

Analysis of realistic mathematics learning approach on the students' problem solving skill and self-confidence on sequence and series materials

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ABSTRACT. This research aimed at analyzing realistic mathematic learning approach on the students' problem solving skill and self-confidence on valid, practical, and effective squence and series materials. This research was conducted at vocational high school with the sample consisted of x grade students of automotive 1 as the experimental class which given a treatment of realistic mathematic learning approach. The subjects were selected purposively with the suggestion from the teacher who understood the students' cognitive and affective condition. The method used was quantitative descriptive because it aimed at analyzing the effect of realistic mathematic learning on the students' mathematics problem solving skill, and the effect of realistic mathematics on the students' self-confidence. The results of the research showed that realistic mathematics learning approach had significant effect on the students' problem solving skill and self-confidence. The tests carried out were normality test in the form of realistic mathematics learning as many as 5.043 and the students' self-confidence as many as 5.031. Linearity test of the data of problem solving skill was 3.759 and self-confidence was 3.357. The regression equation 1 ($\bar{Y} = -48.228 + 0.570x$), regression coefficient obtained was 0.570, which meant that the effect was 61.9%. The results of hypothesis testing showed that the value of $t_{\text{count}} > t_{\text{table}}$ ($5.043 > 1.714$), regression equation 2 ($\bar{Y} = -51.535 + 0.539x$), regression coefficient obtained was 0.539, which meant that the effect was 67.1%. The results of hypothesis testing showed that the value of $t_{\text{count}} > t_{\text{table}}$ ($3.697 > 2.064$). The results of hypothesis testing showed $f_{\text{hitung}} > f_{\text{tabel}}$ ($5.043 > 1.714$) therefore it can be concluded that : h_0 was rejected and h_a was accepted under the condition that there was a significant effect of realistic mathematics learning approach on the students' problem solving skill and the results of hypothesis testing showed that $f_{\text{hitung}} > f_{\text{tabel}}$ ($5.043 > 1.714$) therefore it can be concluded: h_0 was rejected and h_a was accepted under the condition that there was a significant effect of realistic mathematics learning approach on the students' self-confidence. Thus, the effect of realistic mathematics learning approach on the student problem solving skill was 67.1% and self-confidence was 67.1%.

1. Introduction

The low quality of learning outcomes in mathematics makes the level of students' skill to solve mathematics problems is also low. This is a very reasonable thing because there were still many teachers used conventional learning methods to explain the teaching material to the students. Explained that the main factors causing the students' have low skills to solve mathematics problems are the learning carried out so far have not been able to develop students' abilities in term of communicating mathematics ideas accurately, understanding mathematics concepts, and solving mathematics problems. Based on this opinion, it can be seen that so far the learning activities carried out in the classroom are still limited to the knowledge that has not yet permeated the skill to apply and associate mathematics learning in daily life.

According to Tarigan [10], Realistic Mathematics Education (RME) placed the reality and the students' real experiences in daily life as a starting point for learning and made mathematics as the students' activity. The students are invited to think about how to solve the problems they have experienced. Through this learning, the students are expected to be motivated to solve questions

(questions) that lead them in the process of problem solving. The skill to solve mathematics problems is the skill to find a solving method or approach by observing and understanding the problem followed by trying and guessing as well as finding and reviewing it. The development of mathematics problem solving skills equipped the students to think logically, analytically, systematically, critically, and creatively. The understanding to learn mathematics was inseparable from the difficulties in understanding concepts, Selden [7] stated that the perceived difficulties experienced by the students in proving mathematics concepts were influenced by their lack of determination.

Furthermore, the influential factor in problem solving skill is self-confidence that exists in the students which lead to a sense of confidence and trust toward their own abilities. Self-confidence can help someone to be more optimistic and have a positive outlook that makes a person able to socialize with other people and their environment, and will not be afraid to express their opinions and ask questions if there is something they do not understand. However, not all of the students have good self-confidence because each student has a different background and environment. Stated that if the students had good self-confidence, then they could be successful in learning mathematics [8]. Therefore, self-confidence is considered to be able to support the students' motivation and success in learning mathematics. The students will tend to understand, discover, and struggle the mathematics problems they face to get the expected solutions.

Realistic mathematics learning is a theory of learning where one of the learning approaches uses real-world context and is based on the experiences that the students have as the starting point to learn mathematics [12]. Explains that "mentions the use of real world contexts will be more meaningful for students, because they are directly confronted with the situation they face in their environment[12]. Indirectly the students' interest in learning will be more maximal and want to continue learning mathematics in other problems they might face in the outside world " the use of real-world context will be more meaningful for the students because they are directly confronted with the situations they face in their environment. The students' interests in learning indirectly will be more leverage and makes them want to continue learning mathematics with other problems they may face outside. Realistic approach makes it easy for the students to increase their understanding in learning mathematics. The results of research conducted by a number of countries (including developing countries such as Indonesia) showed that realistic approach in mathematics learning provided hope for improving and enhancing the students' understanding of mathematics [1]. Realistic learning approach makes it easy for the students to improve their understanding of learning mathematics. In realistic approach learning, the students in groups carried out activities such as: explaining, agree or disagree, asking questions, and so on [1]. According to Treffers approaches to mathematics learning were classified into four, namely mechanistic, empiricist, structuralist and realistic[8]. The steps in realistic mathematics learning according to Reeuwijk [2] were: (1) Understanding problems/questions. The teacher gave contextual problems/questions and asked the students to understand the problems, (2) Explaining contextual problems. This step was done if there were students who did not understand the problems given yet, (3) Solving contextual problems in groups or individually. In solving problems or questions, the students were allowed to be different from others. (4) Comparing and discussing answers. The teacher facilitated the discussion and providing time to compare and discuss the answers from the questions in groups and then conducting a class discussion. (5) Concluding the results of discussion. The teacher guided the students to draw a conclusion of a concept, then the teacher summarized or solved the concept provided in the questions.

Hobri [3] Solving a problem was a basic activity for human . Hobri [3] solving problem skill was an action to solve problems or process which used power and mathematical benefits in solving problems, which was also a solution finding method through the steps of problem solving. Problem solving in mathematics was a process to find a way to determine the unknown element of knowledge given with a strategy used by the problem solver [12]. It also means that problem solving was an effort to find a way out from difficulties. Lester (2003) stated:“ He also suggests several proficiencies teachers should acquire in order for them to be successful in helping students become better problem solvers and presents a framework for research on problem-solving instruction”. Learning mathematics and mathematical problem solving are processes which are very influenced by the belief of mathematics. According to Polya [3] the indicators of problem solving were divided into four steps: (1) Understanding problems. The students were able to write/mention information given from the questions presented. (2) Planning the problem solving. The students had the problem solving planning

by creating mathematical model and chose a strategy to solve problems given, (3) Solving problems based on the planning, (4) Students were able to solve problems with a strategy they used with correct results, Conducting a re-check, the students were able to check the correctness of the results or answers.

According to Lester [6] self-confidence was a positive attitude of an individual which enabled them to develop positive assessment of their self and environment or a situation they faced. stated that if the students had good self-confidence, they were able to be success in learning mathematics[8]. Self-confidence had a strong influence on the learning achievement[4]. In accordance with [8] said that self-confidence strengthen motivation to reach success, because the higher the self confidence in self skill, the stronger the energy to complete the works. Lauster [5] mentioned the indicators of self-confidence covering: (1) Confidence in self skill, that was a positive attitude of an individual about their self that really understood what they wanted to do, (2) Optimism, that was a positive attitude of an individual who was always good dealing with everything, about their self, hope and skill, (3) Objective, that was an individual who was confidence dealing with problems or everything according to the real truth, not personal truth or to their own truth, (4) Responsible, that was the individual willingness to be responsible for everything happened that became the consequence, (5) Rational and realistic, that was analysis toward a problem, thing, event by using thought that were accepted by reason and based on reality.

Arithmetic of Squence and Series

Feature: Difference in two consecutive terms of equal value called “difference (b)”.

$$U_1, U_2, U_3, \dots, U_{n-1}, U_n$$

$$b = U_2 - U_1 = U_3 - U_2 = \dots = U_n - U_{n-1}$$

$$\diamond \text{ Formula: (1) } U_n = a + (n - 1)b$$

$$(2) S_n = \frac{n}{2}(2a + (n - 1)b)$$

$$= \frac{n}{2}(a + U_n)$$

Descriptions:

- $S_1 = U_1 = a$ = First term
- b = Difference
- n = Number of terms
- $U_n = N^{\text{th}}$ term
- S_n = Number of n in the first term

\diamond Use or application of formula:

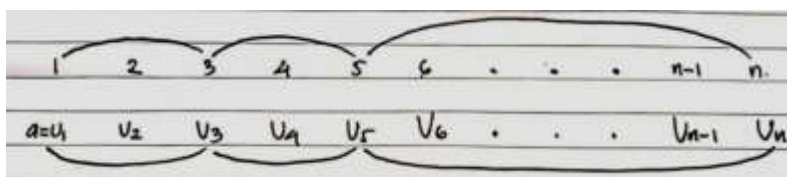


Figure 1. Formula squence and series

1. $b = \frac{U_5 - U_3}{5 - 3}$
2. $U_n = U_5 + (n - 5)b$
3. $a = U_1 = U_3 - (3 - 1)b$
4. $n = \left(\frac{U_n - U_5}{b} \right) + 5$
5. $S_n = \frac{n}{2}(a + U_n)$

Squence and series of geometry

Feature: Comparison in two consecutive terms of equal value called “ratio (r)”.

$$U_1, U_2, U_3, \dots, U_{n-1}, U_n$$

$$b = \frac{U_2}{U_1} = \frac{U_3}{U_2} = \dots = \frac{U_n}{U_{n-1}}$$

❖ Formula: (1) $U_n = a \cdot r^{n-1}$

$$(2) S_n = \frac{a(r^n - 1)}{r - 1} = \frac{U_{n+1} - a}{r - 1}, \text{ if } r > 1$$

$$S_n = \frac{a(1 - r^n)}{1 - r} = \frac{a - U_{n+1}}{1 - r}, \text{ if } 0 < r < 1$$

Descriptions:

- $S_1 = U_1 = a$ = First term
- r = Ratio
- n = Number of terms
- $U_n = N^{\text{th}}$ term
- S_n = Number of n in the first term

❖ Use or application of formula:

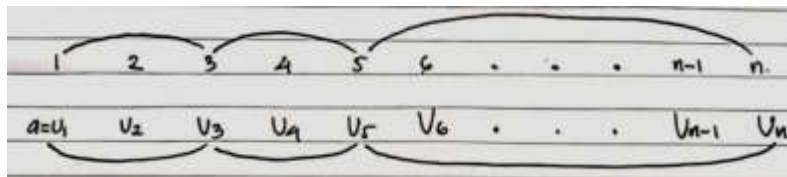


Figure 2. Formula sequence and series geometry

1. $r = \left(\frac{U_5}{U_3}\right)^{5-3}$
2. $U_n = U_5 \cdot r^{n-5}$
3. $a = U_1 = \frac{U_3}{r^{3-1}}$
4. $n = \sqrt{\frac{U_n}{U_5}} + 5$
5. $S_n = \frac{U_{n+1} - a}{r - 1}$
 $S_n = \frac{a - U_{n+1}}{1 - r}$

2. Methodology

The research location was conducted at a vocational high school in Indonesia, odd semester in 2018-2019. This research belonged to quantitative descriptive research which seeks to find out the influence of realistic mathematics learning on the mathematical problem solving skill and the influence of realistic mathematics learning on the vocational high school students' self confidence in sequence and series material. The method used in this research was quantitative. This type of method was selected as it was intended to determine the effect of realistic mathematics learning on the students' skill to solve mathematical problems, and the effect of realistic mathematics learning on the students' self-confidence. Umam [11] The test phase on the research was influenced by used validation and rehabilitation test of questionnaire data. After it was valid and reliable, it was conducted the homogeneity test. Then, the data are known to have the same variant done by regression test, regression equation test, correlation coefficient test and coefficient determination test. The subjects of this research were the students of grade X at vocational high school. They were purposively selected by asking the opinion of the teachers who understood the cognitive and affective conditions of his students.

The research phases consisted of three, covering planning, implementation and reporting. In the planning stage, the researcher prepared a set of self-confidence instruments including questionnaire blueprints, questionnaire weight, and scoring rubrics for mathematical problem solving instruments in which it covered questions blueprints, answer sheets and scoring rubrics. Moreover, in the implementation stage, the students were given a test of mathematical problem solving skill, after that they were required to fill out a self-confidence questionnaire. At the reporting stage, the researcher processed the obtained data while doing the research and compiling the report.

The instruments used in this research were a self-confidence questionnaire consisting of 20 statements and were compiled based on the variable indicators of behavioral characteristics to be examined whilst the tests of mathematical problem-solving skills were compiled in essays consisted of 4 problems to determine students' mathematical problem solving skills. Before giving the test, the instruments were first consulted with a supervisor to measure its content validity, and its empirical validity was tested to determine validity, reliability, differentiation and difficulty index. The data collection techniques for self-confidence and the skill to solve mathematical problems were done by distributing the questionnaires. The form of the scale used in this research was Likert model scale.

3. Results and Discussion

The subjects of this research were the students of grade X majoring automotive at vocational high school as an experimental class which involved 25 students who were tested for their mathematical problem solving skills and self-confidence in realistic mathematics learning.

The regression test was conducted whether or not there was an effect of the implementation of realistic mathematics learning to the students' mathematical problem solving skills and self-confidence, the hypothesis of the regression test was taken after the normality test, the regression equation test, the linearity regression test, the correlation coefficient test, and the coefficient of determination test. The test of data normality was conducted to find out whether or not the data were in normal distribution, based on (table 1), the significance value of Kolmogorov-Smirnova normality test, the significance of self-confidence was $0.200 > 0.05$ and the significance of solving mathematical problems was $0.200 > 0.05$, which meant that the data were normally distributed and the research was able to be continued. The significance of realistic mathematics learning outcomes in mathematics problem solving skill was $0.200 > 0.05$ and self-confidence was $0.200 > 0.05$.

Table 1. Regression normality

	Tests of Normality		
	Kolmogorov-Smirnova		
	Std. Deviation	Test Statistic	Asymp. Sig. (2-tailed)
Problem Solving	5.583	.112	.200
Self Confidence	5.812	.109	.200

The first regression equation test was used to predict how much the dependent value (realistic mathematics learning) was if the independent value (mathematical problem solving) was manipulated. Based on (table 2), from a constant value of $5,043 > 1,714$, the correct regression equation for both variables is as follows:

$$\bar{y} = -48.228 + 0.570x$$

$$\bar{y} = \text{problem solving}$$

$$x = \text{realistic mathematics learning}$$

From the above equation, the regression coefficient of 0.570 was obtained and it stated each increase in the use of realistic mathematics learning affected the skill to solve mathematical problems by 0.570.

And the second regression equation test was used to predict how much the dependent value (realistic mathematics learning) was if the independent value (self-confidence) was manipulated. Based on (table 2), the sig value of regression was taken from a constant value of $5,031 > 1,714$; thus, the correct regression equation for both variables is as follows:

$$\bar{y} = -51.539 + 0.530x$$

$$\bar{y} = \text{self-confidence}$$

$$x = \text{realistic mathematics learning}$$

From the above equation, the regression coefficient of 0.570 was obtained and it stated each increase in the use of realistic mathematics learning affected the skill to solve mathematical problems by 0.570.

And the second regression equation test was used to predict how much the dependent value (realistic mathematics learning) was if the independent value (self-confidence) was manipulated. Based on (table 1.2), the sig value of regression was taken from a constant value of 5,031 > 1,714; thus, the correct regression equation for both variables is as follows:

$$\bar{y} = -51.539 + 0.530x$$

$$\bar{y} = \text{self-confidence}$$

$$x = \text{realistic mathematics learning}$$

From the above equation, the regression coefficient of 0.539 was obtained which stated that each increase in the use of realistic mathematics learning teaching methods affected self-confidence as much as 0.539.

Table 2. Regression Test

Model	Coefficients				
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	48,228	9,563		5,043	,000
Problem Solving	,570	,152	,617	3,759	,001
(Constant)	51,535	9,721		5,301	,000
Self Confidence	,539	,160	,573	3,357	,003

Regression linearity test was used to determine whether or not the regression equation had produced linear. Based on (table 3), it shows that the t_{value} on mathematical problem solving variable was 3.759, at the degree of freedom (df) = $N-2=25-2=23$, on the significance value of 95%, t_{value} was as much as 1.714; thus, it can be concluded that $t_{\text{value}} > t_{\text{table}}$ which means that there was an effect of realistic mathematics learning on the skill to solve mathematical problems. Based on the linearity through ANOVA table, the linearity value ($F=14.131$) with a significance value was $0.01 < 0.05$, it indicates that the regression was able to be used to determine the effect of realistic mathematics learning on the skill to solve mathematical problems.

On (Table 3), it shows that the t_{value} on students' self-confidence variable was 3.357, the degree of freedom (df) = $N-2=25-2=23$ at the significance value of 95% obtained t_{value} as much as 1,714; then, it can be concluded that $t_{\text{value}} > t_{\text{table}}$, it means that there was an effect of realistic mathematics learning on the students' self-confidence. Based on the linearity test through ANOVA table linearity value ($F = 11,266$) with a significance value of $0.00 < 0.05$, the regression was able to be used to determine the effect of realistic mathematics learning on the students' self-confidence.

Table 3. Linearity Regression Test

ANOVA Table						
	Self-Confidence* The Results of Post test	Sum of Squares	Df	Mean Square	F	Sig.
Problem Solving	Regression	459,659	1	459,659	14,131	,001
	Residual	748,181	23	32,530		
	Total	1207,840	24			
Self Confidence	Regression	397,126	1	397,126	11,266	,003
	Residual	810,714	23	35,248		
	Total	1207,840	24			

The correlation coefficient test aimed to determine the strength of the relationship between the two variables. In (table 1.4) a correlation coefficient of 0.617 was obtained. Based on the table of interpretation, the correlation coefficient of 0.617 showed the level of strong relationships, in terms of the application of realistic mathematics learning had a strong relationship with the skill to solve mathematical problems. The coefficient of determination was done to measure how much the

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 Contribution between the dependent variable and the independent variable was in the form of a percent, the coefficient of determination (R Square) was obtained as much as 0.381 with the criterion of the moderate level of relationship. This meant that the contribution of the dependent variable (mathematical problem solving) by the independent variable (realistic mathematics learning) was 38.1% and 61.9% was explained by other variables.

In (table 4) a correlation coefficient of 0.573 was obtained, based on the table of interpretation the correlation coefficient of 0.573 showed the level of strong relationships, in terms of the application of realistic mathematics learning had a strong level of relationship with students' self-confidence. The coefficient of determination was done to measure how much the contribution between the dependent variable and the independent variable was in the form of a percent, the coefficient of determination (R Square) was obtained as much as 0.329 with the criterion of the moderate level of relationship. This meant that the contribution of the dependent variable (self-confidence) by the independent variable (realistic mathematics learning) was 32.9% and 67.1% was explained by other variables.

Table 4. Correlation Coefficient Test and Determination Test

Model Summary					
	Model	R	R Square	Adjusted R Square	Std. Error
Problem Solving	1	,617	,381	,354	5,70347
Self Confidence	1	,573	,329	,300	5,93704

The first regression equation test could be used to predict how high the dependent value (realistic mathematics learning) was if the independent value (mathematical problem solving) was manipulated. Based on (table 4), it showed that the regression sought for sig values. From a constant value of 0.00 > 0.05, the right regression equation for both variables is as follows:

$$\bar{y} = -48.228 + 0.570x$$

\bar{y} = Mathematical Problem Solving

x = Realistic Mathematics Learning

From the above equation, the regression coefficient of 0.570 was obtained which stated that each increase in the use of realistic mathematics learning affected the mathematical problem solving as much as 0.570.

Hypothesis test was used to find out the effect of realistic mathematics learning on the skill to solve mathematical problems, as for the provisions of the hypothesis as follows:

Ho: "There was an influence of realistic mathematics learning on the mathematical problem solving"

Ha: "There was no effect of realistic mathematics learning on mathematical problem solving"

Ho was accepted when $t_{\text{count}} > t_{\text{table}}$, meant that there was a significant influence between learning of realistic mathematics towards solving mathematical problems and Ho was rejected when $t_{\text{count}} < t_{\text{table}}$, meant that there was no effect of learning realistic mathematics towards solving mathematical problems.

In the regression test table (table 4) the value of t_{count} was 5.043 and the value of t_{table} at free degrees (df) = $N - 2 = 25 - 2 = 23$ with a significance of 95% of 1,714 with the provisions of $t_{\text{count}} > t_{\text{table}}$ (5.043 > 1.714) then Ho was accepted and Ha was rejected with the provision that there was a significant influence between the learning of realistic mathematics on solving mathematical problems.

The second regression equation test could be used to predict how high the dependent value (realistic mathematics learning) was if the independent value (self-confidence) was manipulated.

Based on (table 4), it showed that the regression sought for sig values. From a constant value of 0.00 > 0.05, the right regression equation for both variables is as follows:

$$\bar{y} = -51.535 + 0.539x$$

\bar{y} = self-confidence

x = realistic mathematics learning

From the above equation, the regression coefficient was 0.539, which stated that each increase in the use of realistic mathematics learning influenced self-confidence as much as 0.539.

Hypothesis test was used to find out the effect of realistic mathematics learning on self-confidence, as for the provisions of the hypothesis as follows:

Ho: "There was an effect of realistic mathematics learning on self-confidence"

Ha: "There was no effect of realistic mathematics learning on self-confidence"

Ho was accepted when $t_{\text{count}} > t_{\text{table}}$, meant that there was a significant influence between the learning of realistic mathematics towards self-confidence and Ho was rejected when $t_{\text{count}} < t_{\text{table}}$, meant that there was no effect of learning realistic mathematics towards self-confidence.

In the regression test on table (table 4), the value of t_{count} was 5,301 and the value of t_{table} in degrees of freedom (df) = $N - 2 = 25 - 2 = 23$ with a significance of 95% as much as 1,714 with the provisions of $t_{\text{count}} > t_{\text{table}}$ ($5.301 > 1,714$) then Ho was accepted and Ha was rejected with the provision that there was a significant influence between the learning of realistic mathematics on self-confidence.

4. Conclusion

The distribution of analysis of realistic mathematics learning approach on the students' problem solving skill and self-confidence on squence and series materials show the first regression equation test, in the regression test the value of t_{count} was 5.043 and the value of t_{table} at free degrees (df) = $N - 2 = 25 - 2 = 23$ with a significance of 95% of 1,714 with the provisions of $t_{\text{count}} > t_{\text{table}}$ ($5.043 > 1.714$) then Ho was accepted and Ha was rejected with the provision that there was a significant influence between the learning of realistic mathematics on solving mathematical problems. And The second regression equation test, In the regression test on table (table 4), the value of t_{count} was 5,301 and the value of t_{table} in degrees of freedom (df) = $N - 2 = 25 - 2 = 23$ with a significance of 95% as much as 1,714 with the provisions of $t_{\text{count}} > t_{\text{table}}$ ($5.301 > 1,714$) then Ho was accepted and Ha was rejected with the provision that there was a significant influence between the learning of realistic mathematics on self-confidence.

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