

## Model Influence *Contextual Teaching And Learning* Regarding the Reasoning Ability of Class VIII Students at Fatumfaun State Middle School on SPLDV Material

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### Abstrak

Permasalahan utama dalam penelitian ini adalah kesulitan siswa dalam memanipulasi soal kedalam bentuk matematis, kurangnya daya pikir dan belum mampu menyajikan pernyataan matematika secara terilis. Tujuan penelitian ini adalah untuk mengetahui pengaruh model *Contextual Teaching and Learning* terhadap kemampuan penalaran siswa kelas VIII SMP Negeri Fatumfaun. Jenis penelitian yang digunakan dalam penelitian ini adalah *quasi experimental* dengan desain penelitian *pretest-posttest control group design*, jadi penelitian ini menggunakan pendekatan kuantitatif. Subjek dalam penelitian ini adalah siswa kelas VIII B dan VIII C SMP Negeri Fatumfaun tahun ajaran 2023/2024, yang berjumlah 30 siswa. Data penelitian yang diperoleh menggunakan instrumen penelitian berupa instrumen tes kemampuan penalaran matematis pada materi SPLDV yang berbentuk essay sebanyak 2 nomor. Data skor kemampuan penalaran dianalisis menggunakan uji ketuntasan dan uji banding. Hasil penelitian menunjukan adanya pengaruh model pembelajaran CTL terhadap kemampuan penalaran siswa, hal ini ditunjukan dengan : (1) nilai kemampuan penalaran siswa yang mengikuti pembelajaran dengan CTL melampaui nilai KKM(75) dilihat dari hasil uji yaitu  $t_{hitung} > t_{tabel}$ , (2) nilai kemampuan penalaran siswa yang mengikuti pembelajaran dengan model CTL lebih baik dibandingkan dengan siswa yang mengikuti pembelajaran dengan model konvensional, dilihat dari hasil uji  $t_{hitung} > t_{tabel}$ .

### Abstract

The main problem in this research is students' difficulty in manipulating questions into mathematical form, lack of thinking power and not being able to present written mathematical statements. The aim of this research is to determine the effect of the *Contextual Teaching and Learning* model on the reasoning abilities of class VIII students at SMP Negeri Fatumfaun. The type of research used in this research is *quasi experimental* with a *pretest-posttest control group design*, so this research uses a quantitative approach. The subjects in this research were students in classes VIII B and VIII C of Fatumfaun State Middle School for the 2023/2024 academic year, totaling 30 students. The research data obtained used research instruments in the form of mathematical reasoning ability test instruments on SPLDV material in the form of 2 essays. Reasoning ability score data was analyzed using due diligence and comparison tests. The results of the research show that there is an influence of the CTL learning model on students' reasoning abilities, this is shown by: (1) the value of the reasoning abilities of students who take part in learning with CTL exceeds the KKM (75) value seen from the test results, namely  $t_{count} > t_{table}$ , (2) the reasoning ability scores of students who took part in learning with the CTL model were better than students who took part in learning with the conventional model, seen from the results of the  $t_{count} > t_{table}$  test

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## Introduction

Basically, mathematics learning in schools must prepare students to have reasoning skills so that they can guide them in facing challenges, developments and changes (Sumartini, 2015). Reasoning ability is a goal in learning mathematics, providing evidence that reasoning is very important for students to have. (Calista et al., 2022). In Permendiknas Number 22 of 2006, it is explained that reasoning is also included in the objectives of learning mathematics in schools, namely using reasoning on forms and properties, being able to carry out mathematical manipulations to make generalizations and organize facts, or explain mathematical ideas and statements.

From the objectives stated above, it is clear that reasoning ability is one of the main parts to be achieved in mathematics learning objectives and must be possessed by every student. Research conducted (Ainun & Asri, 2023) states that reasoning is one of the mathematical abilities that every student must have because reasoning ability is a thinking process carried out in drawing conclusions. From several opinions, researchers conclude that reasoning ability is a thinking process carried out to draw a conclusion. The importance of students' mathematical reasoning abilities is to make it easier for students to solve difficult problems. However, basically what we know is that students' reasoning abilities are still very low and not in line with expectations (Nurhalin & Effendi, 2022)

Students' lack of reasoning ability comes from the learning process where the teacher dominates and only active students ask questions (Nurhalin & Effendi, 2022). The lack of students' reasoning abilities is due to classroom learning activities being dominated by the teacher, this makes some students in the class active and able to ask questions and provide answers while other students only listen and take notes. The lack of reasoning ability is also caused by understanding the concepts of the material in the questions given to students. Students' reasoning abilities on indicators of carrying out mathematical manipulation are still low because in learning teachers do not link mathematics learning with everyday life (Nurhalin & Effendi, 2022).

Based on the results of preliminary research at Fatumfaun State Middle School, namely by giving reasoning test questions in the form of mathematics questions, researchers at Fatumfaun State Middle School, one of the problems that occurred was the lack of mathematical reasoning ability in solving mathematical problems. An example of a math problem is *Linda's mother went shopping at the market. She bought 5 kg of beef meatballs and 4 kg of fish meatballs for Rp. 550,000. At the same seller, Mrs. Voni bought 4 kg of beef meatballs and 5 kg of fish meatballs for Rp. 530,000. while Mrs. Yatih bought 2 kg of beef meatballs and 3 kg of fish meatballs. How much money should Mrs. Yatih pay?*

From one of the answers, students still have difficulty manipulating the problem into mathematical form as follows

Handwritten student work on lined paper:

$$\begin{aligned}
 &5 \text{ kg bakso sapi} + 4 \text{ kg bakso ikan} = 550.000 \\
 &4 \text{ kg bakso sapi} + 5 \text{ kg bakso ikan} = 530.000 \\
 &y = 550.000 \\
 &x = 530.000 \\
 &x + y = 550.000 + 530.000 \\
 &= 1080000
 \end{aligned}$$

**Figure 1.** Student answers

In this answer, it can be seen that students are not correct in answering problems correctly, the problem is their lack of thinking power and not being able to present mathematical statements in writing, manipulating mathematics in algebra such as for example beef meatballs =  $x$  and fish meatballs =  $y$ , they are still experiencing difficulties. From the results of the students' work on these questions, it can be concluded that the reasoning abilities of these school students are still low. The reasoning indicators according to the Regulation of the Director General of Basic Education, Ministry of National Education Number 506/C/Kep/PP/2004: 1) presenting mathematical statements orally, in writing, with pictures, 2) proposing conjectures, 3) carrying out mathematical manipulations, 4) drawing conclusions, compiling evidence, providing reasons or evidence for the correctness of the solution, 5) drawing conclusions from statements, 5) checking the validity of an argument, 6) finding patterns or properties of mathematical phenomena to make generalizations.

However, in this study the researcher only used indicators, namely 1) presenting mathematical statements orally, in writing, in pictures, 2) carrying out mathematical manipulations 3) compiling evidence, providing reasons or evidence for the correctness of the solution, 4) drawing conclusions from statements logically. Looking at the problems above, one of the methods used by researchers is by applying a model *Contextual Teaching and Learning (CTL)*. Researchers chose this learning model because this learning model is intended so that learning activities relate to context, atmosphere or circumstances, thus, *contextual* interpreted as being directly related to a certain atmosphere (Zulaiha, 2016). *Contextual Teaching and Learning (CTL)* means learning that connects the material taught with the students' real world.

So in conclusion, the CTL learning model is a learning model that links and connects learning material with students' real world, students are given the opportunity to search, process and discover, this aims to make it easier for students understand the concept of learning material. Apart from that, students will also be motivated to study mathematics because students consider mathematics material to be very useful in everyday life. The use of the CTL learning model makes learning more productive, requires students to train and hone their thinking skills to solve problems, because

students seek and express opinions, this makes students' reasoning abilities develop (Faulina, Fina; Fitria, 2017).

With CTL, the learning process places more emphasis on student activity so that learning is not only centered on the teacher but on students who are active and explore their knowledge independently. Active student involvement in learning means students' mathematical reasoning abilities can be well trained. Apart from that, when using CTL it will encourage students to be more active in understanding mathematical concepts so that students are able to train and use their reasoning power to solve mathematical problems related to everyday life. Therefore, researchers conducted research entitled "The Influence of Models *Contextual Teaching and Learning* "On the Reasoning Ability of Class VIII Students of Fatumfaun State Middle School on SPLDV Material".

### Metode

The type of research used in this research is *as if experimental* or quasi-experimental, with a research design *pretest-posttest control group design*. In accordance with the problem that is the focus of this research, namely the influence of the model *contextual teaching and learning* on students' reasoning abilities, the researcher used a quantitative approach. The research location is Fatumfaun State Middle School. There are two sample groups in this research, namely the experimental class which received mathematics learning using *Contextual Teaching and Learning* (CTL) and the control class conduct learning using conventional learning models. Research design viz *Pretest-Posttest Control Group Design*, can be seen in the table below.

**Table 1.** *Pretest-Posttest Control Group Design*

Group	Pretest	Treatment	Posttest
<i>Experiment</i>	$E_1$	$X_1$	$E_2$
Control	$K_1$	$-X_2$	$K_2$

(Sugiyono, 2013)

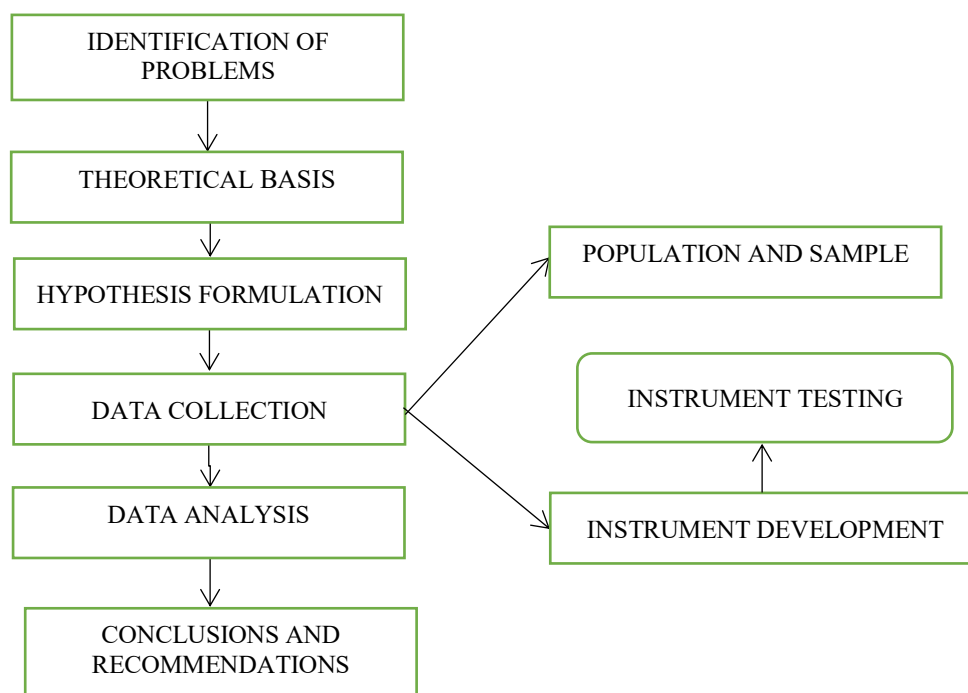
Information :

- $E_1$  = Initial class test experiment
- $E_2$  = End of class test *experiment*
- $K_1$  = Control class initial test
- $K_2$  = Final control class test
- $X_1$  = Treatment (Learning with CTL)
- $X_2$  = Treatment (conventional learning)

The population in this study was the entire class VIII of Fatumfaun State Middle School for the 2023/2024 academic year, which consisted of three classes. The sample used in this research was class VIII B as an experimental class with a total of 14 students and class VIII-C as a control class with a total of 16 students. The sampling technique in research is technique *purposive sampling*. Both

classes are given *pre-test* And *post-test* using equivalent instruments. The instrument used in the research was a reasoning ability test in the form of a description of 2 questions.

Before conducting research, the instrument is first tested for validity. The tests used in the validity of the instrument are the validity of the question items and the reliability of the questions. The data analysis techniques used in this research are the average similarity test, completeness test and comparison test. These three tests were carried out with the help of the SPSS version 22 program. Research procedures are all processes (preparation, implementation and writing of reports) required by researchers to solve problems in research (Suryana A, 2017). The stages of this research are as follows (Suryana A, 2017) :



**Figure 2.** Quantitative Research Procedures

## Research Results and Discussion

### Research result

Based on the research that has been carried out, students' mathematical reasoning data was obtained from the results *pre-test* And *post-test*. Research data can be seen in the following table:

**Table 2.** Research Results Data

No	Experimental Class			Control Class		
	Student Name	Mark		Student Name	Mark	
		Pre-test	Post-test		Pre-test	Post-test
1	DDM	60	75	AGR	60	95
2	EBN	20	50	DB	40	100
3	ITN	50	55	EAT	95	70
4	IT	80	85	FB	60	95
5	JA	60	75	FRT	30	70
6	KB	60	90	JPDM	95	75
7	MJB	65	80	JDS	40	70
8	RT	45	90	KAS	35	50
9	RA	40	80	LT	65	95
10	REU	45	100	MNU	45	65
11	RBK	45	100	MT	40	65
12	TKM	35	95	RRS	0	55
13	YP	55	85	SCN	35	60
14	YF	40	100	VU	45	35
15				YOE	30	70
16				YM	25	40
Rate-rate		50,00	82,86	Rate-rate	46,25	69,38

After the research data is obtained, the next process is to analyze the data with the help of the SPSS version 22 program.

#### 1. Test Prerequisites

##### a. Normality Test

The test is carried out to test whether the data is normally distributed or not. Normality test using *Kolmogorov-Smirnov* In this research calculations using the SPSS version 22 program. To find out whether it is normal or not, if  $\text{Sig} > 0.05$  then the data is normally distributed and if the sig value is  $< 0.05$  then the data is not normally distributed. From the calculation results it was found that the learning outcomes data were grades *pre-test* And *post-test* Both the experimental class and the control class have a significance value greater than 0.05 ( $\text{sig} > 0.05$ ), so it can be concluded that the data group has a normal distribution.

### b. Homogeneity Test

The homogeneity test in this research is a prerequisite test in testing the similarity of the average data used, namely values *pre-test* experimental classes and grades *pre-test* control class, and also as a prerequisite for the comparative test, the data used are values *post-test* experimental classes and grades *post test* control class. The homogeneity test aims to find out whether the data is homogeneous or not. Data will be homogeneous if the sig value is  $> 0.05$ . In the calculations, the researcher used the SPSS version 22 program. From the results of the homogeneity test calculation as a prerequisite for the average similarity test, it is known that the significance value is greater than 0.05 (sig  $> 0.05$ ), so it can be concluded that the two data are homogeneous. And the results of homogeneity test calculations as a prerequisite for the comparative test, it is known that the significance value is greater than 0.05 (sig  $> 0.05$ ), so it can be concluded that the two data are homogeneous

### 2. Average Similarity Test

This test aims to determine whether the level of initial reasoning ability of the two classes is the same or not. The test used is the two independent sample t test with the help of the SPSS version 22 program. The data used are values *pre-test* experimental classes and grades *pre-test* control class. The level of initial reasoning ability of both classes is the same if the grades  $t_{count} < t_{table}$  otherwise if value  $t_{count} > t_{table}$  then the level of initial reasoning ability of the two classes is not the same. The calculation results using SPSS version 22 are as follows:

**Table 6.** Results of the two independent samples t test for the Average Equality Test  
*Independent Samples Test*

		<i>Levene's Test for Equality of Variances</i>		<i>t-test for Equality of Means</i>						
		F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Result	<i>Equal</i>	1.851	.184	.499	28	.622	3.750	7.521	-11.655	19.155
Study	<i>variances</i>									
Student	<i>assumed</i>			.515	25.112	.611	3.750	7.284	-11.248	18.748
	<i>Equal</i>									
	<i>variances</i>									
	<i>not</i>									
	<i>assumed</i>									

Based on the table above, the values are known  $t_{count}$  is 0.499 and value  $t_{table}$  The result obtained was 2.048 based on the rejection criteria  $H_0$ , mark  $t_{count}$  smaller than the value  $t_{table}$  ( $t_{count} < t_{table}$ ) for  $H_0$  accepted, so it can be concluded that the average initial reasoning ability of the experimental class is the same as the average initial reasoning ability of the control class.

### 3. Learning Completion Analysis

Learning Completion Analysis aims to find out what the results are *post-test* achieve completeness or not, the test used is the one sample t test with the help of SPSS version 22. Results *post-test* it is said to be complete when it reaches the KKM that has been set, which is 75. Results *posttest* The experimental class exceeds the KKM value if the value  $t_{count} > t_{table}$ , otherwise if the value  $t_{count} < t_{table}$  then the post-test results of the experimental class do not exceed the KKM value. The calculation results using SPSS version 22 are as follows: :

**Table 7.** One sample t test results for completeness test  
*One-Sample Test*

	Test Value = 75					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Student Learning Outcomes	1.893	13	.081	7.857	-1.11	16.82

Based on the table above, it can be seen that the value  $t_{count}$  is 1.893 and value  $t_{table}$  is 1.782, based on the criteria  $t_{count}$  greater than  $t_{table}$  ( $t_{count} > t_{table}$ ). For  $H_0$  rejected, so it can be concluded that the average value *post-test* the experimental class exceeded the KKM value.

### 4. Comparative Test

The comparative test aims to find out whether the reasoning ability of the experimental class is better than the reasoning ability of the control class or not. The data used is data *post-test* experimental class and *post-test* control class. The test used is the two independent sample t test with the help of the SPSS version 22 program. So as a prerequisite for the t test the two data are first tested for normality and homogeneity.

After the two data have been tested for normality and homogeneity, the two data have a normal distribution and are homogeneous, so they can then be tested using the two independent sample t test. The reasoning ability of the experimental class is better than the reasoning ability of the control class in terms of grades  $t_{count} < t_{table}$ , otherwise if the value  $t_{count} > t_{table}$  then the reasoning ability of the experimental class was no better than the reasoning ability of the control class. The results of the comparative test calculations using SPSS version 22 are as follows:



**Table 8.** Results of the independent two-sample t test for the comparative test

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Result Study Student	Equal variances assumed	.434	.515	2.075	28	.047	13.482	6.499	.170	26.794
	Equal variances not assumed			2.107	27.788	.044	13.482	6.399	.369	26.595

Based on table 7 above, it can be seen that the value  $t_{count}$  which is 2.075 and is a known value  $t_{table}$  namely 2.048 based on value criteria  $t_{count}$  greater than  $t_{table}$  ( $t_{count} > t_{table}$ ), for  $H_0$  rejected, then there is a difference between the values post-test experimental class with control class, where is the value post-test class class is better than grades post-test control class, it can be concluded that there is an influence of the learning model contextual teaching and learning (CTL) on students' reasoning abilities.

### Discussion

The first test carried out was the average similarity test, this test was carried out to determine the initial average value of the experimental class and control class students, the data used in this test was data pre-test experimental class and data pre-test control class. Based on the test results, the average initial test score (pre-test) experimental class is 50.00 and the average initial test score (pre-test) for control class 46.25. Both values show that the initial reasoning abilities of the experimental class and the control class are the same.

Next, both classes were given treatment, the experimental class received learning using the CTL model while the control class carried out learning using the conventional model. Learning in the experimental class uses the CTL model. In research there are several stages in the learning process using the CTL learning model. The following is the learning process in the experimental class using the CTL model. Next, both classes were given treatment, the experimental class received learning using the CTL model.

1) The first stage is *apperception*

At this stage the teacher conveys the learning objectives to be studied and the learning model used, then divides the students into several groups.

2) The second stage is *inquiry*

At this stage the teacher distributes LKPD, after that the teacher provides guidance on the material for all groups to find solutions to problems.

3) The third stage, namely *Questioning*

At this stage students are given the opportunity to ask the teacher questions regarding the problems being worked on. When no students ask questions, the teacher will ask questions as an inducement regarding the questions being worked on.

4) The fourth stage, namely *Learning Community*

At this stage students are given time to discuss with members to work on the LKPD given by the teacher. At this stage the teacher monitors the progress of the discussion and is ready to provide explanations if there are groups experiencing difficulties in the discussion process. 5) The fifth stage, namely *Contructivism* (theory construction).

5) The fifth stage, namely *Contructivism* (theory construction)

At this stage students process the results of the discussion and write them on the LKPD. Students whose groups have the opportunity to present their results prepare themselves, at this stage the teacher directs and facilitates the implementation of the presentation.

6) The sixth stage, namely *Authentic Assesment*

At this stage, students who receive presentation assignments present the results of their discussions, the teacher observes the students' activities during the presentation, then provides reinforcement when the presentation is finished, the teacher also provides an evaluation of the discussion process during the presentation.

7) The seventh stage, namely *Reflection*

At this stage the teacher provides reinforcement for students' answers regarding SPLDV. The teacher gives *reward* (award) for all groups who participated in the lesson well. Students listen to reinforcement of the answers given by the teacher.

The learning process using the CTL model challenges students more independently in working on questions, compiling and drawing conclusions. This activity requires students to develop higher thinking and reasoning skills to investigate or analyze the information so that a solution can be formulated which must also be concluded by themselves.

The due diligence carried out by researchers aims to see whether the average score of the experimental class exceeds the KKM (75) or not. The data used is data *post-test* experimental class, after being tested it was found that the average value *post-test* the experimental class exceeded the KKM score (75). This is an increase in the value experienced in the experimental class, initially the

average value *pre-test* is 50.00, after learning using the CTL model the average value The average obtained was 82.86, there were only two students in this class who got a score below 75.

The last test carried out in data analysis was the comparative test. The comparative test was carried out to see whether the reasoning abilities of the experimental class students were better than the reasoning abilities of the control class or vice versa. Based on the test results, there is a significant difference in scores between the experimental class and the control class, where the reasoning ability of the experimental class is better than the reasoning ability of the control class.

At the beginning, the aim of the research was to see whether there was an influence of the CTL model in improving reasoning abilities. Based on the results of data analysis, it was found that the learning model factors had a significant influence on students' reasoning abilities, or in other words, the reasoning abilities of students who took part in learning using the CTL model compared to the reasoning abilities of students who took part in learning using conventional models.

The CTL learning model and the conventional model have different characteristics. In the first stage of CTL learning, students are given a problem, then students try to find or find a solution to the problem, this makes the students themselves discover the knowledge, the knowledge students gain is a thinking process. In this stage, the teacher does not prepare a certain amount of material that students must memorize, but rather designs learning that allows students to find the material they must understand for themselves, whereas in conventional learning, in the first stage the teacher gives questions to students and then the teacher provides a direct explanation regarding the solution or resolution of the problem given. So based on the source, in the conventional model the knowledge obtained by students comes from the explanation given by the teacher.

The different characteristics of these two learning models allow for differences in students' abilities after participating in the learning. The SPLDV material in the research is related to problems that occur in students' daily lives, the use of CTL is very suitable as a learning model used in learning SPLDV material, this motivates students because the material they study will be useful in students' real lives, so that students are increasingly motivated to solve problems (Fitriani, 2019)

Learning with the CTL model, students have activity and creativity, learning is not only centered on the teacher but students will be guided to explore their knowledge independently. CTL learning also emphasizes students to be active in understanding the learning material. Learning with the CTL model trains reasoning skills on indicators of manipulating mathematics, because learning links the material to students' daily lives. The different characteristics of these two learning models allow for differences in students' abilities after participating in the learning.

Learning using the CTL model requires students to think and reason, connect mathematical concepts, create and communicate mathematical ideas, and think about the most appropriate and reasonable way to solve the questions that have been formulated. This situation will build students' minds and develop their reasoning abilities. This is in accordance with Faulina's opinion that the use

of the CTL learning model makes learning more productive. In CTL learning, students are guided to train and hone their thinking skills in solving problems. Students are also guided in searching and expressing, this makes students' reasoning develop (Faulina, Fina; Fitria, 2017).

## Conclusion

Based on the research objectives, test results, data processing and data analysis, it can be concluded that there is an influence of using the CTL model on the reasoning abilities of class VIII students at Fatumfaun State Middle School for the 2023/2024 academic year. This is proven by using due diligence and comparative tests. Value completeness test *post-test* the experimental class exceeded the set KKM value. Based on comparative tests, value *post-test* experimental class is better than grades *post-test* control class.

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