

The Relationship of Spatial Thinking Ability and Understanding Image Interpretation of Google Earth By Students at SMAN 2 Karanganyar

Anisaa Nur Halimah*, Wahyu Widiyatmoko, Puspita Indra Wardhani and Yunus
Aris Wibowo

Universitas Muhammadiyah Surakarta, Surakarta, Indonesia

*Corresponding author. Email: wahyu.widiyatmoko@ums.ac.id

ABSTRACT

This study aims to determine how the relationship of the ability of spatial thinking to the understanding of image interpretation *google earth* in the matter of remote sensing in SMA Negeri 2 Karanganyar. Type of study in this research is Quantitative Research. The population in this research is all students of class XII IPS di SMA Negeri 2 Karanganyar amounted to 143 students with the sample is the students of class XII IPS 1. The determination of the research sample is selected based on the average value of the end with the technique *purposive sampling*. Data collection techniques used in the form of a questionnaire which is carried out in *online* use *google forms*. Analysis of the data used in this research is Correlation Test *Pearson*. The results showed that 1) Students have the average value of the ability of spatial thinking that 32,5 included in the category of low, 2) The average value of the ability to image interpretation *google earth* in the material of the sensing distance: 67,57 included in the category high, 3) the Value of the significance test of correlation *pearson* that 0,138 so that shows there is no relationship between the ability of spatial thinking and the ability to image interpretation *google earth*.

Keywords: *Google Earth, Spatial Thinking, Image Interpretation, Remote Sensing.*

1. INTRODUCTION

Geography is the science that support the lives of many people because of the field studied in the learning of geography includes the earth and everything that discusses the process of formation as well as the human relationship with the environment. The study of geography learning a highly complex has a purpose, which can provide spatial thinking skills to students [1]. In addition, geography is one of the learning that can help develop spatial ability [15]. One of the main struggle in the teaching and learning of geography is to help students learn to think spatially [2].

The ability of spatial thinking essentially is the ability of a person or the perspective of someone in the process and control the information that exist in space. Spatial thinking is a set of cognitive aspect which is a combination of the concept of spatial (space), overview (tools) and process thinking [3]. Spatial ability can be used to shape and manipulate objects that are visualized in the form of three-dimensional [4]. The

ability of spatial thinking can be used for learning geography but to teach it, teachers geography requires proper knowledge and perception [11]. This ability can be used in the material of remote sensing.

Remote sensing is the science or the technique and art to obtain information about the object, region and symptoms with the tool without touching directly [5]. The science of remote sensing has an important role to analyze the region based on the nature of the reflection wave received by the sensor from the object at the earth's surface and shown in the form of the image [20]. Learning remote sensing demanding teachers using the learning media that follow the development of the times one of them is using satellite imagery. Satellite imagery can show a picture of the earth as a visual and can analyze a variety of fields in remote sensing, such as in the fields of hydrology, geology, oceanography, meteorology, land use, geography and spatial planning and mapping disaster areas [6]. Satellite imagery can be accessed easily and for free through the google earth application.

Google earth is an application that presents a map of the world, the state of the topography, the terrain can overlay the road as well as building location and geographic information other [7]. Google earth imagery can be printed out for learning activities and can be downloaded easily using a laptop or mobile phone by teachers and students. Advantages of google earth is able to provide a deeper understanding to the students in learning the concepts of physics of the earth [8]. Google earth is also influential in improving student learning outcomes [9]. Project-based learning-assisted google earth have a significant effect on the skills of spatial thinking of students [1].

SMA Negeri 2 Karanganyar be the location of the study because based on the results of the survey at SMA Negeri 2 Karanganyar, geography teachers use the lecture method during the learning activities. The lecture method which is done by the teacher only to the extent the transfer of knowledge without the use of media such as satellite imagery so that students are lacking in skill the interpretation of the image. Skill the interpretation of the image needed by the students to interpret the object in the image through the introduction of the object that refers to the investigation of the characteristics on the image. Application of classroom teachers use to demonstrate the power point and give the task to the students.

The researchers wanted to determine the ability of spatial thinking in SMA Negeri 2 Karanganyar because of the ability of spatial thinking is indispensable students, especially high school students to prepare themselves to face the competition of the industrial revolution 4.0 as it is today. The competition requires the skill of a person to understand and plan for the phenomenon of the geosphere in the form of a space such as determining the location of a place, predict the direction of the development of the city as well as distribute the direction of goods and services [10]. Researchers also want to determine the understanding of the interpretation of the imagery through google earth google earth is the one app in the form of digital interactive in a globe and is easily accessible using a mobile phone or laptop. Media google earth rated can improve student learning outcomes [9]. Based on the description that the researcher wants to determine the Relationship of the Ability of Spatial Thinking to the Understanding of the Image of Google Earth on the Material of Remote Sensing in the Class XII SMA Negeri 2 Karanganyar.

2. METHOD

This research uses descriptive research method with quantitative approach. Descriptive method is used to give an overview of the relationship the ability of spatial thinking to the understanding of the interpretation of google earth imagery in SMA Negeri 2 Karanganyar.

Quantitative approach in this study using statistics (numbers) are concerned with the existence of the variables as objects in the study, which will be defined in the form of operational variables. The Data obtained from this study in the form of numbers and will be processed by using the statistical techniques of descriptive and correlational techniques. Variables to be correlated is the ability of spatial thinking and the ability of interpretation of google earth imagery.

The subject involved in this study were students of class XII IPS di SMA Negeri 2 Karanganyar that consists of 4 classes, namely: XII IPS 1, XII IPS 2, XII IPS 3 and XII IPS 4. The sample in this study amounted to 35 students. The determination of the research sample is selected based on the average value end with purposive sampling technique. Found that the class XII IPS 1 has an average value of end is superior to the 83,26 to the knowledge and 82,97 for skills.

Data collection techniques in the form of questionnaires. Questionnaire in the form of questions test the ability of spatial thinking and the ability of image interpretation performed to test the validity and reliability of the first before the instrument used for the data collection process. Data collection was conducted online using google forms with a spread links about the sample of research is the students of class XII IPS 1 SMA Negeri 2 Karanganyar. This technique is done in order to obtain the results of the research results in the form of spatial thinking skills and the ability to image interpretation.

The technique of data analysis used in this research is the technique of quantitative descriptive analysis and pearson correlation analysis. The quantitative descriptive analysis, the researchers used a specialized graph the results of data retrieval. While the pearson correlation analysis used by researchers for information, the presence or absence of a relationship between the ability of spatial thinking and the ability of interpretation of google earth imagery. Pearson correlation test was conducted after the test, the classical assumption, namely normality test and homogeneity test.

3. RESULTS AND DISCUSSIONS

Research conducted at SMA Negeri 2 Karanganyar obtain the data generated in this study of the value of the results of tests that have been done by the students. The results obtained in the form of the value of the results of the tests the ability of spatial thinking and the value of the results of the tests the ability of the interpretation of the image so that in this study there are two values of the test results. The value obtained is the total score obtained by each student. The number of samples in this study a total of 35 samples so that the number of data values that is processed by researchers as much as 35

the value of the results of the tests the ability of spatial thinking and 35 the value of the results of the tests the ability of the interpretation of the image. The results of the value obtained from the ability of spatial thinking and the ability of the interpretation of the image and then analyzed each of the variables with descriptive statistics.

3.1. The Level of Spatial Thinking Skills

The results of the descriptive statistical analysis can be seen in Table 1. Based on the table can be seen that the average value of the spatial thinking skills of the

Table 1. Statistical Analysis of the Distribution of Spatial Thinking Ability Values

Distribution Statistics	
Mean	32,5
Median	31
Mode	25
Standard Deviation	16,68
Number of Samples	35

Source: Researcher, 2021

The level of spatial thinking skills of students of class XII IPS 1 can be seen in Table 2 and figure 1. The level of spatial thinking skills are divided into 3 categories, low, medium and high. The low category has a range of values between 0-33,33, medium category has a range of values between 33,33-of 66,66 and higher categories have a range of values of 66,66-100. The students of class XII IPS 1 that has a value between 0-33,33 in the category of low total 22 students with a percentage of 62,86%. Students who have value to the

Tabel 2. Spatial Thinking Ability Level

Spatial Thinking Category	Value	Total	Percentage (%)
Low	0-33,33	22	62,86
Medium	33,33-66,66	12	34,29
High	66,66-100	1	2,86
Total		35	100

Source: Researcher, 2021

students of XII IPS 1 is 32,5 which is the result of the total number of sample values divided by the number of samples as many as 35 students. The average value of 32,5 including the value in the low category that 0-33,33. The statistics obtained by the students of XII IPS 1 is 31. The value that often appear or mode that is 25, so it can be concluded that most of the students of XII IPS 1 has a value of 25 to test the ability of spatial thinking. The value of standard deviation which is the distribution of the data in a sample test of the ability of spatial thinking shows the value of the 16,68.

category, namely 33,33-of 66,66 as many as 12 students with the percentage of 34,29% and students who have a value with the high category between of 66,66-100 1 students with a percentage of 2,86%. Based on this it can be concluded that the results of the tests the ability of spatial thinking is dominated by students with low category.

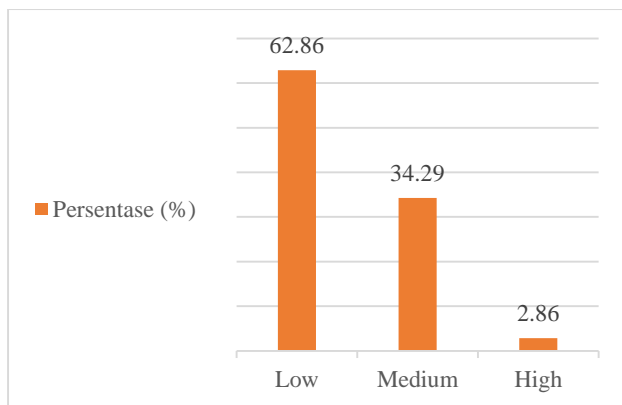


Figure 1 Spatial Thinking Ability Level

The ability of spatial thinking has eight aspects of spatial thinking. Aspects of spatial thinking skills as a benchmark assessment of the ability of spatial thinking.

Table 3. Number of True and False Answers

Aspects of Spatial Thinking		Question	Answer		Percentage (%)
			True	False	
Aspect 1	Understanding orientation and direction	1	21	14	60%
		2	22	13	62,86%
Aspect 2	Comparing information on a map and a graph	3	14	21	40%
Aspect 3	Selecting the appropriate information based on some spatial information	4	6	29	17,14%
Aspect 4	Ability to create topographic profiles based on line lengths on contour maps	5	9	26	25,71%
Aspect 5	Looking for the spatial correlation of various distributions of phenomena	6	9	26	25,71%
		7	14	21	40%
Aspect 6	Drawing 3D drawings based on 2D drawings	8	7	28	20%
Aspect 7	Merge and split maps	9	12	23	34,29%
		10	11	24	31,43%
		11	6	29	17,14%
		12	6	29	17,14%
Aspect 8	Understand the shape of the earth's surface which is represented in the form of points, lines and areas.	13	11	24	31,43%
		14	13	22	37,14%
		15	16	19	45,71%
		16	3	32	8,57%

Source: Researcher, 2021

The results of the research Collins (2018) show some of the students argued that the question number 1 and 2 are included in the category easy because the

Based on Table 3 can be seen the number of students who answered correctly and one of the aspects of spatial thinking skills.

The number of students with correct answers was highest in aspect 1 with a number of problem 1 and 2. In question number 2, there are 22 students answer correctly then followed by the question number 1 with 21 students answered correctly. The correct answer next highest is on the aspects of the 8 with a number of about 15 that as many as 16 students answered correctly. Aspect 2 with a number of problem 3 and the aspect of 5 with the number of about 3 and 7 to be the correct answer next highest with 14 students answered correctly.

instructions on the matter is simple and easy to understand, the other students argue that the direction of the north pointing to the top so need to strategize. A

student develop a strategy that question it would be easier if the compass is used in outlining the problem on number 1 and 2.

The highest error of the students in answering the question of spatial thinking skills are the highest in number about 16, 4, 11, 12 and 8. In number about 16 as many as 32 students are wrong in answering questions the ability of spatial thinking. Then on the number of questions 4, 11 and 12 as many as 29 students answer wrong about the ability of spatial thinking. As many as 28 students answer the questions the ability of spatial thinking with the wrong number about 8.

The results of the research Collins (2018) stated that from 16 about the ability of spatial thinking, question number 11 and 12 are included in the problem with categories is difficult. Based on this it can be concluded that the spatial thinking skills of students included in the low category. However, the ability of students in determining the orientation and direction is very good if compared with the ability of students in understanding the shape of the face of the earth, which is represented

Table 4. Statistical Analysis of Image Interpretation Ability Value Distribution

Distribution Statistics	
Mean	67,57
Median	69
Mode	68,75
Standard Deviation	19,41
Number of Samples	35

Source: Researcher, 2021

In Table 4 and figure 2 can be seen the level of ability of interpretation of google earth imagery in the material of remote sensing which is divided into 3 categories, namely low with a value of 0-33,33, was with the value of the 33,33-of 66,66 and high with a value of 66,66-100. Ability level interpretation of the image of the students in the high category included into the highest levels with the number of students 19 from a total of 35 students. It shows that most of the students

Table 5. Image Interpretation Ability Level

Image Interpretation Category	Value	Total	Percentage (%)
Low	0-33,33	3	8,57
Medium	33,33-66,66	13	37,14
High	66,66-100	19	54,29
Total		35	100

Source: Researcher, 2021

in the form of point, line and area as well as the ability of students in combine and separate the map.

3.2. Image Interpretation Ability Level

Based on the results of the statistical analysis of the value of the ability of interpretation of the image of the students of XII IPS 1 in Table 4 the average value of the ability of interpretation of the image of the students of XII IPS 1 included 67,57. It shows that the average value of the students of XII IPS 1 belongs to the range of the value of the category, namely between 33,33-of 66,66. The value of the middle of statistics students on the matter of the ability of the interpretation of the image that is 69. The value that often appears on the matter of the ability of the interpretation of the image that is 68,75 so it shows that most of the students of XII IPS 1 has a value of 68,75. The value of the standard deviation of the students of XII IPS 1 shows the value of the 19,41.

have a level of proficiency interpretation of the image of the high category with a percentage of 54,29%. In the category there are 13 students with a percentage of 37,14% in the level of ability of the interpretation of the image. There are 3 students with the percentage 8,57% included in the category and level of the lowest category on the ability of image interpretation.

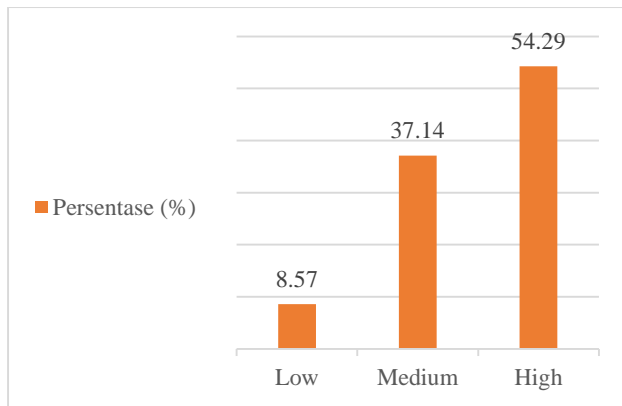


Figure 2 Image Interpretation Ability Level

The ability of Image Interpretation have 2 aspects which are divided into 2, namely the aspect of knowledge of the interpretation of the image and the aspect of skill the interpretation of the image. Aspects such as the benchmark to evaluate the ability of the interpretation of the image. In the aspect of knowledge there is the hue or the color, texture, pattern, shadow, shape, association, size, and site. On the aspect of skills

in the form of a texture which is 20 students. There are 7 the correct answer in the aspect of knowledge is a

In the aspect of knowledge in the form of the shadow of the students have the correct answers 26 and wrong answers 9. There are 2 questions on aspects of knowledge in the form of the form with the number of questions 5 and 9 that each student has the correct answer 26 and 28. Students who answered correctly on the aspect of knowledge in the form of association of as many as 16 students. There are 25 students who answered correctly on the aspect of size in the knowledge of the interpretation of the image.

The number of students who answered correctly and one on the skills of interpretation of the image can be seen in Table 7 with the correct answer which is 31 which is the correct answer highest in the skills of interpretation of the image in the aspect of detection. On the identification of features 5 numbers about the number 10 with the correct answers 21, number 11 with the correct answers 26, number 12 with the correct answers 21, number 15 with the correct answers 15 and

there is a detection, identification and analysis. This is in line with research Saputro (2020) that the spatial thinking skills of the learners using the image sensing has two aspects of research in the form of the aspects of knowledge and aspects of the skill.

Based on Table 6 and 7 can be aware of students who answered correct and wrong on every aspect of knowledge and skill the interpretation of the image. The aspects of knowledge that includes the hue or color and the site has a correct answer that is 29 with a number of problem 1 and 8 which is the highest response in the aspect of knowledge of the interpretation of the image. Students who have the correct answer in the aspect of knowledge in the form of a texture which is 20 students. There are 7 the correct answer in the aspect of knowledge is a pattern and is the answer to the lowest in the knowledge of the interpretation of the image. Students who have the correct answer in the aspect of knowledge

pattern and is the answer to the lowest in the knowledge of the interpretation of the image.

number 16 with the correct answers 25. On aspects of skills in the form of analysis to number about 14 have the correct answers to 5 and is the answer to correct low and answers one of the highest on the skills of interpretation of the image.

The students ability in mastering the aspects of the skills of detection is high compared with the identification and analysis. This is in line with research Saputro (2020) that on the aspect of skills of detection of the students were able to identify the object in the image based on the elements of a hue or color on the image is better than another. Based on this it can be concluded that the ability of interpretation of google earth imagery in the material of remote sensing included in the category of being as well as the students ability in mastering the aspects of knowledge higher than the students' ability in mastering the aspects of skills in the ability of the interpretation of the image.

Table 6. Number of True and False Answers Aspects of Knowledge

Image Interpretation Knowledge			Question	Answer		Percentage (%)
				True	False	
Hue or Color	Identifying the hue or color of an object	1		29	6	82,86%
Texture	Identifying textures on objects	2		20	15	57,14%

Pattern	Identifying patterns on objects	3	7	28	20,00%
Shadow	Identifying shadows on objects	4	26	9	74,29%
Shape	Identifying the shape of the object	5	26	9	74,29%
		9	28	7	80,00%
Association	Identifying associations on objects	6	16	19	45,71%
Size	Identifying the size of the object	7	25	10	71,43%
Site	Identifying the site on the object.	8	29	6	82,86%

Source: Researcher, 2021

Table 7. Number of Correct and False Answers Aspect of Skills

Image Interpretation Skills		Question	Answer		Percentage (%)
			True	False	
Detection	Identifying objects in the image based on the hue or color elements in the image	13	31	4	88,57%
Identification	Identify objects in the image using sufficient information	10	27	8	77,14%
		11	26	9	74,29%
		12	21	14	60,00%
		15	15	20	42,86%
		16	25	10	71,43%
Analysis	Interpret objects in the image detail.	14	5	30	14,29%

Source: Researcher, 2021

3.3. Relationship Between Spatial Thinking Ability And Image Interpretation Ability

3.3.1. Normality Test

Normality test is a test conducted to determine the data distribution is normal or not normal. Normality test is said to be normal if the significance value $>0,05$ and considered abnormal if the value of significance of $<0,05$. The results of the normality test for two data in the study had normal results.

Normality test the ability of spatial thinking and the ability to image interpretation using the method of Shapiro-Wilk with a level of significance of 5%.

Table 8. Normality Test Results Test Value Data

Normality test results in Table 8 the ability of spatial thinking that is 0,269 which means a significance value greater than 0,05, so the normal distribution of data. The Data capacity of the interpretation of the image also is the data that the normal distribution can be seen in Table 8 that is processed using the method of Shapiro-Wilk with a level of significance of 5%. The results of the normality test of the interpretation of the image that is 0,307 which means the value of significance is greater than 0,05 so that the data can be said to be normal distribution.

Test of Normality			
Research Variable	Shapiro-Wilk		
	Statistic	df	Sig.
Spatial Thinking Skills	,961	33	,269

Image Interpretation Ability	,963	33	,307
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a. Lilliefors Significance Correction

Source: Researcher, 2021

3.3.2. Homogeneity Test

The results of the homogeneity test of the value of spatial thinking skills and the ability to image interpretation can be seen in Table 9. The Data can be said to be homogeneous if it has a significance level $>0,05$ and said to be homogeneous if it has a significance level of $<0,05$. The results of the

homogeneity test the ability of spatial thinking and the ability of the interpretation of the image that is 0,279. This suggests that the $0,279 > 0,05$ so that the data the results of the tests the ability of spatial thinking and the ability of the interpretation of the image data is homogeneous.

Table 9. The Results of Data Homogeneity Test Values

Test of Homogeneity of Variances			
Levene Statistic	df1	df2	Sig.
1,192	1	64	,279

Source: Researcher, 2021

3.3.3. Pearson Correlation Test

The prerequisites of the correlation test in the form of normality test and homogeneity test. The results of the normality test showed normal distribution of data

and homogeneity test showed the data is homogeneous so that the test used is parametric statistics. Parametric statistical tests are performed to determine the relationship between the ability of spatial thinking on the ability of image interpretation using the pearson correlation test.

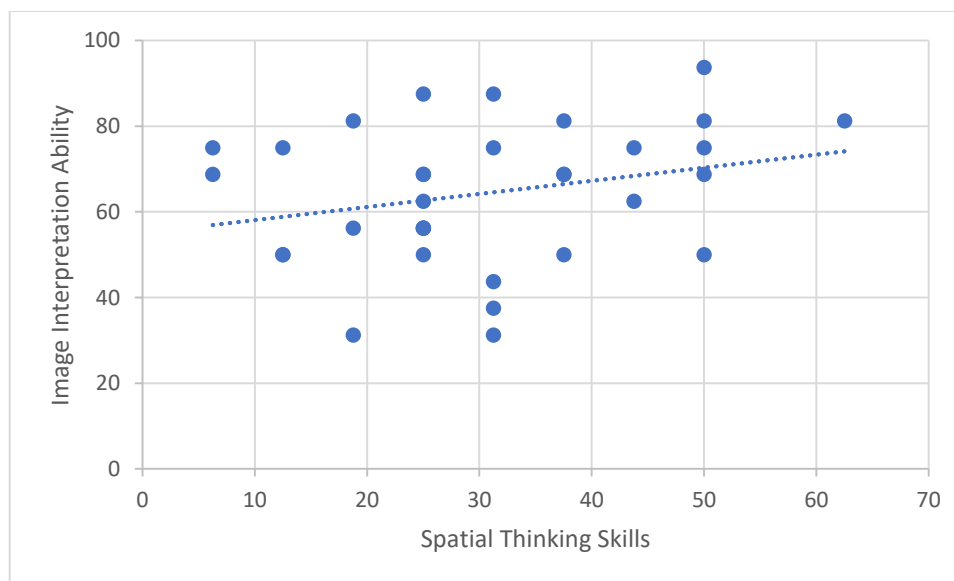


Figure 3 Trend Lines Are The Data Value Of The Test

Table 10. Correlation Test Results Scores of Spatial Thinking Ability and Image Interpretation Ability

Correlations				
			Spatial Thinking Skills	Image Interpretation Ability
Spatial Thinking Skills	Thinking	Pearson Correlation	1	,264
		Sig. (2-tailed)	.	,138
		N	33	33
Image Interpretation Ability	Ability	Pearson Correlation	,264	1
		Sig. (2-tailed)	,138	.

Source: Researcher, 2021

The relationship of the ability of spatial thinking and the ability of image interpretation can be seen in Table 10. Based on the results of parametric statistical tests using pearson correlation results obtained significance 0,138. The value of significance 0,138 indicates the value is greater than 0,05. Based on the results of correlation test, it can be concluded that H_0 is accepted and H_1 is rejected and this study showed that there is no relationship between the variables of the ability of spatial thinking and the ability of the interpretation of the image because the value of significance 0,138 is greater than 0,05.

The relationship between the ability of spatial thinking and the ability of interpretation of the image of students can be seen based on the students ability in answering questions. On the ability of spatial thinking which consists of 8 aspects and is divided into 16 a matter of only a small percentage of students who answered correctly while on the ability of image interpretation, which consists of 2 aspects and is divided into 16 questions show that most of the students answered correctly and the aspects that have the largest percentage contained in the aspects of knowledge. The results of the research Hadi (2012) explain that during this geography learning only emphasizes the cognitive aspects and should be reoriented on the ability of spatial thinking.

Based on the description above can be concluded that each student has different abilities in each of the questions tested whether it is the ability of students who are low, moderate and high. Students have varying abilities on the ability of spatial thinking and the ability of the interpretation of the image due to different intelligence on each student. This is in line with research Harahap (2018) that every student has the ability of different spatial one with the other.

4. CONCLUSION

Based on the research results it can be concluded that the ability of spatial thinking of students included in the low category with an average value of 32,5 whereas the ability of interpretation of the image of the students included in the high category with an average 67,57. The results of pearson correlation test between the ability of spatial thinking and the ability of the interpretation of the image shows a significance value of 0,138. Value 0,138 greater than 0,05, thus indicating that there is no relationship between the ability of spatial thinking and the ability of the interpretation of the image. The level of relationship between the ability of spatial thinking and the ability of the interpretation of the image included in the level of low relationship that 0,264. As this study has a limitation on the technique of

data collection is done online because of the pandemic covid-19 as well as limited the number of respondents in the study. In addition, the ability of the respondents in doing an online test is very dependent on the internet network where not all respondents have the internet network to take the test online. For researchers who want to conduct similar research, the results of this study can be used as a reference to research that has the same title so further research is better and in collecting data more coordinated so that the data obtained will be more complete and easier in the preparation of the study.

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