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Analysis of teacher performance to build student interest and motivation towards mathematics achievement

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ABSTRACT

The purpose of this study was to determine the impact and categories of teacher performance in building student interest and motivation on mathematics achievement. The population in this study was students in the eighth grade of junior high schools from six public and two private schools, and a sample of 277 students was taken by cluster sampling. Data collection instruments used a questionnaire, and data analysis was done by using by descriptive and path analysis. The results of data analysis showed that partially, teacher performance significantly affected student interest and motivation excel at mathematics. Simultaneously, teacher performance is very significant in influencing student interest and motivation to be excellent in mathematics. Partially, teacher performance builds interest and student motivation for mathematics achievement is low category. Simultaneously, teacher performance builds student interest and motivation to excel at mathematics is low category. Both of these can be caused by the ability of teachers to build motivation and interest is not good, so students are also less interested and motivated to learn mathematics.

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1. INTRODUCTION

Student achievement is a benchmark of success in mathematics education. Based on student mathematics achievement, it describes the quality of mathematics learning. The higher student achievement score indicates the higher quality of learning. Based on the results of the Programme for International Student Assessment (PISA) assessment in 2019, it shows that mathematics score is still problematic. In terms of ranking mathematics score, it is ranked 72 out of 78 countries [1].

Many factors can influence the achievement problem. One of them is interest and motivation. They are still important issues as factors that influence the success of mathematics learning. This is based on the assumption that student interest and motivation in mathematics is still low. Many students hate math and their learning interest is low [2]. The impact of interest and motivation on student mathematics achievement can be seen from several research results, partially interest and motivation affect student achievement [3-6], and motivation affect student achievement [7, 8]. Simultaneously, interest and motivation affect mathematics achievement [9].

One of external factor that influences student interest and motivation to learn is teacher factor [10]. The teacher has important role to build student learning interest and motivation [11]. The results show that the teacher's role is to increase student learning interest and motivation in mathematics [12, 13]. Realizing the role of interest and motivation in learning mathematics, some mathematics education practitioners conduct a study, test learning style and develop the form of approaches or learning models so that students are motivated and interested in learning mathematics [14-26].

Based on the explanation above, there are problems regarding student achievement in school mathematics in Indonesia, there is definitely something wrong in the process and implementing learning. One of the factors that can enable the problem is caused by the teacher in carrying out their duties. Therefore, it is important to examine the performance of teachers in building interest and motivation of students in learning mathematics. The purpose of this study is to determine the impact and categories of teacher performance in building students' interest and motivation for mathematics achievement. The results obtained can be useful as a basis for overcoming problems of students' interest and motivation towards mathematics education, so that a better mathematics education outcome is obtained.

2. RESEARCH METHOD

This type of research is ex post facto. It is a study that reveals events that have occurred. This research was conducted in the eighth grade of junior high schools which was consisted of six public schools and two private schools. The number of respondents was 277 students and the sample was taken in clusters from seven districts in North Sumatra. The research instrument was a questionnaire and the data collection techniques were carried out by giving a number of questions to respondents which included: 1) student assessment of the performance of mathematics teachers in building interest (X1), and motivation (X2); 2) student responses about interest (X3), and motivation (X4) to excel at mathematics, and students' mathematics achievement scores (X5) were obtained from the results of the odd semester examinations in the eighth grade mathematics subject matter, and this data was obtained from school documents.

To ensure the validity of the instrument is done by expert judgment, and reliability testing using the formula Cronbach's Alpha [27], i.e., $\alpha = \left[\frac{N}{N-1}\right]\left[\frac{\sigma^2_{x-\Sigma_{i=1}^{N}\sigma^2_{y_i}}}{\sigma^2_x}\right]$. Instrument criteria, reliable if $\alpha \geq 0.137$ with a significance level $\alpha = 0.05$. Based on the reliability test with the help of SPSS version 19, it shows that the research instrument is reliable with Cronbach's Alpha values, which are 0.524, 0.363, 0.737, and 0.809 respectively for variables X1, X2, X3, and X4.

Data analysis using path analysis [28]. The analysis was carried out in three stages, namely: 1) testing the significance of correlations between variables; 2) calculating the path coefficient; and 3) calculating the path coefficient from an exogenous variable to an endogenous variable. Whereas to determine the ability of teacher performance used descriptive analysis through interpretation of intervals and categories [29], as state in Table 1. While for the interpretation of the correlation coefficient with the value of *r* [30], as state in Table 2.

Table 1. Data intervals and categories

Intervals	Category
$X > \bar{X}_i$+1,8 Sb_i	Very good
$\bar{X}_i$ + 0,6 $Sb_i < X \leq \bar{X}_i$+1,8 Sb_i	Well
$\bar{X}_i$ - 0,6 $Sb_i < X \leq \bar{X}_i$ +0,6 Sb_i	Enough
$\bar{X}_i$ - 1,8 $Sb_i < X \leq \bar{X}_i$ - 0,6 Sb_i	Less
$X \leq \bar{X}_i$ - 1,8 Sb_i	Not good

Table 2. Interpretation of value coefficients *r*

Correlation coefficient	Category
0.81-1.00	Very high
0.61-0.80	High
0.41-0.60	Enough
0.21-0.40	Low
0.00-0.20	Very low

3. RESULTS AND DISCUSSION

The results of data analysis with the help of SPSS Version 19 software are used to obtain descriptive statistics, the magnitude of the correlation between the two variables with the *r* test, and the coefficient β to obtain the path coefficient. Based on the results of the descriptive analysis of teacher performance building interest and learning motivation are summarized in Table 3.

Based on Table 3, the interval and mean are presented to describe the categories of teacher abilities, interests and student motivation in mathematics. Based on Table 4, it can be stated that $\overline{X1}, \overline{X2}, \overline{X3},$ and $\overline{X4}$ are at the fourth interval. It shows that the ability of teachers to build interest (X1) and motivation (X2) is less. Likewise, the interest (X3) and motivation (X4) of student learning in mathematics is less. Furthermore, to determine the correlation between variables, then the summary correlation analysis as in Table 5.

Table 3. Descriptive statistics of teacher performance, student interest and motivation

Statistics	Statistical value			
	X1	X2	X3	X4
N	277	277	277	277
Mean	59.0361	59.7978	60.1011	57.8520
Median	63.0000	60.0000	63.0000	58.0000
Mode	63.00	55.00	50.00	54.00
Std. deviation	9.40468	9.01462	11.96510	10.83087
Minimum	31.00	35.00	20.00	25.00
Maximum	81.00	85.00	88.00	88.00

Table. 4. Intervals and categories of teacher abilities, interests and student motivation

Intervals	Teachers		Students		Category
	$\overline{X1}$	$\overline{X2}$	$\overline{X3}$	$\overline{X4}$	
$84 < \bar{X} \leq 100$	-	-	-	-	Very good
$73 < \bar{X} \leq 84$	-	-	-	-	Well
$62 < \bar{X} \leq 73$	-	-	-	-	Enough
$51 < \bar{X} \leq 62$	59.0361	59.7978	60.1011	57.8520	Less
$35 < \bar{X} \leq 51$	-	-	-	-	Not good

$\bar{X}, \overline{Xi}$: Mean

Table 5. Correlations between variables

		X1	X2	X3	X4	X5
X1	Pearson correlation	1	.276**	.292**	.239**	.167**
	Sig. (2-tailed)		.000	.000	.000	.005
	N	277	277	277	277	277
X2	Pearson correlation	.276**	1	.158**	.250**	.177**
	Sig. (2-tailed)	.000		.009	.000	.003
	N	277	277	277	277	277
X3	Pearson correlation	.292**	.158**	1	.381**	.337**
	Sig. (2-tailed)	.000	.009		.000	.000
	N	277	277	277	277	277
X4	Pearson correlation	.239**	.250**	.381**	1	.259**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	277	277	277	277	277
X5	Pearson correlation	.167**	.177**	.337**	.259**	1
	Sig. (2-tailed)	.005	.003	.000	.000	
	N	277	277	277	277	277

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5 describes that all variables correlate with each other very significantly. Thus, it can be stated that all exogenous variables have a very significant path to endogenous variables. Based on Table 5, it can be stated that all exogenous variables have a very significant path to endogenous variables. The path can be stated as in Figure 1.

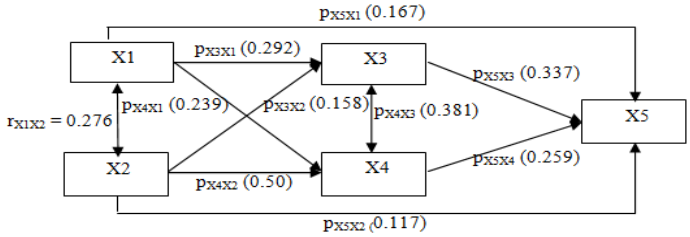

Figure 1. Path diagram and correlation

Figure 1 shows that the teacher's performance pathway builds interest (X1) and motivation (X2), so students are interested (X3) and motivated (X4) to excel in mathematics (X5). So that the path equation can be stated into two paths, namely the direct path and the correlated pathway. Direct path from X1 to X5, i.e., $P1\colon r_{X1X5} = p_{X5X1} + p_{X5X2}\, r_{X1X3}$, and the path equation from X2 to X5, i.e., $P2\colon r_{X2X5} = p_{X5X1} + p_{X5X2}\, r_{X1X4}$.

Furthermore, the correlational pathway consists of two paths, the path equation from X1 to X5, i.e., $P1: r_{X1X5} = p_{X5X1} + p_{X5X2}\, r_{X1X2} + p_{X5X3}\, r_{X1X3} + p_{X3X2}\, r_{X1X2} + p_{X4X2}\, r_{X1X2} + p_{X4X3}\, r_{X1X4} p_{X5X4}\, r_{X1X4}$, and the path equation from X2 to X5, i.e. $P2: r_{X2X5} = p_{X5X2} + p_{X5X1}\, r_{X1X2} + p_{X5X4}\, r_{X2X4} + p_{X4X1}\, r_{X1X2} + p_{X3X1}\, r_{X1X2} + p_{X3X4}\, r_{X2X3} + p_{X5X3}\, r_{X23}$. Furthermore, based on data analysis with the help of SPSS version 19, the path coefficient is obtained from the exogenous variable to the endogenous variable as in the Table 6. Table 6 describes the magnitude of the path coefficient from exogenous variables to endogenous variables. After solving the path equation using the data in Table 6, the coefficients and path categories are summarized in Table 7.

Table 6. Matrix path coefficients for all variable

Variable	X1	X2	X3	X4	X5
X1	1	0.276	0.270	0.184	0.033
X2	0.276	1	0.083	0.199	0.095
X3	0.270	0.083	1	0.381	0.264
X4	0.184	0.199	0.381	1	0.127

Table 7. Coefficients and path categories

Path	Path coefficient	Category
P1	0.29	Low
P2	0.24	Low
P3	0.30	Low
P4	0.31	Low

Based on Table 7, it can be stated in two ways. Firstly, Direct path or partially, path coefficient value P1, i.e. $r_{X1X5} = 0.293 > r_{(\alpha=0.01)} = 0.137$. In other words, teacher performance builds student interest. It significantly influences student interest to excel at mathematics. This is consistent with the results of research that show that interest influences student achievement [31]. Path coefficient value P2, i.e. $r_{X2X5} = 0.239 > r_{(\alpha=0.01)} = 0.137$. It means that teacher performance build motivation. It significantly influences student motivation to excel at mathematics. This is consistent with the results of research showing that motivation influences the value of learning in mathematics [32, 33]. There is a very strong relationship between learning motivation and teacher actions toward learning achievement [34].

Correlational path or simultaneously, the path coefficient value P3, i.e. $r_{X1X5} = 0.302 > r_{(\alpha=0.01)} = 0.137$. It means that teacher performance builds interest and motivation. It significantly influences student interest in mathematics achievement. The path coefficient value P4, i.e. $r_{X2X5} = 0.308 > r_{(\alpha=0.01)} = 0.137$. Teacher performance builds motivation and interest. It significantly influences student's motivation to excel at mathematics. This is related to the results of research showing that interest and motivation affect student learning outcomes [9]. Therefore, to build interest and motivation to learn, the teacher's creativity is needed. The teacher plays an important role in influencing student interests and motivation to teach mathematics [35]. There is a positive relationship between teacher creativity and student mathematics learning outcomes [36].

Secondly, partially P1 pathway shows that teacher performance builds interest. It influences students' interest to excel at mathematics is low category. This can be caused by the ability of teachers to build interest is not good, so students are also less interested in learning mathematics. Path P2 shows that teacher performance builds motivation. It influences student motivation in mathematics achievement is low category.

It can be caused by the ability of the teacher to build is not good, so students are less motivated to learn mathematics. Simultaneously, path P3 shows that teacher performance builds student interest and motivation. It influences achievement interest in mathematics is low. It can be caused by the ability of teachers to build interest and motivation is not good, so students are also less interested in learning mathematics. Path P4 shows that teacher performance builds student motivation and interest. It influences achievement motivation in mathematics is low. It can be caused by the ability of teachers to build motivation and interest is not good, so students are also less interested and motivated to learn mathematics. The low category of teacher performance can be influenced by several factors, such as teacher competency. The results of the study show that the competence of teachers in building interest in learning to increase student motivation is still lacking [37]. Teacher competence to increase students learning motivation is lacking because they lack mastering scientific thought patterns [38].

4. CONCLUSION

Based on the results of path analysis and descriptive, it can be stated several conclusions. Teacher performance in building interest significantly influences student interest to excel at mathematics. Teacher performance in building motivation significantly influences student motivation to excel at mathematics. Simultaneously, teacher performance in building interest and motivation significantly influences student interest to excel at mathematics. Teacher performance in building motivation and interest is very significant in influencing student motivation to excel at mathematics.

Teacher performance builds interest to influence student interest so that achievement in mathematics is the low category. Teacher performance builds motivation to influence student motivation, so that

achievement in mathematics is a low category. Both of these can be caused by the ability of teachers to build interest or motivation is not good, so students are also less interested or motivated to learn mathematics. Simultaneously, teacher performance builds interest and motivation to influence student interest so that achievement in mathematics is low. Teacher performance builds motivation and interest to influence student motivation so that achievement in mathematics is low. Both of these can be caused by the ability of teachers to build motivation and interest is not good, so students are also less interested and motivated to learn mathematics.

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