

Think to Talk Write Learning Mathematics Tool Hands on Activity

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ABSTRACT

By looking at the learning result of Lecturer of DIII Mechanical Engineering Department of Harapan Bersama seen the lack of understanding of the students understanding the subject matter of Applied Mathematics. The objective of the research is to produce a mathematics learning device with Think Talk Write model based on Hand On Activity to improve the valid ability of troubleshooting, practical, and effective math problem solving. This research is a development research using 4D model that is modified into 3D consists of defining, designing and developing phases. The types of devices developed are: (1) Syllabus; (2) Semester Study Plan; (3) Modules and (4) Worksheets, and (5) Troubleshooting Test. The subject of this research is the D III students of Mechanical Engineering Department. Independent variables of this research are independence and problem-solving skills, while the dependent variable is the result of Troubleshooting test. Conclusions gained (a) Students achieved mastery individually (scores above 80) as well as classical, (b) The ability of troubleshooting of Applied Mathematics in a class that uses Think Talk Write model devices based on Hand On Activity is better than the ability of class math problem solving with conventional method, (c) The existence of influence of independence character and problem solving skill to troubleshooting ability of subject Applied Mathematics equal to 90%.

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1. INTRODUCTION

The problems that often arise in learning, especially Applied Mathematics materials include: (1) patterns and teaching methods used conventional method; (2) the media and learning resources used very limited, both in terms of quality and quantity. Therefore, students tend to find difficulties in understanding Applied Mathematics materials so that the achievement of students on this material is relatively low.

Based on observations of researchers and data from other lecturers, to improve problem solving skills, research held by applying the learning model that involves all the student's sense is Think Talk Write model learning. Think Talk Write Learning is a learning model that has a broader meaning than the strategy, method or procedure of learning (Sudia, 2014). The term learning model has 4 special characteristics that are not possessed by the strategy or learning method is a logical theoretical rationale prepared by the educator, learning objectives, teaching steps required for the learning model can be implemented optimally, Learning environment to achieved learning objectives. Attitude and character be considered as important in the lecturing process which is independence directed to contextual learning method (Son, 2017), so that the learning model of Think Talk Write is appropriate when used Hand on Activity approach that emphasize and appropriate in daily life.

Based on mathematics learning model approach in improving students' mathematical communication ability, the conclusion is mathematics learning is effective on mathematics material. Think

Talk Write approach influences the improvement of reasoning ability and mathematical communication as well as student learning independence. Learning does not automatically increase by having the child stand and move (Nasir, 2016). Problem-solving in mathematics learning is an approach strategy as well as a goal to be achieved (Qurohman, 2017). Problem-solving as an approach to learning (Qurohman, 2017). Whereas according to (Rahmawati, 2013) there are two problems: problems to find any problems to prove. According to Polya in (Kadarwati, 2017), there are 4 important steps in solving the problem. The four steps are (McNiff, 2016): Understand the problem as complete as possible; select a plan for completion of some possible alternatives; implement the plan correctly, accurately, and correctly; checking the answers-whether they are correct, clear and argumentative. Learning model has a broader meaning than the strategy (Todd, 2016), method or procedure of learning.

The term learning model has 4 special features (Hodges, 2016), that are not possessed by a strategy or method of learning : the logical theoretical rationale composed by educators, learning objectives to be achieved, the teaching steps needed for the learning model can be optimally implemented, the learning environment necessary for learning objectives can be achieved. According to (Ahmadi, 2017) the need to be an ideal and innovative teacher. The lecturer may be on apperception less to attribute that the importance of matter to aspects of human life (Sariningrum, 2017).

Lessons that support students being scientific and drill students to perform a scientific method called Think Talk Write Model (Artini, 2016). Hand On Activity is an activity designed to involve learners in getting information by asking, move and find, collecting data, analyzing and make their own conclusions. The Hand On Activity approach is based on the view that students must construct the mathematical knowledge. Realistic mathematics education or Hand On Activity is known as a successful approach. The idea of mathematical learning with realism is not only popular in Netherlands, but much influences mathematics educators in other countries. According to Becker and Selter as quoted in (Zetriuslita, 2016) there is a result of quantitative and qualitative research indicating that students who receive hands-based learning on hands got higher scores than students who have acquired conventional-based learning in numeracy skills, especially at practice.

2. RESEARCH METHODS

This research is classified as development research, that is the development of mathematics learning tools. The device developed are syllabus, Semester Lesson Plan, module, Worksheet, and Troubleshooting Ability Test. The Four-D Model development was suggested by Siyasailam Thiagarajan, Dorothy S. Semmel, and Melvyn I. Semmel (1974) in (Orton, 2004). The model consists of four stage of development that Define, Design, Develop and Disseminate or adapted into 4D models, namely defining, designing, developing, and deployment. Modifications include 3 steps / stages, namely definition, design, development, while the stage of disseminat is not done. The steps taken are: The practicality of instructional devices can be determined from the student response about the implementation of learning by using Think Talk Learning model device based on Hand On Activity on Applied Mathematics material (Qurohman, 2017). Learning devices are practical if the average respondents gives a minimum rating on the "agree" category.

Learning is effective after experiencing the learning process with a device developed using a model Think Talk Write-based Hand On Activity if (1) the students clasical completing in the experimental class more than 75% of students obtained greater score than/or equal to 78 with an average of more or equal to 80; (2) Problem solving skills and student independence during the learning process affect the Troubleshooting test; (3) Troubleshooting test result of experiment class is better than control class. So, to measure the effectiveness of learning outcomes, statistically performed completeness tests, and influence test.

3. RESULTS AND DISCUSSION

A. Troubleshooting Instrument Testing Analysis

In addition to validate the learning tools, troubleshooting test questions is done on the test class to determine the validity, reliability, difficulty and distinguishing power, as follows:

Validity Items

To calculate the coefficient of item validity used product moment correlation formula. In this study, item is valid if it has high or very high validity or has a value $r_{xy} > 0.6$. As for the items that have medium validity, low and very low will be revised or not used.

Reliability Items

To calculate the reliability of the learning result test is using alpha formula. The result from 8 items obtained $r_{11} = 0,887$.

Level of Difficulty

To test using the difficulty level formula. Nevertheless there are those who argue that the items are considered good if the items have medium difficulty.

Distinguishing Power

Distinguishing power is the ability of an item to distinguish between clever students (high ability) to stupid students (low ability). Figures that indicate high distinguishing power are called discrimination indices (DI). After validation of the Mathematics Troubleshooting on Applied Mathematics material, it produces the item criterion.

B. Result of Learning Effectiveness Test Analysis

1. Prerequisite Test (Normality Test and Homogeneity Test)

Prior to effectiveness test by analyzing the results of mathematical troubleshooting test, the prerequisite test (preliminary test) is done, as a prerequisite to do normality test and homogeneity test.

a. Test of Troubleshooting Data Normality.

The normality test aims to see whether the distribution of data comes from normally distributed data performed on the dependent variable.

As Hodengan uses significant value obtained from the Kolmogorov-Smirnov table of SPSS program output, if the value is significant $> 5\%$ then H_0 is accepted. In this study using 5% significance level. The output of the normality test can be seen in Table 1.

Table 1. Tests of Normality

	Kolmogorov-Smirnov		
	Statistic	df	Sig
Class Eksperiment and Class Control	.089	78	.181

Based on the Test of Normality table in Kolmogorov-Smirnov coloumn Test, it can be seen that the sig value for the experimental class and control class is $0.181 = 18.1\%$. Sig value $> 5\%$ then H_0 accepted. It means the sample class comes from a normally distributed population.

b. Homogeneity Test of Troubleshooting Test Data

Homogeneity tests used to find out whether the observational class students were in a homogeneous population or not . From the calculation results obtained Farithmetic = 1.01 with $F_{table} = 1.69$. Since $F_{count} < F_{table}$, then H_0 is accepted, so the sample variance is homogeneous.

c. Completeness Mathematical Ability Troubleshooting Test.

Individual result of learning test is used to know the achievement of student's completeness in Applied Mathematics material compared with Criteria of Completion Minimum of 80. Thus, the research variable data is tested whether it meets the value of 80 or not. Furthermore, the results are compared with the value of table z using the real level. The conclusion is H_0 is rejected, it means that the percentage of students who reach more than the minimum value is more than 75%.

d. Differential Average Test or Comparison Test

The comparative test aims to compare the student's score of solving skill in mathematic using a Think Talk Write based on a Hand On Activity class using conventional methods.

2. Variance Similarity Test

Testing criterion H0 is rejected if Fcount > Ftable when Ftable is obtained from distribution list F with dk numerator n1-1 (for Think Talk Write model and Hand on Activity based class) and dk denote n2-1 (conventional method class) and a significant level of α. In this study α taken 5%.

From the calculation obtained value Fcount = 1.74 while Ftable = 1.69 Because Fcount = 1.74 > 1.69 = Ftable, then H0 is rejected, so the variance of the class with Think Talk Write model based on Hand on Activity not equal to the class variance by conventional methods.

3. Comparative Test Between Think Talk Write based on Hand On Activity Class and Conventional Method Class

The comparative test is intended to compare the mean of mathematical troubleshooting abilities between Think Talk Write based on the Hand on Activity class with the class using conventional method. The statistic formula test is presented in Table 2.

Table 2. Mean Difference Statistical Test Formula

Varians	Test Statistic
Same Variant	$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{S^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$ <p style="text-align: center;">and</p> $s^2 = \frac{(n_1 - 1)s_1^2 - (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$
Different Variant	$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}}$

Source: (Nasir, 2016)

After calculated the value of T count, then compared with t table. H0 rejection criteria provided in Table 3.

Table 3. Statistics Criteria Mean Differences Test

Variant	Test Statistics
Same Varian	Ho accepted if $t \leq t(\alpha, n_1 + n_2 - 1)$
Different Variant	Ho accepted if $t_i \leq t(\alpha, n_1 + n_2 - 1)$

Source: (Nasir, 2016).

Results obtained from Think Talk Write based on Hand on Activity class and conventional methods class can be seen in Table4.

Table 4. The Result of Post Test Calculation of Troubleshooting Test of Experiment Class and Control Class

Variant Source	Eksperimenter Class	Control Class
Total	3195	2842
\surd	39	39
\bar{x}	81,92	72,84
Varians(s2)	33,23	57,82
Deviation Standard	5,76	7,60

From the calculation obtained $t_{count} = 5,922 > 1,671 = t_{table}$, the rejection criterion H0 uses the hypothesis of receiving if $t \leq t(\alpha, n_1 + n_2 - 1)$. $t_{table} = 1,671$. So H0 rejected while H1 accepted, it means the score in Think Talk Write and Activity based on Hand On Activity class is better than conventional method class.

C. The Influence Test of Independence character and Problem-Solving Skill

The test aims to know the influence of independence and troubleshooting skill of student toward Troubleshooting Test result. The result of independence questionnaire score and observation score of student's problem solving regressed into Troubleshooting test score.

The general form of multiple linear regression is:

$$Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \epsilon$$

The hypothesis is as follows.

H0: $\beta_i = 0, i = 1,2$ (no influence of independence and student's problem-solving skills to Troubleshooting test result)

H1 : There is i so $\beta_i \neq 0, i = 1,2$ (there is an influence of students' independence and problem-solving skills on KPM results)

Multiple regression analysis can using SPSS program. In this study the influence test using SPSS software with $\alpha = 5\%$, with multicollinearity, autocorrelation, and heteroskedastis test.

Based on the observation of independence character and problem-solving skills as well as troubleshooting math test. This study calculate using SPSS program. The results can be seen in Table 5.

Table 5. Significance Test of Independence Character Effect and Problem Solving Skills to Troubleshooting

ANOVA ^b					
Model	Sum of Squares	df	Mean Square	F	Sig
Regression	1111.944	2	505.912	72.612	.000
Residual	251.822	36	6.917		
Total	1266	38			

a. Predictor: (Constant), Problem Solving Skill, Independence

b. Dependent Variable: Problem Solving Ability

From the table obtained sig value. = 0,000 < 0.05 which means H0 rejected. H1 accepted. It shows that linear regression, means there is a significant influence between independence character and problem solving skills (collectively) to the ability of mathematics troubleshooting obtained by students.

Furthermore, to determine regression formula equation used Table 7, as follows :

Table 6. Regression Formula Equation

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
	1 (Constant)	-38.603	10.325		
Independence	.359	.104	.271	3.342	.002
Troubleshooting Capabilities	1.183	.129	.752	9.273	.000

Dependent Variable : Troubleshooting Capabilities

Based on the Table 6, regression equation is obtained $\hat{Y} = -38.603 + 0,359X_1 + 1,183X_2$, it means that each addition of independence character variable X_1 or one unit will increase the value of the Mathematical Troubleshooting Test of 0.349 and each addition of the problem solving skill variable (X_2) as big as one unit there will be the addition of the Mathematical Troubleshooting Test of 1,193.

The influence of independence character and problem-solving skills on Mathematical Troubleshooting abilities are described in Table 7.

Table 7. The Influence of Independence Character and Problem Solving Skills on Mathematical Troubleshooting Abilities

Model Summary ^b					
Model	R	R. Square	Adjusted Square	Std. Error of the Estimate	Durbin-Watson
1	.895	.900	.790	2.63958	1.703

Predictors : (Constant), Problem Solving Skills, Independence
Dependent Variable : Troubleshooting Capabilities

Taking into consideration Table 8, obtained R Square = 0.90 = 90%. The effect of independence character and problem-solving skills on the ability of mathematical troubleshooting separately can be seen by performing partial test of multiple regression. Hypothesis proposed ;

H0: regression coefficient is not significant (no effect)

H1: regression coefficient significant (influential)

Table 8. Coefficient of Regression Equation

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
	Contant	-39.603	10.325		
Independence	.349	.104	.271	3.342	.002
Problem-solving skill	1.193	.129	.752	9.273	.000

Dependent Variable: Troubleshooting Capabilities

Taking into consideration in Table 9, the significance value for the independence character sig = 0.002 = 0.2% < 5%, so H0 is rejected but accepting H1, it means that independence character has an effect on the ability of solving mathematical problem. The

great influence of character independence to the ability of problem solving mathematics is 32.7%. While the value of significance for problem solving skills sig = 0.00 = 0% < 5%, so H1 accepted, it means problem solving skills affect the ability of troubleshooting. The great influence of problem-solving skills on math's troubleshooting ability is 74%. It means that 90% of mathematical problem solving ability of Applied Mathematics is influenced by independence characteristic and problem-solving skills in troubleshooting test (collectively), while 10% is influenced by other factors.

4. CONCLUSIONS

Based on the results and discussions that have been described, obtained the following conclusions: (1) Using the 3-D development model generated learning device in DIII Mechanical Engineering students with Think Talk Write model based on Hand on Activity on Applied Mathematics materials consisting of Syllabus, Semester Study Plan, Modules , Worksheets, and Troubleshooting Test. Since the learning device developed has been validated by expert in their field, the learning device developed in this research is valid, (2) The use of Think Talk Write Learning model device based on Hand On Activity is considered practical, (3) Applied Mathematics materials using Think Talk Write model devices based on Hand On Activity are effective, that is : (a) The ability to solve mathematical problems achieve mastery both individually and classically, in other words, students who are treated score 78 individually . Then based on the calculation of classical completeness obtained the conclusion that students who achieve a minimum score or more than 75%, (b) Ability to solve mathematical problems in Applied Mathematics materials using Think Talk Write model based on Hand On Activity is higher than students with conventional learning, (c) Positive influence of independence character and problem-solving skills on mathematical Troubleshooting Ability of Applied Mathematics material. So that the character of independence and problem solving skills affect the Troubleshooting ability im the amount of 90%.

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