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The Effect of Mathematical Disposition on Students' Mathematical Performance

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Abstract.
Mathematical disposition is a tendency to think and act in a positive way. Changes in learning activities due to Covid-19 have an impact on the learning environment. This study aims to obtain an overview between dispositions and mathematical performance in online learning, and the effect of disposition on the mathematical performance of high school students. This research is concerned with correlation and regression analysis that relates mathematical dispositions to mathematical performance on relation and function material. The research was conducted on 70 high school students from the city of Bandung. To analyze data related to correlation and regression, Pearson product-moment was used. The results of this study were as follows: 1) A significant positive correlation was observed between mathematical disposition scores (X), and mathematical performance scores (Y) with a correlation coefficient of r = 0.42, this means that r^2 = 17.2%. The variation in students' mathematical performance (Y) can be explained by the student's mathematical disposition variable (X). 2) Based on the regression equation Y = 34.211 + 0.548X, this shows that because the X coefficient is 0.548 > 0 (positive) and significant, the mathematical disposition variable has a positive effect on mathematical performance in online learning.

Keywords: high school students, mathematical disposition, mathematical performance.

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1. INTRODUCTION

Affective elements, in addition to cognitive elements, are vital in the development of mathematical learning [1]. Mathematic disposition is an emotive element that might influence a student's learning process [2,3], which has a long-term effect on students' belief in mathematics [4]. The concept of mathematical disposition was first introduced by NRC (2001), The inclination or practice of viewing mathematics as plausible, practical, and valuable with confidence in one's tenacity and efficacy is defined as mathematical disposition [5].

NRC (2001) lists mathematical dispositions along with strategic competence, adaptive reasoning, procedural fluency, and conceptual understanding as mathematical skills [6]. A productive mathematical disposition is characterized as a person's views and attitudes toward mathematics that enable him to regard mathematics as rational, practical, and beneficial [7].

When students work on arithmetic issues, they will demonstrate their mathematical disposition by showing confidence, responsibility, diligence, never giving up, feeling challenged, being willing to try new things, and reflecting on how they think they did [5]. In particular, in online mathematics learning, there are special factors that may hinder students' mastery of the material in mathematics learning towards mathematical dispositions, as stated by Cockcroft, 1982 which states that mathematics is a difficult subject both to teach and to learn [8]. Besides that, the learning process is also inseparable from the conditions of the learning atmosphere that will influence the thought process, communication, and student learning achievement [9–12]. Mathematical dispositions can be thrown off by changes in the learning environment [1]. Changes in the learning environment in Indonesia, from classroom-based to online-based, have necessitated a reassessment of the mathematical learning process, which was exacerbated by the emergence of the coronavirus in March 2020 [12,13], which created a learning system become distracted, so it needs a lot of consideration to optimize it again. Teachers and students must be able to adapt to changing learning environments while still paying attention to health regulations, which include the mathematical learning process.

Students' mathematical disposition It appears to be especially significant in difficult learning situations, such as online learning, where students must work independently fewer opportunities to communicate with teachers and peers directly resulting in becoming socially isolated [14]. Mathematical disposition in online learning is very important to be considered as the key to students' mathematical academic success in distance education [15]. Many junior high school students do not enroll in high school math and science classes because of their unfavourable attitude toward mathematics or their poor image of mathematics [4].

Teachers are encouraged to shift from a negative to a positive (productive) mathematical mindset so that they trust in the capacity of mathematics to solve issues in their daily lives [16]. A disposition is a belief or inclination that motivates someone to act, respond, or behave in a certain way [17]. Action will bring what someone believes to live. If a mental function is good and the condition is under control, actions will be good and directed. The psychologically mathematical tendency will then be linked to mental function, so improving students' mathematical abilities.

Previous research, on the other hand, has been more focused on the importance of the ability of teachers to build positive attitudes or productive dispositions in mathematics learning in normal conditions before the pandemic [7, 8]. In addition, previous research used online learning through the use of computer labs as a class for online learning [23], and the presence of an already-existing online learning platform that aids students in terms of facilities [13,19]. In the case of the spread of Covid-19, especially in Indonesia, this is inversely proportionate to current conditions. This drastic change in conditions is manifested in the shift from classroom-based to online-based learning interactions, and the lack of a good platform to accommodate online learning, as well as the need for quotas to access learning materials, all of these factors are thought to influence students' mathematical dispositions.

Based on the characteristics and criteria listed above, this may have an impact on online learning dispositions during the Covid-19 period, the goal of this research is to gain a better understanding of mathematical dispositions and performance in online learning, as well as the impact of dispositions on high school students' mathematical performance on related content and functions. This study emphasizes the importance of remembering that affective factors, particularly mathematical dispositions, play an important role in the development of students' mathematical skills, which will impact the learning process' success, especially as face-to-face learning patterns in the class shift to online-based learning.

2. RESEARCH METHOD

The method in this research uses correlation and regression analysis. The use of correlation analysis aims to obtain an overview of the percentage of variation (rise and fall) of students' mathematical performance variables (Y) Variations in the mathematical disposition variable can explain this (X). Meanwhile, regression analysis aims to obtain the criteria for the effect of the mathematical disposition variable (X) on the mathematical performance variable (Y) in online learning on relation and function material. From the data analysis, it was obtained a picture of the standard deviation of mathematical disposition of 54.13 and mathematical performance of 63.87, correlation and regression analysis can be carried out if it meets (1) the assumption of normality of mathematical disposition scores (X), and mathematical performance scores (Y) normally distributed, (2) mathematical performance score data and mathematical disposition using a ratio interval scale.

Participants in this study amounted to 70 high school students in Bandung City who have studied material relations and functions with online learning. This high school was selected through random sampling, the learning process during the Covid-19 pandemic using online learning. The researchers employed a 25-item mathematical disposition questionnaire. A Likert scale with four points is used to assess each item, ranging from Strongly Disagree (SD) with a score of 1, to Strongly Agree (SA) with a score of 4. Items used to measure students' mathematical dispositions on relation and function material in online learning include; (1) self-confidence in solving math problems in online learning; (2) flexibility in exploring mathematical ideas with various alternatives in solving problems; (3) strong determination to solve math tasks online; (4) interest and curiosity in learning mathematics online; (5) the tendency to reflect on their performance during online learning, on relation and function material. The mathematical disposition questionnaire was administered via Google Form at the end of the class. The reliability test of the mathematical disposition questionnaire was obtained with a value of α = 0.810, meaning that the instrument in this study was in the high-reliability category. Meanwhile, the final score on the evaluation of relation and function material is used to calculate the mathematics performance score.

3. RESULT AND DISCUSSION

Because the goal of this research is to get a sense of the students' mathematical inclinations, and performance in online learning and also the impact of mathematical proclivities on students' mathematical performance on relation and function material, the hypotheses that must be answered in this study are as follows.

1. Is there a significant positive correlation between the mathematical disposition score (X) and the mathematical performance (Y) of students in online learning?

2. Does mathematical disposition (X) have a positive effect on students' mathematical performance (Y) in online learning?

To test the two hypotheses, regression analysis was used with the help of SPSS 25 software. Hypothesis-1: Is there a significant positive correlation between mathematical disposition scores (X) and students' mathematical performance (Y) in online learning?

The results of the hypothesis-1 testing are shown in Table 1 below.

As a result of the study's findings, correlation output in Table 1, it turns out that the correlation coefficient between mathematical disposition (X) and mathematics performance (Y) is 0.428 because the significant value is 0.000 less than α = 0.05, which means there is a substantial positive correlation between mathematical disposition scores and

Table 1: Correlations between mathematical disposition scores (X) and mathematical performance (Y).

		Mathematical performance	Mathematical disposition
Pearson Correlation	Mathematical performance	1.000	.428
	Mathematical disposition	.428	1.000
Sig. (1-tailed)	Mathematical performance	.	.000
	Mathematical disposition	.000	.
N	Mathematical performance	70	70
	Mathematical disposition	70	70

mathematical performance. Therefore, the conclusion is the hypothesis which states that there is a strong link between arithmetic and science. disposition scores (X) and mathematical performance (Y) in online learning on relations and functions material are accepted.

Further analysis of the results of the positive correlation between the mathematical disposition score (X) and the mathematical performance (Y) in online learning on relation and function material is strengthened by the results of the R Square value of r2 = 18.4%, and the variation (ups and downs) of variable Mathematical performance (Y) changes in the mathematical disposition variable can be explained (X), as shown in Table 2.

Table 2: Summary model variations of mathematical performance variables and mathematical dispositions.

Model	R	R Square	Adjusted R Square	Std. An error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.428[a]	.184	.172	6.779	.184	15.287	1	68	.000

a. Predictors: (Constant), mathematical disposition X

Hypothesis-2: Does mathematical disposition (X) have a positive effect on students' mathematical performance (Y) in online learning?

The results of the hypothesis testing-2 are shown in Table 3 below.

TABLE 3: Regression equation coefficients.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	34.211	7.629		4.484	.000			
	Mathematical disposition	.548	.140	.428	3.910	.000	.428	.428	.428

a. Dependent Variable: Mathematical performance

From the output in Table 3 above related to coefficients, it turns out that the regression equation that connects the mathematical disposition variable (X) with the mathematical performance variable with the regression equation Y = 34, 211 + 0.548X, and because the coefficient of X is 0.548 is positive, the second hypothesis which states that the mathematical disposition variable (X) has a positive effect on mathematical performance (Y) in online learning is accepted.

The findings of this correlation show that the higher the mathematical aptitude, the better, the higher the mathematics performance, and vice versa, The lower one's mathematical disposition, the lower one's mathematical performance will be. Students with strong mathematical tendencies believe they can rely on their abilities since they perform well in arithmetic. Students with strong mathematical tendencies can perform well in math when completing assignments. This suggests that pupils with a strong mathematical temperament will be able to adapt to the online learning environment during the Covid epidemic. This finding supports the results of previous studies [9–12, 18], this indicates that the two variables have a positive association. This discovery backs up the findings of online learning research that shows how to increase students' mathematical dispositions, which is one part of their arithmetic skills [19,20].

The results of this study have weaknesses, where the subject is limited, for the city of Bandung. If you want to obtain generalizable research, a similar study (replication) should be conducted in other areas with different samples.

4. CONCLUSION

The findings of this study can be applied to the relationship between students' mathematical inclinations and their mathematical performance in general, which needs to be considered in online learning. For this reason, in online learning, it is necessary to consider the findings which include (1) students 'mathematical performance will be high if students' mathematical dispositions are also high. (2) students' mathematical

disposition is an important variable that students must have because the mathematical disposition variable influences mathematical performance in a good way.

Based on these conclusions, it is suggested that mathematical learning is oriented towards improving students' mathematical dispositions. For further researchers, it is better to analyze which disposition indicators have the most influence on mathematical performance. This research is also limited to high school students, further research can be carried out on university students.

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