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The Relationship between Self-Efficiency and Mathematical Knowledge of 3-D Shapes of Fifth Grade of Elementary School

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Abstract

This study aims to determine the relationship between self-efficacy and mathematical knowledge of 3-D shapes of fifth graders of elementary school. Participants in this study were 76 fifth grade students from a public school in Duri region, Indonesia. The method used in this research is the correlation and regression study. Instruments in this study are non-test and test. The non-test instrument is in the form of a questionnaire, and the test instrument is in the form of questions regarding the 3-D shapes. The indicators of self-efficacy consist of magnitude (level of task difficulty), strength (strength of belief) and generality, while the indicators of mathematical knowledge of 3-D shapes are properties, area, and volume of cubes and rectangular prism. The data analysis technique was carried out by presenting data, normality test, linearity test, linear regression test, and hypothesis testing using Pearson's product moment correlation. The results show that there is a significant positive relationship between students' self-efficacy and mathematical knowledge of 3-D shapes.

Keywords: *3-D shapes; cube; rectangular prism; self-efficacy*

1. INTRODUCTION

Mathematics is a subject that is studied from elementary school to university. Even in daily activities, the use of mathematics is needed so that mathematics must be taught to children from an early age (Nurzayyana et al., 2021; Winanda et al., 2020). It is just that many children have difficulty understanding mathematics and consider mathematics a difficult subject (Wijaya in Lado et al., 2016). One of the concepts of learning mathematics that is difficult for students to understand is geometry. When students find it difficult to understand there are negative things that arise, one of which is anxiety, while the factor that causes this anxiety is self-efficacy (Smith in Lado et al, 2016). Self-efficacy is a student's confidence in his abilities. Self-efficacy also affects the academic achievement of students,

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because students are often difficult and unable to show their academic achievements optimally because they feel unsure that they are able to complete their tasks. In addition, students who have high self-efficacy will create a feeling of calm in doing even difficult tasks and activities.

For the task of learning mathematics, it takes self-confidence in students so that they can complete the task of learning mathematics and apply it. This is in line with the opinion of Nurazizah and Nurjaman (2018) which suggests that there is a significant relationship between self-efficacy and students' mathematical abilities.

The higher the self-efficacy of the fifth-grade students, the lower the anxiety of participating in mathematics lessons, (Isnandita, 2017). High self-efficacy will help create a feeling of calm in doing difficult tasks and activities. Conversely, someone, who doubts his ability, believes that something is more difficult than it is (Mukhid, 2018).

Therefore, researchers are interested in seeing the relationship between self-efficacy and mathematical knowledge, especially in the form of 3-D shapes. This research is also to find out how the students' self-efficacy abilities, spatial knowledge skills, and how big the relationship between self-efficacy and spatial knowledge of fifth-grade students at an elementary school in Duri region, Indonesia.

a. Self-Efficacy

Etymologically self-efficacy consists of two words, namely *"self"* which means a personality structure, and *"efficacy"* which means self-assessment, whether a person can do good or bad actions, right or wrong, can or can't do something. something that is in accordance with what is required (Alwisol in Sihaloho, 2018).

Self-efficacy is an individual's belief in his ability, therefore the more an individual believes in his ability, the greater the effort he does and the more active he is because he believes that his ability can help in doing a task and help face obstacles and obstacles to achieve high academic achievement (Khotimah, et al 2016). From the definition of self-efficacy above, the researcher defines self-efficacy as belief in one's self in his abilities. So if someone has high self-efficacy, then he will be more active and believe that he is able to complete the tasks assigned to him. There are three indicators of self-efficacy (Bandura in Isnandita, 2017) that are elaborated as follows:

Magnitude (level of task difficulty)

Magnitude (level of task difficulty), namely the level of problem related to the level of task difficulty faced by students. If the tasks are arranged according to the level of difficulty, then a person's self-efficacy may be limited to tasks that are easy, moderate, or even include difficult tasks, according to the perceived ability limit to meet the behavioral demands required for each individual level.

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***Strength* (strength of belief)**

Strength (strength of belief) is a component related to the strength of an individual's belief in his ability. Strong and steady expectations of individuals will encourage efforts to earnestly achieve goals even though they may not have had supporting experiences. On the other hand, weak expectations and lack of confidence in the ability to do something will be easily shaken by unsupportive experiences and lack of interest in it.

Generality

Generality that conviction of the individual against his ability to rely on an understanding of her abilities, it relates to the broad scope of behavior is believed by the individual is able to be implemented, whether limited to an activity and specific situation as well as on a series of activities and broader and more varied situations. So that individuals who understand the limits of their abilities will try to increase their limits.

There are several reasons why self-efficacy is very important for students to have in learning mathematics (Bandura in Zubaidah, 2015), namely:

1) Mobilizing and implementing actions for achieving better results including in the mathematics learning process
2) Increasing one's competence to succeed in assignments -The task is good in easy even difficult tasks.
3) Individuals tend to be able to do tasks that they feel capable and believe they can complete and avoid tasks that they cannot do.
4) View difficult tasks as challenges to master rather than threats to avoid.
5) Is a key source of human action, "what people think, believe and feel affects how they act".
6) Influencing the way in which a person's choice of actions in math problems.
7) Have a stronger interest and deep preoccupation with activities, setting challenging goals for them in math lessons.

b. Knowledge of 3-D Shapes

Knowledge is a theoretical and practical understanding *(know-how)* possessed by humans (Putra, 2020), and is very important for people's intelligence. Knowledge also plays an important role in the development of individual, organizational and community life.

Knowledge is the result of knowing after someone has sensed a certain object. Knowledge or what is commonly referred to as cognitive is a very important domain and influences the formation of one's actions (Notoajmojo in Febriyanto, 2016). So, knowledge is a theoretical and practical understanding that a person has and is an important domain for the formation of one's actions.

Meanwhile, spatial structure is a shape that has dimensions of length, width, and height. A flat-sided space is a

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three-dimensional shape in which all sides are flat or a shape that can be seen from all sides is flat (Rahmayani et la., 2021). Build Space has a relative position and direction, especially if a part of the area is designed in such a way for a particular purpose. (Febriyanto, 2016). As 3 dimensions, space is closely related to volume. Conceptually, a volume has 3 dimensions, namely: length, width, and height. All volumes can be analyzed and understood to consist of: a) The point or end where certain planes meet. b) Lines or sides where two planes intersect. c) The plane or surface that forms the boundaries of the volume.

According to Sulisyanto (2013), spatial structure has the following elements:

a) Side is a partition or border on the inside and outside of a shape, in the wake there is a flat side, for example, in the form of a cube, beam, and so on. . There are also those that have curved sides such as tubes, cones, and spheres.
b) The rib is the intersection of two side planes in the shape, so that the rib is a line segment. There are edges that are straight lines as in cubes, blocks, and so on, and there are also edges that are curved as in tubes and cones.
c) The vertex is the intersection of three planes or three or more edges.

The types of spatial structures in this study are cubes and blocks, namely:

Cube

The cube is a geometric shape whose all sides are congruent squares (same and congruent) and are limited by 6 planes. The shape of the cube itself is often encountered in everyday life, such as dice, chalk boxes, tissue boxes and so on (Martini, 2015) There are also cube nets and find the volume of the cube space.

Rectangular-prism

Rectangular-prism is a geometric shape that has 6 rectangular areas that have 3 pairs of equal or congruent sides. In everyday life, we encounter many block shapes, such as the form of a blackboard eraser, pencil case, and so on (Martini, 2015).

The parts of the beam are the sides of the beam, the ribs of the beam and the corner points of the beam. There are also block nets and find the volume of the block space.

In this study, the mathematical knowledge that will be measured is related to the geometry of flat-sided shapes in fifth grade elementary school. Basically geometry material has a great opportunity to be seen by students when compared to other mathematics learning materials, because geometry material is already known to students, fields and spaces but in fact some students have difficulty understanding mathematical concepts related to geometry (Jupri, 2018).

This can be seen from the results of interviews with several fifth grade students regarding learning to build a flat side space, which contains material on blocks and cubes. Based on an interview with a fifth grade student, Annisa, she said that the material on building blocks

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and cubes is a difficult subject, such as determining the elements in the beams and cubes. According to Satria, the study of spatial structure on blocks and cubes is a very difficult lesson, namely in determining the size of one of the blocks, or determining the side of a cube that already knows the volume of the cube.

2. RESEARCH METHODS

The type of research used in this study is quantitative, especially the correlational method where the correlational method is intended to determine whether there is a relationship between the two variables used in this study, namely the variable (X) in the form of self-efficacy and the variable (X) in the form of self-efficacy (self-efficacy). Y) knowledge of flat side space. The population in this study amounted to 76 fifth grade students at SDN 12 Mandau, Indonesia. Samples were taken using saturated samples, where this sampling technique used the entire population as the research sample.

The first step is to prepare research instruments. According to Sugiyono (2017) states that a research instrument is a tool used to measure the observed natural and social phenomena. In this study, researchers used non-test and test instruments.

The measurement scale used in this research instrument uses a Likert scale. The Likert scale is a scale that can be used to measure a person's opinions, perceptions and attitudes about a particular object or phenomenon. The answers to each instrument item used in the Likert scale have a gradation from very positive to very negative which can be in the form of words such as Very Appropriate (SS), Appropriate (S), Not Appropriate (TS), Very Not Appropriate (STS). The Likert scale uses a score of 1-5. In this study, researchers only used a score of 1-4 by missing neutral answers because it could lead to a tendency for respondents to choose a middle/neutral answer (Arikunto, 2013).

The non-test instrument was in the form of a questionnaire about *self-efficacy* and the test instrument was a question of knowledge of the flat side of the space. The research instrument in the form of questionnaires and test questions was tested on 30 non-sample students, which were then tested for validation and reliability tests to obtain which items from the questionnaires and test items were valid and could be used for research. In the trial of the research instrument in the form of questionnaires and test questions, 48 self-efficacy questionnaires and 20 test questions of knowledge of flat side space were presented in the form of an objective. After the trials and validation tests were carried out, 20 valid statement items were obtained from the self-efficacy questionnaire, and 12 valid questions were obtained from the flat-sided wake-up test. Of the 20 items of valid self-efficacy questionnaire, and 12 items of valid flat-sided spatial knowledge questions have very high reliability.

The data analysis technique in this study uses computer-assisted statistics, namely SPSS version 24 with the

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following stages: a) data presentation, after obtaining data from the*self-efficacy* questionnaire and the flat-sided wake-up test questions, the efficacy questionnaire data is scored. themselves with a test instrument in the form of questions. b) sorting the data from the smallest to the largest, calculating the *range* , determining the mean and standard deviation (standard deviation) and determining the category of self-efficacy with spatial knowledge using three categories, namely low, medium and high.

Before carrying out data analysis, the analysis prerequisite tests were carried out first, namely: a) normality test, normality test using thetechnique *Kolmogrov Smirnov* with computer assistance, namely SPSS version 24. And the data is declared normally distributed if the probability value is above the significant level = 0, 05. b) linearity test, linearity test is carried out to determine whether two variables have a linear relationship or not significantly. With the test criteria, if the linearity coefficient is significantly less than 0.05, then the linearity test is feasible to use in linear regression. Linearity test using SPSS ver 24 computer assistance. Data analysis in this study includes: a) hypothesis testing, namely in the form ofcorrelation test *product moment*. This test is conducted to determine whether there is a relationship between two variables. This correlation test was carried out with the help of SPSS version 24. b) significant test, this test was conducted to determine the magnitude of the relationship between the independent variables and the dependent variable which was expressed by the correlation coefficient, using the t test. with the test rule that if $t_{arithmetic}$ t_{table} , then Ho is rejected with the meaning that there is a significant relationship between variable (X) and variable (Y). c) The coefficient of determination, to express the small contribution of the variable (X) to the variable (Y). d) Linear regression test, to test whether the relationship between two variables is significant or not through regression and is expressed by the correlation coefficient. In this test bnatuan researchers used SPSS version 24.

3. RESULTS

a. Self Efficacy

Self-efficacy was measured by three indicators. The results can be seen in Figure 1.

Based on figure 1, *magnitude* (task difficulty level) which consists of 4 question items as many as 26.31% of the students' voices stated that they were very appropriate, this shows that students can do every task or problem mathgiven by the teacher. While as many as 32.89% of students stated that it was not appropriate, this shows that they do not agree that if they are tired when studying mathematics, they do not pay attention to the teacher when explaining mathematics lessons. Furthermore, on the indicator which *strength* consists of 10 question items, it is obtained that 42.76% of students stated SS (very appropriate). Patience and thoroughness,

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then as many as 13.42% of the vote stated STS (very inappropriate) this indicates that students believe they are able to complete math tasks well.

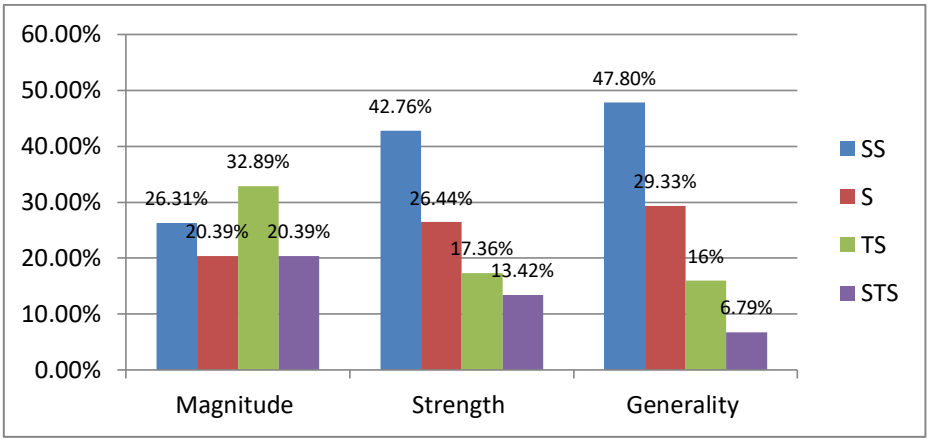

Figure 1. Self-efficacy score

On the generality indicator obtained as many as 47.80% SS votes (very appropriate) this shows that students are serious about getting better math scores, students also repeat the subject matter at home even though they already understand, while 6.79% students stated STS (very inappropriate) this indicates that students will repeat the mathematics subject matter. Table 1 for self-efficacy data categories (*Self efficacy*) is as follows:

Table 1. Categories of Students' Self-efficacy

No	Interval	Frequency	Percentage (%)	Category
1	66 – 80	33	43,4 %	Very High
2	51 – 65	38	50 %	High
3	36 – 50	5	6,75 %	Low
4	20 - 35	-	-	Very low

Based on table 1 of the data categories of self-efficacy *(self-efficacy)* can be seen that there are 38 students or respondents who have a high category with a percentage of 50% and not in the very low category. Judging from the number of frequencies, it can be seen from the table above that the self-efficacy of grade V students at the State Elementary School 12 Mandau is categorized as high with the highest frequency. The self-efficacy variable (X) is also known to have an average (mean) of 62.75 and a standard deviation of 20.44.

b. Students' Knowledge of 3-D Shapes

Students; knowledge of 3-D shapes was measured based on the material of cubes and blocks, which obtained the following results as presented in Figure 2.

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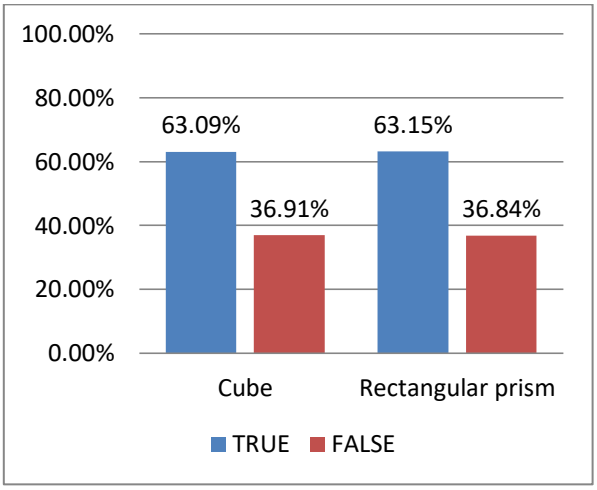

Figure 2. Students' Knowledge of 3-D Shapes

In Figure 2 describes data about knowledge of flat-sided shapes, namely about cubes and beam. From Figure 2 on this cube material is presented as many as 7 item questions of which 63.09% of students answered correctly, this shows that students' knowledge about the shape of the cube is good, so that students are able to answer questions about the elements of the flat side. cubes such as corner points, edges, and sides of the cube, then hit the nets of the cube to find the volume of the cube. Furthermore, on the block material, 63.15% of students answered the question correctly and 36.84% of the other students answered the question incorrectly. This shows that most students have good knowledge of the geometric shape of the beam, so that students are able to answer questions about the shape of the beam such as beam elements such as corner points, edges and sides of the beam. Next about the block material, 63.15% of students answered the question correctly and 36.84% of the other students answered the question incorrectly. This shows that most students have good knowledge of the geometric shape of the beam, so that students are able to answer questions about the shape of the beam such as beam elements such as corner points, edges and sides of the beam. Next about the beam nets to find the volume of the block space (Table 2).

Table 2. Category Knowledge of spatial structure

No	Interval	Frequency	Percentage (%)	Category
1	76 – 100	16	21,05%	Very High
2	51 – 75	34	44,73 %	high
3	26 – 50	22	28,94 %	low
4	0 – 25	4	5, 26 %	Very low

As been seen in table 2, there are 16 students which is included in the very high category with a percentage of 21.05%, then 34 students or respondents are included in the high category with a percentage value of 44.73%. Based on the data that has been processed by the examiner and presented in table 2, it is known that the students' knowledge of class v elementary school 12 Mandau is included in the high category with the highest frequency, namely 34 students with a percentage of 44.73%.

c. Hypothesis Testing

Testing the hypothesis in this study using computer-assisted SPSS version 24 can be seen in the table 3.

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Table 3. Correlation Test between Self-Efficacy and 3-D Shapes

Self efficacy	Pearson correlation	1	0,337
3-D Shapes	Pearson correlation	0,337	1

As been seen in table 3 regarding the correlation test between the variable (X) of self-efficacy and the variable (Y) of spatial knowledge, the results of the $r_{count\ are}$ 0.337, in which there is a positive relationship between self-efficacy and spatial knowledge. Furthermore, to determine the significance of the correlation coefficient of self-efficacy with students' spatial knowledge, a t, with the results presented in table 4.

Table 4. Significant test between Self-efficacy and 3-D Shapes

Self Efficacy with spatial knowledge	t_{count}	t_{table}	Coeffition ef determination	Interpretation
	3,077	1,66	11,3 %	The relation ship of which is significant

Based on table 4 the results of the significance test of self-efficacy with knowledge of spatial structure obtained t_{count} of 3.077 while t_{table} of 1.66, so it can be seen if $t_{count} > t_{table}$ then it can be it is concluded that Ho is rejected and Ha is accepted, because as is known there is a significant relationship between self-efficacy and knowledge of flat-sided geometry. Table 4 also shows the results of the coefficient of determination of 11.3%, which shows that self-efficacy contributes to students' spatial knowledge of 11.3%. Meanwhile, the remaining 88.7% were caused by other factors apart from self-efficacy.

As for knowing how big the relationship between self-efficacy and spatial knowledge is, it can be seen in table 5.

Table 5. Interpretation of self-efficacy and 3-D shapes

Correlation	Correlation coefficient (r_{xy})	Interpretation coefficient of determination
Self efficacy with spatial knowledge	0,337	Low

Based on Table 5, the correlation coefficient (r_{xy} shows that) is 0.337, which results are included in the low category. In the correlation test, it was found that Ha was accepted and Ho was rejected, which can be concluded that there is a significant positive relationship between self-efficacy and knowledge of building space for fifth grade elementary school students at Mandau 12 State Elementary School. Based on this conclusion, it shows that the higher the variable X (self-efficacy), the higher the variable Y (Knowledge of spatial structure).

d. Linear Regression Test Regression

One way to make a prediction on an unknown variable from a known variable and know the magnitude and direction of the relationship. Results of linear regression between students' self-

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efficacy and knowledge of 3-D shapes is presented in Figure 3.

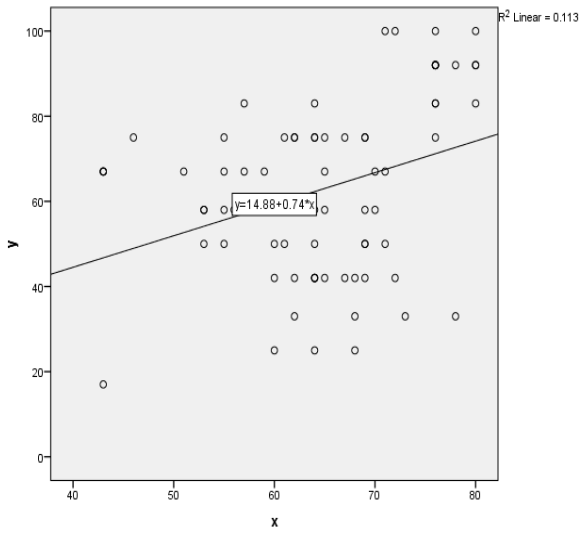

Figure 3. The regression model of Self-efficacy and 3-D shapes

Referring to Figure 3 the results of data analysis linear regression efficacy (self-efficacy) with knowledge of geometrical equation regression is Y = 14.88 + 0,74X, R^2(coefficient which express the contribution of X to Y) amounted to 0,113. With this equation, it can be seen that spatial knowledge can be estimated if we know the value of *self-efficacy*. From the value of b = 0.74, it means that for every 1% addition to the level of self-efficacy (X), the knowledge of building space (Y) will increase by 0.74. This linear equation shows that the regression coefficient value is positive (+) so that it can be said that *self-efficacy*(X) has a positive effect on spatial knowledge (Y).

4. DISCUSSION

Self-efficacy is a belief that individuals have in their abilities. Self-efficacy is basically a cognitive process which results in decisions, beliefs in estimating their ability to carry out certain tasks to achieve the desired results. Based on the results of research conducted at an elementary school in Duri, Indonesia., it was found that 38 students were included in the high category with a percentage of 50%. Meanwhile, for the very high category, there were 33 students with a percentage of 43.4%. This can be seen from 3 aspects of self-efficacy, namely *Magnitude* (level of task difficulty), *Strength* (strength of belief) and *Generality* which of these three aspects is used as a benchmark for measuring student self-efficacy. Students who have high enough self-efficacy will also be persistent and not give up easily, but on the other hand students who have low enough self-efficacy will easily give up. According to Ghufron and Suminta (2013) individuals who have high self-efficacy will have high learning outcomes, therefore students or individuals who have high self-efficacy will be more persistent in facing difficulties to achieve better mathematics learning outcomes.

Based on the results of research on students' knowledge about building space, it can be seen after doing research on fifth grade students of an elementary school as many as 34 students from the total number of respondents as many as 76 students get results in the high category with a

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percentage of 44.73%, while as many as 4 students are included in the high category. very low category with a percentage of 5.26%, in which students' knowledge of spatial structure is quite good. Because building space is one of the materials whose concepts are difficult for elementary school students to understand.

Based on the research that has been carried out, to determine the relationship between self-efficacy and spatial knowledge, the researchers conducted a prerequisite analysis test, namely by carrying out normality tests and linearity tests. The results of the self-efficacy normality test are known to be P-Value, namely Asymp. Sig. (2-tailed) has a value of 0.200 > 0.05, so it can be concluded that the residuals have met the assumption of a normal distribution. while the normality test for the spatial knowledge variable is known to be P-Value, namely Asymp. Sig. (2-tailed) has a value of 0.094> 0.05 so it can be concluded that the residuals have met the assumption of a normal distribution. Furthermore, to test the linearity test, a significant value of 0.027 was obtained, where the resulting significant value was smaller than 0.05, where there was a linear relationship between self-efficacy (X) and spatial knowledge (Y). as for the linear relationship between self-efficacy (X) and spatial knowledge (Y) indicating that the variables have a unidirectional relationship.

Next, a hypothesis test was conducted to determine whether there was a significant relationship between self-efficacy (X) and spatial knowledge (Y). It was obtained r_{count} of 0.337 with the level of interpretation of the relationship included in the low (weak) category. The positive relationship meant is that the self-efficacy variable (X) is in line with the spatial knowledge variable (Y) or the increase in the self-efficacy value will be in line with the increase in spatial knowledge, and vice versa the decrease in the self-efficacy value (X) will be in line with the decrease in waking knowledge. room. This means that students' self-efficacy can increase knowledge of spatial structure, in other words high self-efficacy is needed for high student spatial knowledge as well.

The results of this study are in line with research conducted by Alminingtyas, et al (2018) which examined the relationship between self-efficacy and learning outcomes in mathematics where the results had a positive direction of 0.598, in which the hypothesis in this study Ho was rejected, and H1 was accepted, or with In other words, there is a significant relationship between self efficacy and mathematic learning.

5. CONCLUSION

Based on the data processing that has been carried out in this study, it can be concluded that there is a significant positive relationship between self-efficacy and the knowledge of classroom construction of class 5 grade elementary school 12 Mandau where $t_{count\ is}$ 3.077 > $t_{table\ is}$ 1.66. with the meaning that there is a significant relationship, so it can be concluded that the hypothesis (Ha) is

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accepted and (Ho) is rejected with a sound that there is a significant positive relationship between self-efficacy (self-efficacy) and spatial knowledge.

Based on the conclusions above, the researcher provides several recommendations as follows:

1. For teachers, after the implementation of this research, it is expected that teachers will be able to assist students in improving students' self-efficacy. Teachers are also expected to be able to come up with a solution for how to learn geometry about geometric shapes that can be easily understood by students, because this material is one of the materials that is difficult for students to understand.
2. For students, the research that has been carried out proves that there is a relationship between self-efficacy and spatial knowledge, with that students are expected to be able to increase their self-efficacy, so that students are able to complete certain tasks and achieve the desired thing well.
3. For parents, parents are expected to help students improve their self-efficacy. By always supporting whatever the individual wants to do and what he wants to achieve and always encouraging and convincing him that he can achieve what he wants.

For researchers, for further researchers after the implementation of this research, it is hoped that they can examine other factors that affect students' spatial knowledge.

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