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Problem Solving Skills in Child Friendly Learning Through the Discovery Learning based on *Applet Geogebra* in Terms of Learning Style

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ABSTRACT

The problem in this study is the low mathematical problem- solving ability caused by ineffective learning, the use of learning models that are not innovative, the lack of use of learning media that can visualize mathematical concepts, and the different learning styles of each student. This study aims to analyze the ability of mathematical problem solving in child-friendly learning through discovery learning model based on *applet geogebra in* terms of David Kolb's learning style. This research uses *mixed methods* design with *concurrent embedded* model. The instruments in this research are David Kolb learning style test questionnaire and math problem solving ability test questions. The results showed that the math problem solving ability of students with *diverging* learning styles was in the sufficient category in problem solving. The math problem solving ability of students with *assimilating learning* style is in the sufficient category in problem solving. The mathematical problem-solving ability of students with a *converging* learning style is in the sufficient category in problem solving. The mathematical problem-solving ability of students with an *accommodating* learning style is in the sufficient category in problem solving.

Keywords: learning style, discovery learning, math problem solving ability

INTRODUCTION

Mathematics is one of the subjects that contribute to everyday life (Rahayu & Kusuma, 2019). This is in line with the opinion of Frudental and Gravemeijer in Zaenuri who revealed that mathematics is also referred to as a daily human activity (Zaenuri, 2018). Mathematics as a basic science needs to be mastered well by students, especially since elementary school age. However, in reality, the paradigm that develops is that not a few students think that math is a difficult and scary subject and has nothing to do with everyday life. Mathematics learning is closely related to the ability to solve problems. In a field of study, a person's problem-solving ability cannot be separated from his understanding of the subject matter. Thus, in order for students to solve problems in mathematics, they must understand mathematics well. One of the failures of students in learning mathematics is not being able to grasp concepts correctly. This happens because they have not arrived at the abstractions process, still in the concrete world of examples and have not been able to describe it. Learners have not yet come to an understanding of the relationship that explains the relationship between concepts. So that students find it increasingly difficult to understand other concepts that are derived from concepts that have not been mastered earlier. As a result, students give their own

understanding of the concept and result in misconceptionsin the minds of students (Kusmaryono, 2019).

Looking at the achievement of Indonesian students' learning outcomes in science and mathematics is worrying compared to other countries. Indonesian students are still predominantly in the low level, or more on the ability to memorize in science and mathematics learning. which was targeted at Indonesian 4th grade elementary / MI students in 2015. For Mathematics, Indonesia ranks 45th with a score of 397 out of 50 countries whose students were tested. This proves that Indonesia's math learning achievement is still low. Looking at the results of a survey conducted by the *Program for International Student Assessment* (PISA) in 2018 also shows that the average score of mathematical ability of Indonesian students is 379 below the average score of mathematical ability of other students which is 487 (OECD, 2019).

The success of learning mathematics in elementary school is strongly influenced by the role of the teacher. If the teacher understands mathematical concepts and can motivate students to participate in mathematics learning, then the objectives of learning mathematics at school will be achieved optimally. Math learning will be more effective if done in a fun atmosphere. Thus, teachers must strive for pleasant situations and conditions so that they can contribute to creating a Child Friendly School. The role of teachers in realizing Child Friendly Schools (SRA) includes teachers being able to create a child-friendly teaching and learning process and the use of available facilities and infrastructure without burdening students. In the learning and teaching process, models, methods, strategies, media and even learning facilities are adjusted to the needs of the class.

Based on the results of observations made to several fifth-grade teachers at SD Gugus Wijaya Brata Magelang in March 2022, it was found that the learning outcomes of fifth grade mathematics were still low. Low learning outcomes are caused by low problem solving skills, especially in math learning. This is caused by several factors including teacher skills in teaching, student activities, learning models, and learning media used by teachers. The teacher still uses a direct learning model. The media used are not yet varied and technology-based. According to Akinmola (2014) teachers are encouraged to always develop problem solving skills in students to help solve everyday problems and build sustainability in the 21st century.

Related to the problem of low problem-solving skills and student learning outcomes in mathematics to date, it is time to improve the mathematics learning process, especially regarding the model, approach or technique used in learning, and learning media. One of the innovations that can be done by teachers is to change the learning model that is *teacher centered* to *student centered.* One of the learning models that provides opportunities for students to build their own knowledge through concept discovery is the *Discovery Learning learning* model (Yuliana, 2018). Research conducted by Nurhasanah et al., (2018) shows that the use of the *Discovery Learning learning* model can improve mathematical problem-solving skills and student activity when learning is included in the good category.

A supporting factor in the learning model is learning media. Learning media has an important role in helping the delivery and understanding of material. One of the learning media that helps the learning process is Geogebra. According to Hohenwarter et al., (2008) Geogebra is a dynamic math *software* that combines geometry, algebra, and calculus. This is supported by the results of research conducted by Jelatu et al., (2018) showing that *Geogebra-assisted* mathematics

learning leads to the achievement of understanding of mathematical concepts. Then Yatim et al., (2022) in his research revealed that the results of data analysis showed that conceptual understanding of the topic of student differentiation increased by using the *Brain-Based Teaching* approach based on *Geogebra software*.

Another factor that affects problem solving ability is learning style. According to David Kolb (2005) in Suryono & Hariyanto (2013) learning styles are divided into four, namely (1) *Diverging,* each individual is able to see concrete situations from various points of view. *Assimilating,* individuals are skilled in processing a variety of information and can put into a logical and definite form. (3) *Converging,* individuals are most unique among other learning styles in finding practical uses for ideas and theories. (4) *Accomodating,* this individual has the advantage of beung able to learn from direct experience. Each students has a learning style that is different from one another. According to the opinion of Bire et al, (2019) explains that learning style is a person's way of absorbing information, processing it, and manifesting in the real form of his life behaviour.

Based on the background that has been described, the researchers examined the problem-solving ability in child-friendly learning through the *Discovery Learning* model based on *Applet Geogebra* in terms of learning style.

MATERIALS & METHODS

The design in this research is *mixed methods* with a *concurrent embedded* model, which is a combination research method that combines quantitative and qualitative research methods by mixing the two methods unbalanced. The methods are used together at the same time, but independently to answer similar problem formulations. In this method there are two models, namely primary methods or secondary methods. The primary method is the higher weight method and the secondary method is the complementary method. In this research, the primary method is quantitative method and the secondary method is qualitative method. The specific design of this research is as follows (1) compiling a research design, (2) determining the research site and taking care of licensing, (3) preparing research instruments which include learning style questionnaires, problem solving ability tests, *discovery* learning-based learning tools, and learning media with *applets geogebra* that have been validated by expert validators, (4) collecting data on student learning styles by giving learning style questionnaires, (5) provide child-friendly learning through *discovery learning* model based on *applet geogebra,* (6) collect data on problem solving ability by giving a problem solving ability test, (7) analyze data on problem solving ability in solving mathematical problems, (8) analyze data on the effect of learning style, (10) present all data obtained both quantitatively and qualitatively.

The population in this study were fifth grade students of SDN Gugus Wijaya Brata Magelang even semester of the 2022/2023 academic year. Sampling in this study used *cluster random sampling* technique, which randomly selected two classes from the population. With this technique, two sample classes were obtained, namely the first class as an experimental class taught with the *Discovery Leraning* learning model based on *Applet Geogebra* and the second class as a control class taught with the *Discovery Leraning* learning model.

RESULT & DISCUSSION

The results of the initial data analysis and the final data. Initial data analysis uses normality test and homogeneity test. The normality test is used to determine whether the sample is normally distributed or not.

Table 1. Normality Test Results

Tests of Normality							
	Class	**Kolmogorov-Smirnov[a]**			**Shapiro-Wilk**		
		Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Student Learning Outcome	Experiment Pretest	,116	27	,200*	,967	27	**,515**
	Experiment Postest	,196	27	,009	,933	27	**,082**
	Control PreTest	,174	27	,036	,935	27	**,093**
	Control Postest	,188	27	,016	,943	27	**,145**
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

Based on the results of the normality test, it is known that the significance value (Sig.) for all data both Kolmogorov Smirnov test and Shapiro-Wilk test >0.05, so Ho is accepted. So it can be concluded according to the test criteria that the research data is normally distributed.

The homogeneity test in this study used Levene's test with the help of the SPSS program with a significant level of 5%. If the significance is >0.05, it can be concluded that the two groups are homogeneous and if the significance value is <0.05, it can be concluded that the two groups are not homogeneous.

Table 2. Homogeneity Test Results

		Levene Statistic	**df1**	**df2**	**Sig.**
Ability Solving Math Problems	Based on Mean	2,684	1	52	,107
	Based on Median	2,926	1	52	,093
	Based on Median and with adjusted df	2,926	1	49,739	,093
	Based on trimmed mean	2,715	1	52	,105

The homogeneity test results show that the significance value (Sig.) Based on Mean is 0.107> 0.05. So it can be concluded that the variance of data or samples comes from a population that has the same variance.

Hypothesis testing is used to prove the truth of the proposed hypothesis. Hypothesis testing in this study includes testing hypothesis 1, hypothesis 2, and hypothesis 3 which consists of learning completeness test, mean difference test, and *N-Gain* test.

1. Hypothesis Test 1

Hypothesis 1 test was used to test whether the mathematical problem-solving ability of students who received child-friendly learning with the *discovery learning* model assisted by *applets geogebra* achieved classical completeness of more than 75%.

Table 3. Test of completeness of experimental and control class

Class	**Number of Students**	**Percentage of Completion**	**Z_{hitung}**	**Z_{tabel}**	**Description**
Experiment	27	96%	2,56	1,64	Completed Classical
Control	27	70%	-0,56	1,64	Not Classically Completed

Based on the table above, it can be seen that the experimental class obtained Zhitung = 2.56 and the control class obtained Zhitung = -.0.56. So that in the experimental class Zhitung> Ztabel meaning that it shows that the experimental class that applies the *Discovery Learning learning* model assisted by *Geogebra Applet* reaches the criteria for learning completeness of not less than 75%. While in the control class Zhitung < Ztabel, meaning it shows that the control class that applies *Discovery Learning* learning does not reach 75% learning completeness.

2. Hypothesis Test 2

Hypothesis 2 test is used to test whether the average problem-solving ability of students who get child-friendly learning with *discovery learning* model assisted by *geogebra applet is* better than the class that gets learning with *discovery learning* model.

Table 4. Mean Difference Test

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PreTest Eksperimen - PostTest Eksperimen	-41,667	12,860	2,475	-46,754	-36,579	-16,835	26	,000
Pair 2	PreTest Kontrol - PostTest Kontrol	-32,593	19,383	3,730	-40,260	-24,925	-8,737	26	,000

Based on the *Pair 1 output, the* sig value is obtained. (2-tailed) of 0.000 <0.05, it can be concluded that there is an average difference in the results of students' mathematical problem-solving skills for the experimental class *pretest* and the experimental class *posttest*. Based on the *Pair 2 output, the* sig value is obtained. (2-tailed) of 0.000 <0.05, it can be concluded that there is an average difference in the results of students' mathematical problem-solving ability for the control class *pretest* with the control class *posttest.* While the difference in the average change for the two classes in the experimental class is 41% and the control class is 32% so that the average problem-solving ability of students who get child-friendly learning with the *discovery learning* model assisted by *applets geogebra is* better than the class that gets learning with the discovery learning model.

3. Hypothesis Test 3

Hypothesis 3 test is used to test the improvement of problem-solving ability of students who get child-friendly learning with *discovery learning* model assisted by *geogebra applet is* higher than students who get child-friendly learning with *discovery learning* model.

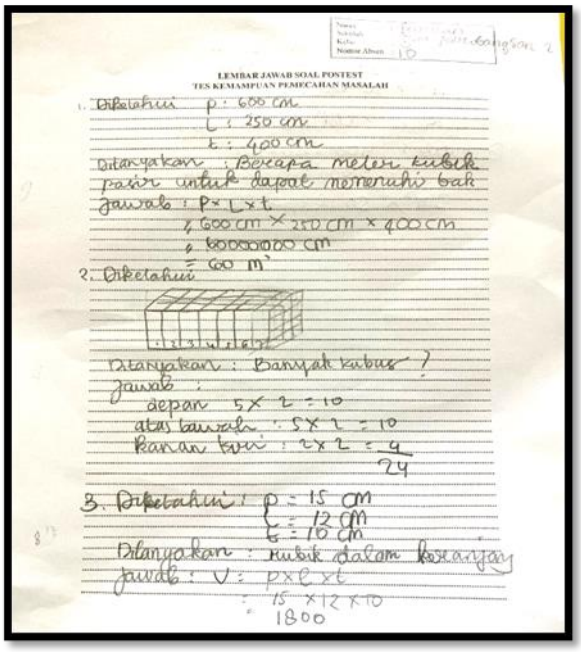
Table 5. Mean Improvement Test

Descriptives					
	Class		Statistic		Std. Error
NGain_Persen	Experiment	Mean		69,5654	2,99088
		95% Confidence Interval for Mean	Lower Bound	63,4176	
			Upper Bound	75,7133	
		5% Trimmed Mean		69,2555	
		Median		66,6667	
		Variance		241,524	
		Std. Deviation		15,54104	
		Minimum		42,86	
		Maximum		100,00	
		Range		57,14	
		Interquartile Range		17,78	
		Skewness		,594	,448
		Kurtosis		-,275	,872
	Control	Mean		50,2768	4,89696
		95% Confidence Interval for Mean	Lower Bound	40,2109	
			Upper Bound	60,3426	
		5% Trimmed Mean		51,4621	
		Median		57,1429	
		Variance		647,466	
		Std. Deviation		25,44536	
		Minimum		-25,00	
		Maximum		93,33	
		Range		118,33	
		Interquartile Range		33,33	
		Skewness		-,838	,448
		Kurtosis		1,466	,872

Based on the results of the N-Gain Score Test calculation, it shows that the average value of the N-Gain score for the experimental class is 69.6%, including in the high category. While for the control class is 50.3% including in the medium category. Therefore, it can be concluded that the experimental class experienced a higher increase compared to the control class.

Students with *diverging* learning styles

The test results of the problem-solving ability of students with *diverging* learning styles are taken by the subject by analyzing the answers to the questions. The answers are presented in Figure 1 and Figure 2.



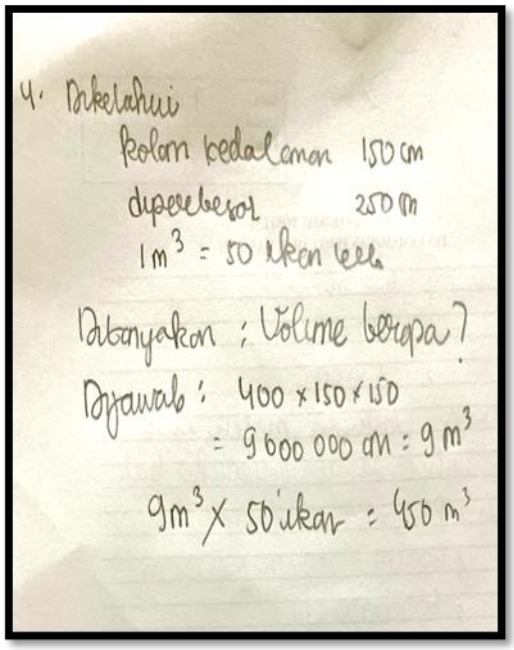


Figure 1. and Figure 2. Test results of problem solving skills of students with *diverging* learning styles

Based on Figure 1 and Figure 2 regarding the written results of problem-solving problems, it can be described that the subject is good at understanding the problem because he is able to write most of the information contained in the problem from number 1 to number 4. Of the four problems provided, the subject has understood the material and understands how to use the method or formula to solve the problem correctly. The subject is good at solving even though there are some answers that are not correct. At the final stage in the subject's problem-solving ability, the subject did not perform the rechecking stage by re-entering the final result into the formula to ensure the answer. Seen in the answer sheet, the subject did not write the conclusion of the answer obtained. Based on the explanation above, it can be summarized the results of the written test of problem-solving ability with *diverging* learning styles in table 6.

Table 6 Summary of students with *diverging* learning styles

Problems Solving Stages Indicator	Category
Understand the problem	Good
Make a problem solving plan	Simply
Implementing the problem-solving plan	Simply
Rechecking	Less

Based on the overall answers of subjects with *diverging* learning styles are in the sufficient category. At the stage of understanding the problem, subject can write down the information known and asked from the questions asked in each given math problem. Subject is sufficient in developing a problem-solving plan and implementing the problem-solving plan. However, subject S1 is lacking in the rechecking stage. This is in line with Eko Setiyono Riau et al., (2016) which states that in working on the problem-solving ability test with a *diverging* learning style cannot show the steps of completion at the rechecking stage. In addition, subjects with *diverging learning styles* get bored more quickly if they do not understand the problem and are creative (Jalinus et al., 2020).

Students with *assimilating* learning style

The test results of the problem-solving ability of students with *assimilating* learning styles are taken by analyzing the answers to the questions. The answers are presented in Figure 3 and Figure 4.

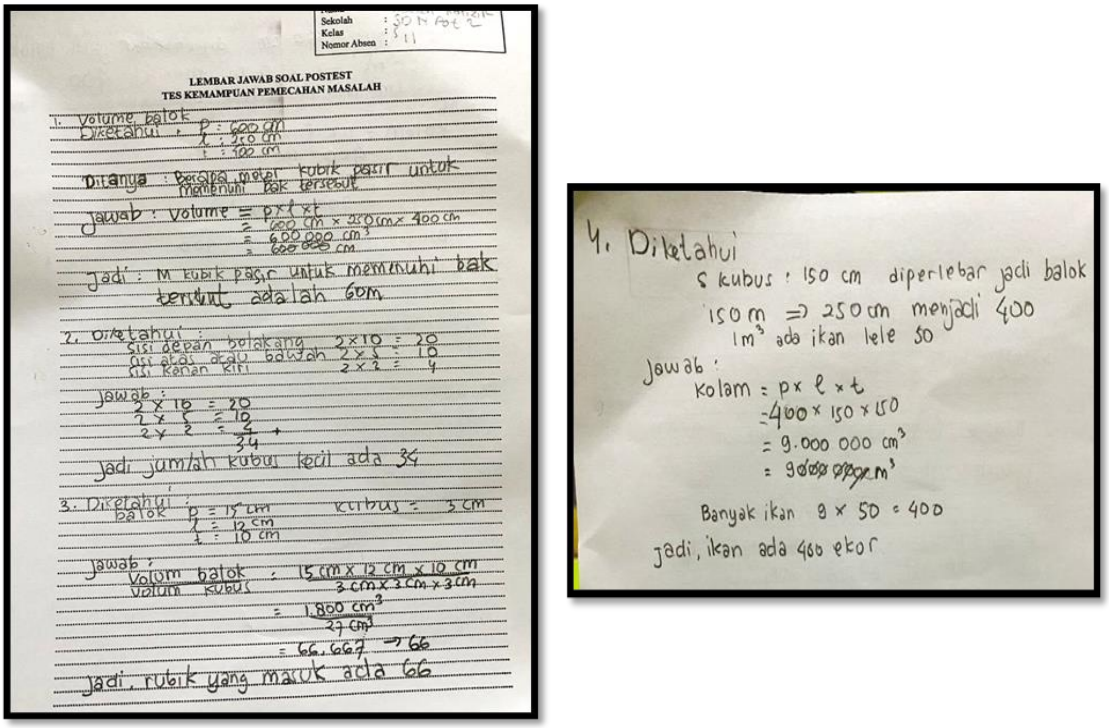


Figure 3. and Figure 4. Test results of problem-solving skills of students with *assimilating* learning style

Based on Figure 3 and Figure 4 regarding the written results of problem-solving problems, it can be described that the subject is good at understanding the problem because he is able to write most of the information contained in the problem. Then the subject has planned the problem solving well. Of the four problems provided, the subject has understood the material and understands how to use the method or formula to solve the problem correctly. The subject is sufficient in solving even though there are some answers that are not correct. In the final stage in the subject's problem-solving ability, it is sufficient to carry out the rechecking stage by re-entering the final results into the formula to ensure the answer. Based on the explanation above, it can be concluded that the results of the written test of problem-solving ability with *diverging* learning styles in table 7.

Table 7. Summary of students with *assimilating* learning style

Problems Solving Stages Indicator	Category
Understand the problem	Good
Make a problem-solving plan	Simply
Implementing the problem-solving plan	Simply
Rechecking	Simply

Based on the overall answers of subjects with *assimilating* learning styles are in the sufficient category. The subject is sufficient in understanding the problem, compiling a solution plan, and implementing the solution. At the rechecking stage, the subject is able to write conclusions but some answers are still not correct. This research is relevant to research conducted by Eko Setiyono Riau et al., (2016) with the results of research that subjects with *assimilating* learning styles are capable of checking back but not perfect.

Students with *converging* learning style

The test results of the problem-solving ability of students with *converging* learning styles are taken by analyzing the answers to the questions. The answers are presented in Figure 5 and Figure 6.

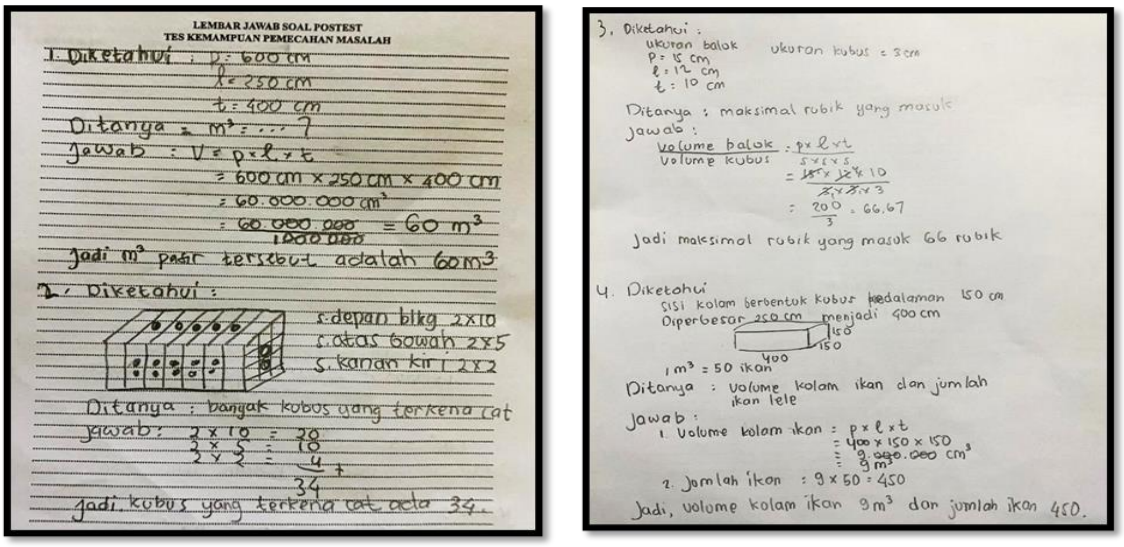


Figure 5. and Figure 6. Test results of students' problem-solving ability with learning styles *converging*

Based on Figure 5 and Figure 6 regarding the written results of problem-solving problems, it can be described that the subject is good at understanding the problem because he is able to write most of the information contained in the problem correctly. Then the subject has planned the problem solving well. The subject is good at solving even with the right answer. In the final stage of problem-solving ability, the subject is good at doing the rechecking stage by re-entering the final result into the formula to ensure the answer. Based on the explanation above, it can be concluded that the results of the written test of problem-solving ability with *converging* learning styles in table 8.

Table 8. Summary of students with *converging* learning style

Problems Solving Stages Indicator	Category
Understand the problem	Good
Make a problem-solving plan	Good
Implementing the problem-solving plan	Good
Rechecking	Good

Based on the overall answers of subjects with *converging* learning styles are in the good category. The subject is good at understanding the problem, planning the solution, implementing the solution, and checking the answer again. This research is relevant to research conducted by Eko Setiyono Riau et al., (2016) with the results of research that subjects with *converging* learning styles are able to solve problems up to the rechecking stage.

Students with *accomodating* learning style

The test results of students' problem-solving abilities with *accomodating* learning styles were taken by analyzing the answers to the questions. The answers are presented in Figure 7.

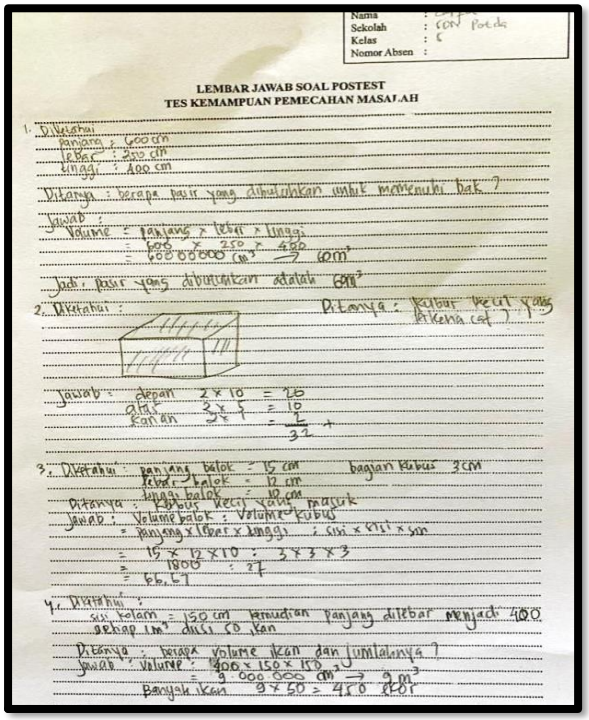


Figure 7. Test results of problem-solving skills of students with *converging* learning styles

Based on Figure 8 regarding the written results of problem-solving problems, it can be described that the subject is good at understanding the problem because he is able to write down the information contained in the problem. Then the subject has planned the problem solving well. the subject already understands the material and understands that he will use the method or formula to solve the problem. The subject is sufficient in solving even though there are some answers that are not correct. In the final stage of the subject's problem-solving ability, it is sufficient to carry out the rechecking stage by re-entering the final results into the formula to ensure the answer. Based on the explanation above, it can be concluded that the results of the written test of problem-solving ability with *accomodating* learning style in table 9.

Table 9. Summary of students with *acomodating* learning style

Problems Solving Stages Indicator	Category
Understand the problem	Good
Make a problem-solving plan	Simply
Implementing the problem-solving plan	Simply
Rechecking	Simply

Based on the overall answer the subject with an *acomodating* learning style is in the sufficient category. This research is relevant to research conducted by Eko Setiyono Riau et al., (2016) with the results of research that subjects with an *acomodating* learning style are able to carry out problem solving steps but do not check back.

CONCLUSION

Based on the results of research that has been carried out in SD Gugus Wijaya Brata Magelang, it can be concluded that mathematical problem solving ability in child-friendly *learning* through *geogebra applet-based discovery learning* model is better than mathematical problem solving ability with discovery learning model, the average mathematical problem solving ability of students who get child-friendly learning with *geogebra applet-based discovery learning model* is better than students who get child-friendly learning with *discovery learning model*, the experimental class experienced a higher increase compared to the control class. mathematical problem-solving ability in child-friendly learning through *geogebra applet-based discovery learning* model is better than mathematical problem-solving ability with *discovery learning model*. The use of *discovery learning* model assisted by *geogebra applet is* more effective than the *discovery learning* model. *The* problem-solving ability of students with *diverger, assimilator,* and *accomodator* learning styles in child-friendly learning through the *Geogebra Applet-based discovery learning model* is in the sufficient category, while the problem-solving ability of students with *converging learning* styles is in the good category.

Declaration by Authors

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