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Analysis of Mathematical Reasoning Abilities Junior High School Students In Terms of Learning Styles On Online Learning

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Abstract

This study aims to determine the profile and relationship between students' mathematical reasoning abilities and learning styles in online learning. The research method used is a quantitative method. The population was grade VIII studnets studying in public Junior High School (JHS) in DKI Jakarta province and the sample was 400 respondents by using cluster random sampling. To identify the relationship between mathematical reasoning ability and learning style, a sample of 39 students was taken from 400 respondents. The research instrument was in the form of a questionnaire and mathematical ability test questions in the form of a description. The data analysis technique used descriptive statistics. The results showed that: (1) the tendency of students' mathematical reasoning abilities was included in the medium category, (2) students had varied learning styles, namely visual, auditory, and kinesthetic learning styles (3) the tendency of students' learning styles of public JHS in DKI Jakarta is visual learning style with a percentage of 32.25% as many as 129 students from 400 respondents, (4) there is a significant relationship between mathematical reasoning abilities and student learning styles with a Pearson correlation score of 0.565, and the relationship between the two variables is included in the category of moderate correlation.

Keywords: Mathematical Reasoning; Learning Style; Junior High School Students, Online Learning

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Introduction

Online learning is one form of learning solution during the COVID-19 pandemic. During the enforcement of community activity restrictions period there has been an increase in the number of students taking online courses, in China online courses are carried out by educators providing material to students then students study and watch the material (Hong et al., 2021). Not much different from China, in Indonesia when online learning takes place, educators provide learning materials assisted by learning management systems such as google classroom, canvas, and microsoft teams (Pokhrel & Chhetri, 2021). One of the subjects given in online learning is mathematics.

Mathematics is closely related to many things, one of which is the ability to think. This can be seen in the 2013 curriculum which is a form of refinement of the 2006 curriculum (KTSP) with the aim of learning mathematics that emphasizes student abilities (Richardo, 2017). According to the NCTM in learning mathematics, the abilities that must be developed by students include mathematical communication skills, problem solving, representation, mathematical connections and mathematical reasoning abilities. The ministry of national education disclosed that mathematical reasoning and mathematics are 2 things that cannot be separated since mathematical content is comprehended using reasoning while reasoning is developed via mathematics learning (Octriana et al., 2019). If mathematical thinking abilities are not cultivated early on in pupils, students will assume that mathematics is only a subject matter that must follow set methods without grasping its underlying significance.

According to (Gürbüz & Erdem, 2016), mathematical reasoning may be defined as the process of arriving at a choice in a way that is meticulous, inventive, creative, and logical. The capacity to think mathematically is one that should be developed by pupils as it is highly vital in day-to-day living. The ability to reason mathematically serves as a basis on which one may build their mathematical knowledge (Riyanto & Siroj, 2011). According to the findings of TIMSS in 2003, the study showed that Indonesia received a score of 379 while the international average score of TIMSS was 500. In 2007, it obtained a score of 411 from its average international score of 467. In 2011, Indonesia received a score of 386 from the average international score was 500 (Khoirudin & Rizkianto, 2018). Finally, in 2015, Indonesia received an average score of 397 out of an average international score of 500 (Hadi & Novaliyosi, 2019). According to these findings, Indonesia has never achieved the TIMSS international average score; hence, Indonesia continues to have a very poor level of reasoning ability. This is in line with the research that was carried out by Indriani et al., (2018) in analyzing students' mathematical reasoning abilities and the habits of mind of junior high school students in quadrilateral and triangle material. They found that the level of students' mathematical reasoning ability is still very low, and this finding supports their findings.

Students in the junior high school level are typically youngsters who are between the ages of 12 and 15 years old. According to Indriani et al. (2018), children aged 11 years and over have entered a stage where children are able to think logically and abstractly. This demonstrates that junior high school students should have entered the operational stage where children are able to think logically, but the facts on the ground show that junior high school

students still have a lot of problems with their low reasoning abilities. Additionally, Indriani et al. (2018) contend that the lack of mathematical reasoning abilities, particularly in junior high school students, cannot be separated from a number of factors. These factors include the surrounding environment, characteristics in the learning process, and a lack of attention from parents. Indriani et al., (2018) argues that the lack of mathematical reasoning abilities, particularly in junior high school students, cannot be separated from a number of factors. Student learning styles are characterized by learning traits that are intrinsically linked to the activities of knowledge absorption, processing, and reception (Sari, 2014). The view of Sayuri et al., (2020), which demonstrates that one of the aspects that impact the students' mathematical reasoning ability is learning style, also lends credence to this idea.

Learning style is one of the ways a person receives and processes information or learning materials they receive during the learning process (Widyawati, 2016). Learning style can be said as a way that a person can do in the cognitive realm to be able to understand and carry out individual activities (Permana, 2016). Each student has his own uniqueness in the level of speed of learning, as well as his learning style (Permatasari, 2021). Based on one's learning style, not all students have the same learning style and one's ability to receive and absorb information is also different, some are fast, medium, and slow. To maximize students' mathematical abilities, they must first know whether their learning style is visual, auditory or kinesthetic.

Visual learning style is a learning style that relies on visual activity, the characteristics of this learning style include: tend to be neat and orderly, and include meticulous. Furthermore, the auditory learning style is usually called the listener's learning style, the characteristics of the auditory learning style include: fluent in speaking and learning through what he hears. Then the kinesthetic learning style, usually superior in the field of sports, or activities that involve members of the body. This type of kinesthetic learning style is often referred to as a driving learning style. This is because students with this type of learning style really like to use their limbs during the learning process, the characteristics of this learning style include: tend to speak slowly and slowly, care about physical appearance, happy with direct practice (Karim, 2014).

Online learning has not been the subject of much study on mathematical reasoning abilities and learning methods. Several prior research, such as those by Astuti et al. (2021) and Wahyudi and Walid (2020), have examined reasoning skills and learning styles in various methods. In grade 10, Astuti et al. (2021) examined the association between learning styles and mathematical reasoning abilities, whereas Wahyudi and Walid (2020) used the Missouri Mathematics Project Learning Model to define the relationship between mathematical reasoning abilities and learning styles.

During online learning, the author investigates the mathematical reasoning skills and learning style of students in eighth grade. The purpose of this study was to assess the mathematical reasoning ability and learning styles of students, as well as the link between the two.

Methods

The population in this study were all students of Junior High School in DKI Jakarta as many as 220.321 students (Pendidikan, 2021). The respondents in this study were class VIII students in the odd semester of the 2021/2022 academic year. Because the researcher did not get specific information about the number of students for each level, therefore the researcher made an estimate by dividing the total number of students at Junior High School in DKI Jakarta by three because there are three levels at the Junior High School level. Based on the calculation results, the estimated number of students in Junior High School class VIII in the province of DKI Jakarta is 73,441 students. In determining the number of samples, the researchers used the slovin formula (Wirawan et al., 2019). Based on the results of calculations using the researcher's Slovin formula, it takes at least 400 respondents to be able to represent the population. For the purposes of analysis, researchers took respondents using cluster random sampling technique. The cluster random sampling technique is used if the population is spread over several clusters and has homogeneous characteristics, then one or several areas can be taken at random and used as a research sample (Gulo, 2017). According to the findings of the researchers, the province of DKI Jakarta is home to two schools, specifically Junior High School 171 Jakarta and Junior High School 270 Jakarta. The method of data gathering was carried out in two stages throughout the process. Before the exam, the first step is to compile information on the various approaches to education adopted by the students. The data collecting process began with the administration of a questionnaire as an instrument, and then followed with the administration of a test instrument to evaluate the participants' capacity for mathematical reasoning. The mathematical reasoning ability test questions are organized with the test instruments in accordance with specified indications, which include formulating a hypothesis, executing mathematical manipulation, presenting explanation or proof for the correctness of the result, and drawing conclusion. All of the students were provided with learning style surveys in addition to test questions.

Table 1. Learning style questionnaire

Learning Styles	Indicator
Visual	1. Organized and tidy is also a good long-term planner. 2. It is easier to remember what you see than by hearing. 3. Thorough.
Auditory	1. It is easier to understand what is heard than to see it. 2. Is a fluent speaker and smart in telling stories. 3. Likes to read aloud and move the lips rather than having to write it down.
Kinesthetic	1. Frequent physical activity. 2. Prefer to learn through practice. 3. Use a lot of body language. 4. Can not sit still for a long time.

The learning style questionnaire consists of 24 statement items which are arranged based on the learning style questionnaire grid. The learning style questionnaire grid is shown in table 1. In the preparation of the questionnaire instrument using a likert scale consisting of 4 answer choices, namely always, often, sometimes, and never (Setiana & Purwoko, 2020). Each answer has a score of 1-4. After the grid is determined, the next step is to arrange the statement items according to the grid. The sample of the learning style questionnaire is presented in table 2 below.

Table 2. Study style questionnaire sample

No	Item Question	Answer Options			
		1	2	3	4
1	I am an organized and neat person.				
2	I prefer to listen to explanations from educators or friends rather than having to see them.				
3	I can't sit still for long.				

The test instrument consists of 5 questions. The material used in the test instrument uses number pattern material. The test instrument was arranged based on the reasoning ability test grid accompanied by a score rubric. The test instruments and questionnaires that have been compiled are then validated through 3 lecturers in the field of mathematics education and by students. Furthermore, after going through the validation process, the instrument must be tested for reliability. If the value of Cronbach's alpha is more than 0.6, then the data are considered to have a high level of reliability (Dirwan, 2019). On the other hand, the results from the mathematical reasoning ability test have a cronbach alpha value of 0.798, while the learning style questionnaire data have a cronbach alpha value of 0.809. According to the findings of the estimation, it was discovered that both instruments had a cronbach alpha value that was more than 0.6, which indicates that both instruments may be considered dependable. The sort of learning style that students have was determined by doing an analysis on the responses to a questionnaire about student learning styles. After that, we add up all of the points for each possible learning style. The kind of learning style held by students is determined based on the greatest number of scores among the three different types of learning styles. The number of scores received is then seen from the highest number of scores among the three different types of learning styles.

Results

Mathematical Reasoning Ability

After the computation results were evaluated, the data that was generated from them were then descriptively analyzed with the assistance of Microsoft Excel and SPSS 25. Figure 1 displays the findings from the investigation into the students' mathematical reasoning skills.

Table 3 provides a profile of the students' mathematical reasoning abilities based on the standards of the students' mathematical reasoning abilities.

kemampuan penalaran

N	Valid	400
	Missing	0
Mean		62,11
Median		65,00
Mode		65
Std. Deviation		19,642
Minimum		10
Maximum		100
Sum		24845

Figure 1. The results of the analysis of mathematical reasoning abilities

Based on figure 1, the lowest value is 10 and the highest value is 100. Then it can be seen that the mean is 62.11, the median is 65.00, the mode is 65, the Standard Deviation is 19.642, and the sum is 24845 using SPSS 25.

Table 3. Criteria for Mathematical Reasoning Ability

Score	Category	Frequency	%
$x \geq 70$	High	170	43%
$70 > x \geq 40$	Medium	181	45%
$x < 40$	Low	49	12%

In table 3 the criteria for students' mathematical reasoning abilities based on (Nisa, 2021) can be seen from 400 respondents, 170 students with a percentage of 43% have a high level of mathematical reasoning ability, 181 students with a percentage of 45% have a moderate level of mathematical reasoning ability and 49 students with the percentage of 12% have a low level of mathematical reasoning ability. After knowing the tendency of the level of mathematical reasoning ability of all students, the researcher selected a class of 39 students randomly to see specifically the students' mathematical reasoning ability in solving mathematical problems based on predetermined indicators.

Table 4. Description of students' reasoning ability scores in each question indicator

Indicator	N	Min Score	Max Score	Average	%
Making a conjecture	39	1	5	2,97	30,8
Performing mathematical manipulation	39	2	5	4,1	74,4
Providing reason or evidence for the validity of the solution	39	2	5	4,53	89,7
Drawing conclusion	39	1	5	3,36	51,3

Table 4 presents data on students' mathematical reasoning ability scores in each indicator. The average percentage of mathematical reasoning ability of students' ability to

carry out calculations based on mathematical formulas or rules that apply to the making a conjecture indicator with a percentage is 30.8%, it means that most students have not been able to use patterns or relationships to analyze in the problem solving process, in The performing mathematical manipulation indicator with a percentage of 74.4% means that students can perform a mathematical manipulation in solving a problem, then on the Providing reason or evidence for the validity of the solution indicator the percentage of the average obtained is 89.7%, this means most of the students were able to compile evidence or reasons for obtaining a solution, and on the drawing conclusion indicator the average percentage was 51.3%, this means that some students can draw a conclusion from mathematical problems. Furthermore, the results of the student's reasoning ability test in solving mathematical problems on number pattern material show the results if students' mathematical reasoning abilities have differences between high, medium, or low mathematical reasoning abilities.

The following is a sample of student answers in answering questions which include indicators one to four.

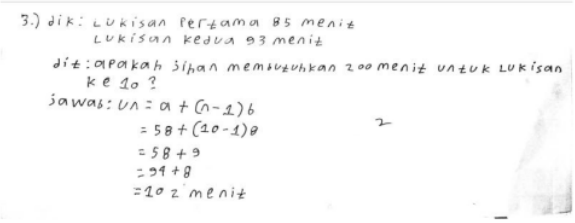

Figure 2. Students' answers to high-level mathematical reasoning abilities

Figure 2 shows that subjects with high-level mathematical reasoning abilities can use patterns or relationships to analyze the problem solving process according to the indicators of making a conjecture. Subjects are also able to work on problems on indicators of performing mathematical manipulation and Providing reason or evidence for the validity of the solution where students are able to manipulate mathematics and compile evidence or reasons to obtain solutions to mathematical problems. Then, students are also able to draw a conclusion from a mathematical problem according to the drawing conclusion indicator.

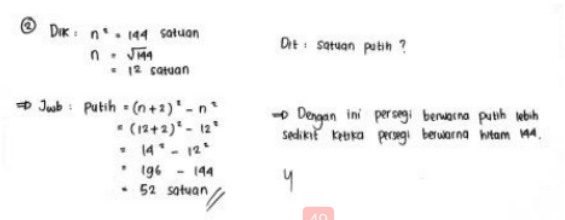

Figure 3. Students' answers with moderate level of mathematical reasoning ability

Figure 3 shows that subjects with moderate level of mathematical reasoning ability have not been able to use patterns or relationships to analyze in the problem solving process

according to the indicators of making a conjecture, but the subject is able to work on problems on the indicators of performing mathematical manipulation and Providing reason or evidence for the validity of the solution where students are able to manipulate mathematics and compile evidence or reasons to obtain solutions to mathematical problems. Then, students cannot draw a conclusion from a mathematical problem according to the drawing conclusion indicator.

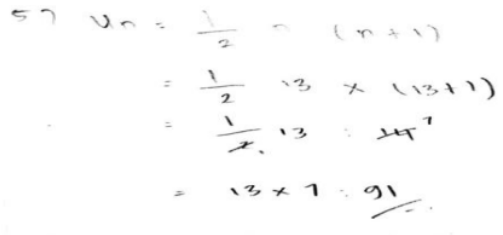

Figure 4. Students' answers to low-level mathematical reasoning abilities

Figure 4 shows that subjects with low-level mathematical reasoning abilities cannot use patterns or relationships to analyze in the problem solving process according to the indicators of making a conjecture. Subjects are also not able to work on problems on the performing mathematical manipulation indicator where students are not able to manipulate mathematics but students are able to compile evidence or reasons to obtain solutions to mathematical problems in accordance with the indicator Providing reason or evidence for the validity of the solution. Then, students are not able to draw a conclusion from a mathematical problem according to the drawing conclusion indicator.

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Learning Style

To find out the tendency of all students, the percentage calculation for each student's learning style is carried out, namely visual, auditory and kinesthetic. The way to find out the overall tendency of students is to use the following formula:

$$p = \frac{F}{N} \times 100\% \qquad (a)$$

Information:

P : Percentage
F : The frequency that the presentation is looking for
N : Number Of Case

According to the findings of the calculation, it is known that out of 400 respondents, 129 students, which corresponds to a percentage of 32.25%, have a visual learning style, as many as 114 students, which corresponds to a percentage of 28.50%t, have an auditory learning style, as many as 104 students, which corresponds to a percentage of 26% have a kinesthetic learning style, and as many as 53 students have a combination learning style,

including 12 students, which According to the collected data, the majority of students in the eighth grade at Junior High School in DKI Jakarta have a visual learning style, while some have auditory and kinesthetic learning styles. The interpretation of each type of learning style belongs to different categories. This can be seen from the characteristics possessed by class VIII students through the questionnaire method. So, it can be concluded that the learning style trend of eighth grade students of Junior High School in DKI Jakarta is visual learning style. The histogram of the student learning style categories is shown in Figure 5

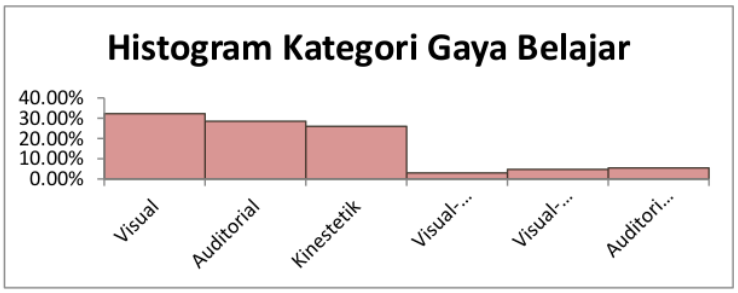

Figure 5. Histogram of learning style categories

The researcher did statistical estimation of the value to measure mathematical reasoning ability and learning style. Then it was found that there were 170 students with 49 students having visual learning styles, 43 students having auditory learning styles, 52 students with kinesthetic learning styles and 26 students with combined learning styles at the level of mathematical reasoning ability is in high category, then there are 181 students with 60 students having visual learning styles, then 63 students with auditory learning styles, 40 students with kinesthetic learning styles and 18 students having combined learning styles which are at the medium level of mathematical reasoning ability. And finally, there are 49 students with 20 students having visual learning styles, 8 students with auditory learning styles, 12 students with kinesthetic learning styles and 9 students with combined learning styles who are at a low level of mathematical reasoning ability.

Furthermore, to find out the profile of learning styles in class VIII Junior High School in DKI Jakarta by calculating the measurement scores to determine the level of criteria for each learning style, namely visual, auditory, and kinesthetic. The criteria for the student learning style questionnaire are presented in table 5 below.

Table 5. Criteria for student learning style questionnaire

Learning Style	Score	Category	F	%
Visual	$x \geq 25{,}7$	High	85	21%
	$25{,}7 > x \geq 19{,}3$	Medium	250	63%
	$x < 19{,}3$	Low	65	16%

Auditory	$x \geq 25{,}3$	High	106	26,5%
	$25{,}3 > x \geq 18{,}7$	Medium	223	55,75%
	$x < 18{,}7$	Low	71	17,75%
Kinesthetic	$x \geq 25{,}7$	High	81	20%
	$25{,}7 > x \geq 19{,}3$	Medium	241	60%
	$x < 19{,}3$	Low	78	20%

Data from student learning styles shows students who have a visual learning style from 400 respondents, 85 students with a percentage of 21% belong to the high category visual learning style, 250 students with a percentage of 63% belong to the medium category visual learning style and 65 students with a percentage of 16% classified in the low category visual learning style. The tendency of visual learning styles can be seen in the amount of percentage, the greater the percentage then that is the most dominant learning style in students. So it can be concluded that the category of visual learning styles of students of Junior High School in DKI Jakarta is included in the medium category. This means that students are quite capable of processing information using visual media such as diagrams, graphs, pictures and others.

Following that, based on the auditory learning style of the 400 respondents, 106 students, or 26.5 percent of the total, belong to the high category of auditory learning style, 223 students, or 55.75 percent of the total, belong to the medium category of auditory learning style, and 71 students, or 17.75 percent of the total, are classified as being in the low category of auditory learning style. The majority of students at Junior High School in DKI Jakarta have an auditory learning style, and the percentage of those students who identify as belonging to the medium group is 55.75. This indicates that pupils are not only able to digest knowledge by listening to it, but also that they are able to discuss and explain it to other people. While the kinesthetic learning style is known from a total of 400 respondents, there are 81 students who belong to the high category of the kinesthetic learning style, 241 students who belong to the medium category of the kinesthetic learning style, and 78 students who belong to the kinesthetic learning style category. Low. The inclination of pupils at Junior High School in DKI Jakarta to learn best through auditory means places them in the medium group, with a rate of sixty percent falling into this category.

Mathematical Reasoning Ability and Learning Style

To find out the relationship between students' mathematical reasoning abilities and learning styles, using correlation analysis. Before testing the relationship between reasoning ability and learning style, the data of these two variables must be normal. The data from the normality test are in table 6.

Table 6. Normality test results

Instrument	Lo	L table
Mathematical Reasoning Ability	0,058375307	0,068
Learning Style	0,050087372	0,068

In the normality test, the data is said to be normally distributed if $L_o < L_{tabel}$ (Marpaung & Winarto, 2013). From the two data, the mathematical reasoning ability and learning style have a value of L_o less than L_{tabel}, which means that these two variables are normally distributed and can represent the existing population. In addition, if it has been established that the data follows a normal distribution, the data hypothesis can be put to the test. The goal of the testing of the hypothesis is to evaluate the link between the students of the eighth grade at Junior High School in DKI Jakarta's mathematical reasoning abilities and the learning styles of those students as they engage in online learning. The researcher will be using SPSS 25 in order to investigate the hypothesis. Figure 6 illustrates the findings obtained from doing the correlation analysis using SPSS.

Correlations

		Gaya Belajar	Kemampuan Menalar
Gaya Belajar	Pearson Correlation	1	.565**
	Sig. (2-tailed)		.000
	N	400	400
KemampuanMenalar	Pearson Correlation	.565**	1
	Sig. (2-tailed)	.000	
	N	400	400

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

Figure 6. Correlation test results

From the results of the analysis using the Pearson Product Moment using SPSS 25, it was obtained that the significance value for both variables was 0,000. A variable can be said to be correlated if the significance value is < 0,05, then if the significance value is > 0,05 then the data is declared to have no relationship or no correlation. So, it can be concluded that the two learning style variables with mathematical reasoning ability have a positive relationship or correlation. Then for the Pearson correlation or correlation value of 0,565 based on the degree of relationship, the value of 0,565 is included in the category of moderate correlation.

Discussion

The findings of the research indicate that students' learning styles have an effect on students' mathematical reasoning abilities. This can be seen from the significance value of learning styles and mathematical reasoning abilities, both of which have values that are lower than 0.05. The researchers believe that this relationship exists because students' learning styles affect students' ability to reason mathematically. This is related to indicators of mathematical reasoning abilities that have been determined in this study. Mathematical reasoning is related to developing hypotheses, building an argument, making patterns and relationships in mathematics, and choosing the use of appropriate strategies for solving a mathematical problem (Berg & McDonald, 2018).

The results showed that the indicators of mathematical reasoning ability had different percentage values. The indicator with a low percentage is making a conjecture with 30.8%, this is because in the indicator making a conjecture, the average score obtained by students does not reach a score of 4. Then, the indicator with a moderate percentage is the drawing conclusion with 51.3%. The drawing conclusion indicator is quite good, where 17 of 39 respondents scored 3 and 4. This is in line with the results of research by Agustyaningrum et

al., (2019) that the making a conjecture indicator shows a low percentage level and the drawing conclusion indicator shows a percentage level currently.

Furthermore, for the indicators of performing mathematical manipulation and providing reason or evidence for the validity of the solution, the percentages are 74.4% and 89.7%, respectively, this shows that the percentage level of the two indicators is in the high category. Based on the average score data, most students get a score of 4 and 5, this is what causes these two indicators to be included in the high category. This is different from the results of research by Agustyaningrum et al., (2019) that the indicators of performing mathematical manipulation and providing reason or evidence for the validity of the solution are at a low category level.

On the basis of the results of an analysis of data regarding students' mathematical reasoning abilities in solving problems according to the indicator stages, it was discovered that students with high mathematical reasoning abilities corresponded with the stages of mathematical reasoning ability indicators. Even though there was a tiny inaccuracy in proposing claims, responders were able to provide accurate findings, computations, and manipulation processes. In contrast, students with average mathematical reasoning abilities are able to manipulate and produce proper solutions when working on mathematical reasoning ability exam questions, but they continue to make errors when generating hypotheses and drawing conclusions. Then there are students with low reasoning capacity who, while their mathematical reasoning skill corresponds to the indicator stages when working on exam questions, make multiple errors in understanding and completing the offered answers, forcing respondents to provide wrong or no responses.

In addition, the computation led to the discovery of the mean value of 62.11. If you look at the table of criteria for students' abilities in mathematical reasoning, you'll see that the moderate criteria includes the mean price as one of the factors. It is possible to draw the conclusion that the degree of mathematical reasoning ability of students in class VIII at Junior High School in DKI Jakarta tends to fall somewhere in the middle of the spectrum. This is consistent with the findings of a study that was carried out by Wahyuni et al., (2019), which revealed that the mathematical reasoning abilities of pupils were rated as moderate, with a score of 2.02. Students acquire knowledge in accordance with their favored modes of learning, and each mode of learning has the potential to influence both the students' mathematical reasoning processes and their learning results (Ridwan, 2017). Marwiyah et al. (2020) found that differences in learning styles can affect students' mathematical reasoning abilities. The results of this research show that students who have visual, auditory, and kinesthetic learning styles each have different mathematical reasoning on each indicator of mathematical reasoning. This finding is supported by the findings of the research conducted by Marwiyah et al. (2020), which found that differences in learning styles can affect students' mathematical reasoning abilities.

According to the findings of this research, the majority of students in the eighth grade at Junior High School in DKI Jakarta had a preference for the visual learning style as their primary mode of education. These findings are consistent with the findings of study carried out by Nisa (2021), which indicates that the most common kind of learning style among

students is a visual learning style, in which students take pleasure in reading and learning via the use of their sense of sight.

Conclusion

The mathematical reasoning ability of the students of Junior High School in DKI Jakarta is included in the moderate category and in the research the researchers also found varied learning styles in students, namely visual, auditory, kinesthetic and combination learning styles. In addition, the trend of learning style of Junior High School in DKI Jakarta students is visual learning style. Students' mathematical reasoning abilities and learning styles in online learning have a significant relationship. In this case, it can be stated that if in the mathematics learning process educators use appropriate methods according to students' learning styles, this will greatly affect their mathematical reasoning abilities.

When it comes to the data collection process, the information provided by respondents through questionnaires does not always show the actual opinion of the respondents, which occurs because of differences. Based on the direct experience of the researcher, there are some limitations that the researcher needs to pay attention to in order for future researchers to finish their research. Each responder has their own unique set of thoughts, comprehensions, and replies. Another aspect that plays a role in determining results is the respondents' level of candor when it comes to filling out the questionnaire, in addition to their capacity for mathematical thinking. In addition, researchers have limitations with time and money so that researchers cannot reach the entire population of grade 8 students in the DKI Jakarta area because the area coverage is also very wide.

Conflicts of Interest

Regarding the publishing of this work, the authors state that there is no potential for a conflict of interest. In addition, the authors have taken full responsibility for any ethical concerns that may have arisen, including but not limited to instances of plagiarism, misconduct, data fabrication and/or falsification, multiple publishing and/or submission, and redundancy.

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