the increase of student learning independence and TTW, it will increase the student mathematical communication.

Keywords: *mathematical communication skill, learning independence, TTW learning model.*

INTRODUCTION

In globalization, development of science and technology enable all society elements obtain information abundantly, quickly, and easy from all resources and whole world corners. Therefore, education has important function to increase and develop human resources. Increasing quality of national education is one strategic way to manifest human resources increase that are able to compete in national and international level. According to constitution number 20 in 2003 chapter I about national education system mentioned that all student must be directed actively to develop their potency to have religion spiritual power, self-control, personality, intelligence, attitude, and skills(Depdiknas, 2003)**.** Academic development, vocational development, personal development and social development are purpose of education Fahrurrozi (2014: 2).

Mathematic is one of subject that must be learned by students in every level of education because mathematics is one of the subjects that has a very important role in improving one's knowledge, understanding and skills to make a good quality education. Satriawan (2017: 88) explained that mathematic is so close to our life so students will be able to apply mathematics in useful context for students, both in daily life and work. Student can obtain critic thinking skills, systematic, logic, creative and cooperative through methematics learning. From the

characteristic of mathematics cause perception in student that mathematics is the difficult and complicated subject (Budhiharti S J, 2017: 39).

In addition to have creative thingking, good achievement, students also must have good mathematical communication skills. Sapitri (2015: 274) explained that ability to communicate their ideas with others and give students opportunity to show what they learned have. Students skill to describe their ideas, explain and discuss mathematics is kind of mathematical communication. Asmara A (2014: 41) explained that there are five communication aspects That is representative, listening, reading, discussion, and writing. Suitable to NCTM explanation Letwinsky (2017: 58) mentioned that to understand mathematically, a student must develop fluency in mathematics language, not only to express their idea clearly and persuasive, but also to challenge their thinking and intellectual activity their self. Suitable to Permendiknas Number 20 in 2006 about content standard mentioned that mathematical learning is to encourage students have skills to problems-solve, model design, and communicate ideas with model, table, symbol, and diagram to explain problems and condition.

Mathematical communication is very important, but reality in learning process is not suitable with the fact. Astuti D (2017: 12) explained that*"oneof the vast crises of the educational system inmany countries, especially third world countriesis the problem of low academic achievemen."*.One of education system big crisis, especially in developing country is the low academic achievement. This case can be seen in international study survey result about mathematics and science achievement by *Trends in InternationalMathematics and Science Study* (TIMSS) and *Programme for International Student Assessment* (PISA). Result achieved by Indonesian student was low category, so far from good category where in this category students must be forced to understand concepts well, can organize information, problem-solves not routinely, take and propose conclusion truth argument. Here are the very important of mathematical communication because communication can develop knowledge, by the opinion Aprisal A. (2018: 177) that mathematical communicates helps students to build their mathematical knowledge and help them to understand mathematical concepts.

Mathematical communication skills that are still low category need to be increased by learning approach that can increase student mathematical communication skill. Learning approach applied can be used as facilitator to increase student mathematical communication skill. In general reality, mathematical learning in school still be centered in teacher. As a consequence, teaching and learning process emphasize in teaching thereof learning. Teaching and learning process only transfer knowledge from teacher to student, so that mathematics is understood with memorizing and formula remembering. According to result of survey IMSTEP Zaini (2014: 154) in teaching teacher observation by conventional that in mathematical learning , teachers is too concentrated in procedural and mechanistic, learning-centered teachers, mathematical concept is explained informatively and students only are trained to solve question example without concept understanding.

Mathematical learning approach that give opportunity for students to build their knowledge so that it is wished can increase students mathematical communication ability (Zaini, 2014: 155). One of mathematical learning model to solve that problems is by cooperative learning, according Sapitri (2015: 275) expressed that cooperative learning model enable students can achieve success in learning, beside that it can train student to have creativity, both *thingking skill* and *social skill*, such as creativity to have argument, receive suggestion and critics from the other people.

Cooperative learning model is interactive learning collaboration by cooperative setting which is in learning process to create discussion that be followed by all students actively and

interactively in group clas (Mahmud D.A, 2014: 193). Agustyaningrum N (2016: 191) expressed that cooperation can delete mental inhibition because the limited experience and tight perspective. By cooperation to achieve togetherness cooperation, students can also develop their mathematical communication creativity because students are asked to explain their idea, both speaking and writing. In this case, cooperative learning model that be used by researcher is *Think-Talk-Write* (TTW) learning model.

TTW learning model is strategies to facilitate language training by speaking and writing fluently, force student to think, speak, and then write the problems and write the solution Huda (2013: 218). Besides that, TTW is a learning model that must students to think privately then discuss each thinking in group and write the discussion result. Suitable to explanation from Camurty R. C (2018) that TTW learning model make students learn privately before learning. According to Wirda (2017: 18) expressed that TTW is learning model that is wished to grow understanding ability and student mathematical communication. There are three phases of TTW learning model. There are (1) students learn material (to think), (2) students discuss learning material results (speaking), (3) students write idea that is obatained from speaking phase (writing) Supandi (2018: 78).

TTW learning model is wished to help students to compete in health academic atmosphere in small group that are each change their think, give motivation to members of group, and students have high independence to obtain well communication skill. Nowadays, private learning concepts is correlated with several other education concepts and contemporary relevance such as personality, learning-centered students and learning possession**.** Independence learning is defined as learning model where students with other relevant person can make decision which is needed to fulfill private learning necessary (Cukurova, 2014: 59). Kopzhassarova (2016: 88**)** also explained that independence is responsible decision taking because individual is wished to analize problems, describe their work, make decision, and take action.

Based on above explanation, so that there are several problems that need to be understood. They are the low of student learning independence, student attitude to mathematics which is less happy, and the lack of student mathematical communication. Therefor, we need analysis to obtain solution to solve them. Learning process is very important in influence of student success, so that we need to researh deeply.

RESEARCH METHOD

This research used quantitative research by korelational research. The population of this research was grade IX Junior High School in Central Lombok, West Nusa Tenggara. Sampling technique used was stratified cluster random sampling. Three variables measured were two independent variables and one dependent variable. Independent variable was learning independence (X_1) and TTW (X_2) and dependent variable was student mathematical communication (Y). The data collecting technique used instruments. They were questionnaire and essay question test. Data analysis used doubled regression analysis because in this research we study about contribution those are given by independent variable to dependence variable.

RESULTS AND DISCUSSION

Research Data Description

Independence

Based on statistical analysis that learning independence variable by data total (N)equal to83, mean equal to 75,24, and deviation standard equal to 8,551.

Learning model

Based on statistical analysis that learning model variable by data total (N) equal to 83, mean equal to 76,39, and deviation standard equal to8,422.

Mathematical Communication

Based on statistical analysis that learning model variable by data total (N) equal to 83, mean equal to 77,83, and deviation standard equal to 10,067.

Normality test

Data normality test is performed on the estimated error of regression Ŷ on X using inferential statistics namely Kolmogorov-Smirnov Test because the number of respondents 83 is more than 50. Details of each test results of normality of research data are as follows.

Table 1. Normality test among three variables

One-Sample Kolmogorov-Smirnov Test

Kolmogorov-Smirnov Z	.751
Asymp. Sig. (2-tailed)	.626

Based on the data obtained in table 1. The normality test shows that the significance value of asiymp is 0.626 greater than 0.05. That is, data from each variable come from populations that are normally distributed.

Homogeneity test

Table 2. Homogeneity test among three variables

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Independence	1.898	2	80	.157
Model	.724	2	80	.488
Communication	.066	2	80	.936

From above table, significance of learning independence equal to 0.157, TTW as learning model equal to 0.488, and mathematical communication equal to 0.936. There are concluded that they are homogeny data because sig. > 0.05.

Based on the prerequisite tests that have been done, the results are obtained that the regression prerequisite tests are met. So that hypothesis testing can be done using multiple linear regression analysis. Testing the hypothesis of this study using the formula of regression and correlation. The hypothesis is analyzed by simple regression and correlation formulas.

Doubled Regression Analysis

Correlation value

Table 3. Correlation test value among three variables

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.675[a]	.455	.442	7.522

Based on table above R^2 (R Square) value is 0.455 or (45,5%). This value showed that percentage of independent variable contribution (independence and TTW) toward dependent variable (mathematical communication) is 45,5%, while another value 54.5% is influenced or explained by another variable that is not entered in this research.

Doubled regression test

Table 4. Doubled regression test for t test

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations		
		B	Std. Error	Beta	T	Sig.	Zero-order	Partial	Part
1	(Constant)	8.631	8.509		1.014	.313			
	Kemandirian	.399	.115	.339	3.462	.001	.569	.361	.286
	Model (TTW)	.513	.117	.429	4.388	.000	.611	.440	.362

Based on Table 4. above we obtained equation $Y = 8.631 + 0.399X_1 + 0.531X_2$, it means if learning independence variable (X_1)increase in unit, so that mathematical communication (Y) will increase 0.399. Besides that, TTW variable as learning model (X_2), if increase in unit, so that mathematical communication will increase 0.531. Based on summary model table R (Square) value showed that correlation coefficient 0.455 × 100% = 45,5% is mathematical communication variation (Y) which is determined by learning independence variable (X_2) and TTW as learning model (X_2). Simultaneously, independence in learning mathematics and learning models contribute to mathematical communication. The more the value of independence in learning mathematics increases, and the learning model will also increase mathematics communication.

Based on Table 4. we obtained value of learning independence contribution was 0.569 so that percentage of learning independence toward mathematical communication was r^2 x 100% = $(0,569)^2$ x 100% = 32,37%. T_{count}value = 3.462 by sig. 0.001, while t_{table}= 1.663, t_{count}> t $_{table}$ (3.46 > 1.663, sig value < 0.05) (0.001 < 0.05), so it can be concluded that H_0 is denied, means learning independence (X_1) partially contributed significantly toward mathematical communication (Y).

The contribution of mathematical communication, students' perceptions of mathematics, and learning facilities towards mathematics learning outcomes following the opinion of Djamarah (2011: 177) regarding the factors that influence the process and learning outcomes. These factors can come from internal and external elements. External elements come from the environment and instrumental. Factors from the environment are the natural and socio-cultural environment, while from the instrumental namely the curriculum, programs, facilities and

facilities, and teachers. The element from within comes from physiological and psychological factors. Physiological factors are physiological conditions and the five senses

Partially there is the contribution of independence to mathematical communication with t_{count} = 3,462 According to (Kopzhassarovaa, Akbayeva, & Eskazinova, 2016) said that the right independent work organization contributes a lot to the development of students' critical thinking, reflective skills. Broadly speaking, learning independence has a relationship to students' mathematical communication skills and there is a relationship between learning independence of mathematical communication skills (Kurnia, Mulyani, & Rohaeti, 2018)

while for value of learning model is 0.611 so that percentage of learning model toward mathematical communication is r^2 x 100% = $(0,611)^2$ x 100% = 37,33%. T_{count}value = 4.388 by sig. 0,000, while t_{table}= 1.663, t_{count}> t $_{table}$ (4.388 > 1.663, sig value < 0.05) (0.000< 0.05), so it can be concluded that H_0 is denied, means learning model (X_1) partially contributed significantly toward mathematical communication (Y).

The TTW learning model contributes to mathematical communication with t_{count} = 4.388. The value of relative contributions and the value of effective contributions given the learning model variables in mathematics subjects towards mathematical communication show that learning models in mathematics subjects make a positive contribution to mathematical communication. Thus, there is a partial contribution of learning models in mathematics to mathematical communication. The application of interactive learning methods in educational institutions launches the mechanism of developing personality features, whereby interactive forms can contribute to the conditions needed for communication (Alexandrovna, 2018). This is also confirmed by the results of research conducted (Wirda, Deny, & Hidayat, 2017) namely the TTW learning model can improve student abilities. By applying a learning model that provides opportunities for students to discuss and interact with each other so that their mathematical communication skills increase, namely by using cooperative learning (Tinungki, 2015).

F test value

Table 5. F $_{test}$

ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	3782.951	2	1891.475	33.428	.000[a]
	Residual	4526.688	80	56.584		
	Total	8309.639	82			

Based on Table 5. test F above we obtained F_{count}value = 33.428, sig. 0.000, while F_{table} = n-k-1 = 83-2-1 = 80, we obtained F_{table} is 3.11. F_{count}> F $_{table}$ (33.428 > 3.11, sig value < 0.05) (0.000 < 0.05), so it can be concluded that H_0 is denied, means learning independence (X_1) and learning model (TTW) (X_2) simultaneously contributed significantly toward student mathematical communication (Y).

CONCLUSION AND SUGGESTION

Conclusion

Based on research result and data analysis result, we conclude that :

Learning Independence and TTW model learning simultaneously contributed significantly equal to 45.5% toward student mathematical communication grade VII Junior High School in

Central Lombok. This case showed that learning independence and learning model simultaneously contributed toward students mathematical communication.

Learning independence contributed significantly equal to 32.37% toward student mathematical communication in students grade VII Junior High School in Central Lombok. This case showed that learning independence contributed toward student mathematical communication.

TTW learning model contributed significantly equal to 37.33% toward student mathematical communication in grade VII Junior High School in Central Lombok. This case showed that TTW learning model contributed toward student mathematical communication.

Suggestion

Suitable to research result and discussion, there are several suggestion.

Learning independence is one factor to support student success in study. Therefore, both teacher and researcher furthermore to observe student learning independence well, because learning independence can support student mathematical communication creativity.

For the similar research, we suggest to make research design group consist of experimental group and control group to know clearly what influential variable is toward student mathematical communication creativity.

For the next research to use varied TTW learning model by other cooperative learning model so that discussion group can be interested and not boring.

Finally, mathematical communication creativity should be more emphasized in students skill to make mathematical model.

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