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THE EFFECT OF *MULTI REPRESENT DISCOURSE* LEARNING ON MATHEMATICAL REASONING ABILITY AND SELF-CONFIDENCE OF JUNIOR HIGH SCHOOL STUDENTS

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Abstract

This study aims to determine; (1) whether there is an initial ability of the experimental class students with the control class; (2) whether the mathematical reasoning ability of students who were given representation discourse was better than the control class; (3) how is the influence of *representation discourse on the mathematical reasoning ability of junior high school students in Serang Regency; (4) how self-confidence is the students' multi-representation discourse.*

This research uses an experimental type and uses pretest-posttest control group design. This research was conducted in the even semester of 2022 with a sample of two classes: VII B as the experimental class and VII A as the control class. Data collection techniques using tests. At the same time, the data analysis technique used t-test analysis, *Effect Size, and percentage of the questionnaire.*

Based on the study's results, the results obtained (1) The analysis results obtained sig (2 tailed) = 0.834 and the value of sig = 0.05. Because 0.0834 > 0.05, then H_0 accepts; (2) The results of the independent t-test obtained sig (2 tailed) = 0.000 and a sig value of 0.05, then H *$_0$ rejects and H_1 accepts; (3) The results of the analysis using* effect size *obtained Cohen's effect size* value *of 3.494258 where the value is classified as very high; (4) the results of the analysis of the self-confidence test obtained an average of 83.167% which is classified as high.*

Conclusions (1) There is no difference between the experimental class students and the control class students; (2) The mathematical reasoning ability of students who are given representation discourse is better than conventional classes; (3) the influence of representation discourse on students' mathematical reasoning abilities is classified as very high; (4) self-confidence of students who are given the representation discourse is high.
Keywords*: Mathematical Reasoning Ability, Multi-Representation Discourse*

INTRODUCTION

Mathematics is one of the sciences that is vital in everyday life. Mathematics is also referred to as the parent science of the other because mathematics is an exact science, so mathematics is interrelated with other sciences. In addition, mathematics is also universal and understandable to everyone. However, in learning mathematics, students are trained to have the ability to think critically, reason, be creative and be able to apply it in everyday life and other sciences.

Learning mathematics in schools is not only learning numbers but teaches students the ability to think mathematics. In school, mathematics learning aims for students to understand mathematical reasoning so that they can explain and apply concepts and solve problems to obtain solutions, the emergence of curiosity and interest in mathematics learning. However, the facts show that mathematics learning

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in schools has not been achieved so far because the understanding and reasoning of mathematics are still shallow. The low level of mathematical reasoning can be seen in how students apply formulas and solve problems to given problems (Sumartini, 2015).

According to Suendang (2017), mathematics learning cannot be separated from problems because their reasoning abilities characterize the success or failure of learning mathematics. Students' high and low mathematical reasoning abilities can be seen from the learning outcomes and how the students solve the problems obtained. The factors that can affect students' mathematical reasoning ability are internal factors and external factors. Internal factors exist in the student, for example, intellectual. At the same time, external factors are outside of students, for example, the models teachers use in mathematics learning and how teachers deliver mathematics learning.

The Indonesian Programme for International Student Assessment (PISA) study results are always the lowest order every year of the number of participating countries. The average score obtained by Indonesia is still far from reaching the international average score. In 2000 Indonesia was ranked 39th out of 49 participating countries. Then in 2018, Indonesia was ranked 72nd out of 83 participating countries. This underlies that from 2000 to 2018, the achievement of Indonesia's PISA index did not experience a better increase (Saputri, 2021).

Several factors are the background to the low results of Indonesia's PISA. One of the contributing factors is that students are not used to solving problems, especially in mathematics subjects that require students to have mathematical reasoning skills. This is an essential highlight in improving the quality of education in Indonesia for PISA results in the following year.

Mathematical reasoning is the mastery of several learning materials, where students not only know and know but can re-express in language that is easy to understand and able to apply them. This is reinforced by Kusumah (in Ultimate & Yuhana, 2016), the reasoning is defined as concluding an argument and a way of thinking which is an explanation to show the relationship between two or more things based on specific properties or laws that are recognized as valid, using specific steps that end in a conclusion.

This is in line with Suriasuman's opinion (in Hidayati & Widodo, 2015) reasoning is a thought process in concluding the form of knowledge. Based on the description above, it can be concluded that mathematical reasoning is a thought process consisting of several steps to get a conclusion in the form of knowledge.

In connection with the above problems, students must have good *self-confidence* in mathematics. *Self-confidence* is a person's assessment of himself regarding the ability he has to do something or a goal to be achieved. Students' self-confidence in mathematics is confidence in the ability to solve problems, understand concepts, and solve mathematical tasks, as well as exchange ideas with friends to complete tasks in mathematics learning.

Through mathematical reasoning, students are expected to be able to relate and solve problems with the essential ability to understand the concepts they understand. Students' low mathematical reasoning is caused because they do not want to ask the teacher when they find difficulties, and they think that math is difficult, tedious, and scary. That way, the right and supportive method is needed when learning mathematics.

The *Multy Representacy* (DMR) Discourse Model is one of the models that educators can use in learning mathematics to improve reasoning and students. The DMR model is a learning model that emphasizes classroom arrangements and group

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work for students so that during learning, students can discuss between groups to solve problems (Suendang, 2017). Through this learning, students can develop the mathematical reasoning they already have. Students will be directly involved during learning and must put forward their ideas to better understand the mathematical reasoning they are learning.

The results of preliminary observations made with students and mathematics teachers at SMP IT Darussalam Pipitan show that mathematics learning is more teacher-centred. Teachers are more active in explaining information to their students, whereas students are passive in ongoing math learning. Students tend to wait more for the information provided by the teacher than to find it on their own. If students are given different questions from the exercises the teacher has exemplified, most students cannot do the questions. Students do not know what steps to take to do the exercises given because they feel confused. Students also lack the confidence to do the questions in front of the class.

To overcome the above problems, teachers must apply an innovative mathematics learning strategy. Learning mathematics that can improve reasoning skills is learning that provides breadth for students to develop their potential. In addition, students must have the confidence to be active in learning mathematics. Efforts to improve reasoning ability can be applied with a model, namely the *Diskusus Multy Representacy model. Multy Representacy discourse* is a learning that emphasizes the use of multi-representation in a discourse-shaped classroom *setting* (Purwasih & Bernad, 2018).

According to research conducted by the thesis entitled The Influence of the *Multy Representacy Discourse* Learning Model on the Ability to Understand Mathematical Concepts and Self Efficacy, Students from the study explained that the low ability to understand mathematical concepts and *self-efficacy* of students. Efforts to improve students' mathematical concept comprehension and *self-efficacy* by applying a learning model, the *Multy Representacy Discourse*. Based on the results obtained by the *Multy Representacy Discourse* learning model, it can improve students' mathematical concept comprehension ability and *self-efficacy*.

Furthermore, the research conducted by Rahmawati's (2019) thesis entitled Development of Mathematical Learning Tools Cooperative Model Type Discourse *Multy Representacy* To Improve Student Representation Ability. From the study, it was explained that the low representation ability of students—efforts to improve student representation ability by using the *Multy Representacy Discourse* model. Based on the results obtained by the *Multy Representacy Discourse* learning model, it can improve students' representation ability.

METHOD

In this study, we are using a quantitative approach. Creswell (in his Supratic, 2015) states that the quantitative approach is the measurement of objective quantitative and statistical data through scientific calculations derived from a sample of people or residents who are asked to answer several questions about the survey to determine the frequency and percentage of their responses.

This type of research uses experimental research and a *pretest-posttest control group* design. Because in this study, treatment was given to determine the relationship between treatment and the aspects to be measured. In this study, the free variable (X) is the learning model of the *Multy Representacy Discourse,* and the bound variable

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(Y) is the ability of mathematical reasoning and *student self-confidence* in the material of presenting data.

This research was conducted at SMP IT Darussalam Pipitan. The implementation time in the even semester is from May to June of the 2021/2022 academic year. The population in this study was all grade VII students at SMP IT Darussalam Pipitan for the 2021/2022 school year. A sample is part of the number and characteristics shared by the population. What will be learned from that sample, the conclusion will be enforceable for the population. The samples in this study were classes VIIA and VIIB. The sampling technique in this study was saturated sampling. According to Sugiyono (in Purba, S. D. (2014), the saturated sampling technique is a sample determination technique when all population members are used as samples.

The analysis used for quantifiable data is statistical analysis. In statistical analysis, it is divided into two, namely descriptive statistics and inferential statistics (Muhson, 2018).

RESULTS AND DISCUSSION

a. Initial Capability Data Analysis (*Pretest*)

Table1. Experimental Class and Control Class T Test

Initial capabilities	*Sig.*	t_{hitung}	t_{tabel}	Conclusion
	0,855	0,184	2,093	H_0 accept

Based on Table 18, a sig value (2-tailed) of 0.855 and 0.184 was obtained, where the sig value > 0.05 and the value of < it can be concluded that there is no difference in the initial ability of the experimental class students with the control class.t_{hit} $t_{hit}t_{tabel}$

b. Final Capability Data Analysis (*Posttest)*

Final capability	*Sig.*	t_{hitung}	t_{tabel}	Conclusion
	0,000	4,188	2,093	H_1 accept

From the table above, significant values were obtained in the *independent t-test* of 0.000 and 4.188. It can be seen that the t_{hit}*sig* value < 0.05 and the > value then H $t_{hit}t_{tabel}0$ is rejected, and H_1 is accepted. So it can be concluded that the mathematical reasoning ability of students given the learning of the *Multy Representacy Discourse* model is better than in conventional classes.

c . *Test Effect Size*

The magnitude of the influence of the *Multy Representacy Discourse* learning model on students' mathematical reasoning ability can be determined from the effect *size* (d) value. In this study, because it only used one sample group as an experimental class, an *effect size* was used for *non-independent group study participants* (Umam & Jiddiyyah, 2021)

Table2. *Effect Size* Test Results (d)

Average		Standard Deviation		S_{pooled}	d
Pretest	*Posttest*	*Pretest*	*Posttest*		
50	78	8,111071	6,968524	8,013147	3,494258

Based on the table above, it can be seen that *the value of cohen's effect size* is 3.494258. This shows that 3.494258 2.1, which means it has a very high influence based on the table of interpretation criteria for the value of≥ *Cohen's effect size* on

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page 51. The conclusion is that the influence of *Multy Representacy Discourse* learning on students' mathematical reasoning ability is powerful.

d. *Self Confidence Test*

The questionnaire in this study was used to determine students' responses to mathematics learning with the *Multy Representacy Discourse* approach related to students' mathematical reasoning ability and *self-efficacy*. Student response questionnaires always used, often, ever, and never consistently scored 4, often scored 3, never scored 2, and never scored 1.

The decision-making criteria in the self-confidence assessment are seen from the percentage interval. At intervals, 25% - 39% are categorized as very low, 40% - 54% are categorized as low, 55% - 69% are categorized as medium, 70% - 84% are categorized as high, and 85% - 100% are categorized as very high.

Table3. Experimental Class *Self-Confidence* Results

No	Aspects	Indicators	Experiment (n = 20)	
			Percentage	Category
1	Confidence in oneself	Believe in one's abilities	83%	Tall
2	Act independently in making decisions	Not dependent on others	81%	Tall
		Responsible	84%	Tall
		Want to achieve high	82%	Tall
3	Have a positive self-concept	Not easy to give up	83%	Tall
4	Dare to express an opinion	Have the courage to act	86%	Very High
Average			83,167%	Tall

It can be seen in the table above that self-confidence in the experimental class obtained a high percentage of *self-confidence* . 5 indicators are categorized as high, and one indicator is categorized as very high. The average self-confidence in the experimental class obtained a percentage of 83.167%, where the figure was categorized as high *self-confidence*. In conclusion, the influence of *student self-confidence* given by the *Multy Representacy Discourse* learning model is relatively strong.

Discussion

1. Experimental and Control Class Initial Capabilities

In the initial stage of this study, researchers want to know the initial abilities of students before being given learning by providing a test of mathematical reasoning ability (*pretest*). According to students is an ability that has been possessed before learning takes place, which is a prerequisite for following the following learning process.

In the process of doing *pretest* questions, most students in both experimental and control classes have difficulty doing these questions because they have not been taught material related to pretest questions, namely data presentation materials. So that the *pretest* results obtained from the experimental and control classes are relatively low, based on the results of the *pretest*, students can describe the initial ability of mathematical reasoning of experimental class students and control classes

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in solving data presentation problems based on mathematical reasoning indicators as follows:

a. Plan the turnaround process

In practical classes, students and control classes doing questions tend to be incomplete in writing down what is known and asked on the questions, even though most students do not write down what is known and asked in the *pretest* questions given.

b. Analyzing the mathematical situation

At this stage, neither the experimental nor control class students can analyze the formula used in the *given pretest* question. Most students do not use the formula in doing the problem.

c. Solve problems with systematic steps

At this stage, both in the experimental and control classes, students cannot solve the problem with systematic steps. In working on *pretest* questions with data presentation material, students experience confusion about the steps that will be taken in doing the questions. Some students are correct in answering the questions but cannot solve the questions with systematic steps, and most students do not know the stages that will be used in doing the pretest questions given.

d. Drawing logical conclusions

In the final stage of making conclusions, students in the experimental and control classes do not make conclusions in each question. Based on the explanation above and the *pretest* results in the experimental class and control class, it shows that the initial ability of the experimental class and control class students to understand the data presentation material does not make a difference. This is in line with the research of Endrawati & Ramlah (2021) entitled Analysis of Mathematical Reasoning Ability in Opportunity Material Reviewed from Students' Initial Ability which states that students' initial abilities in practical and control classes are relatively the same.

2. Mathematical Reasoning Ability On *Multy Representacy Discourse* Model

The study found that the Multy Representacy Discourse model is better than the conventional one. This is because, in the experimental class, *multi-representacy discourse* is given where the model has stages that are not carried out in conventional classes, namely:

a. Students have discussions with predetermined groups.
b. Each group discusses the material studied, and each member records what is being discussed.
c. Students ask each other questions and answers with the presenter.
d. The teacher adds an understanding of the material.

Figure 1. Students discuss with their groups.

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Figure 2. Researchers guide groups experiencing difficulties

As seen in figures 1 and 2, the experimental class is conducting a discussion with his group of friends. By conducting discussions, students will be more active in asking questions, so students will be happier in learning mathematics. Therefore, it will be faster to form a mathematical reasoning process because students can solve a problem found in the given problem with discussion. According to Sari (2019), by applying the *Multy Representacy Discourse* learning model, students are actively involved in the learning process, and students will feel that learning is fun, effective and fast. Meanwhile, according to Wakhidah *et al.* (2018), learning with the Multy Representation Discourse learning model can improve students' mathematical reasoning abilities. This learning process is not carried out in conventional classes, whereas in conventional classes, the learning uses the lecture method. So, students in conventional learning tend to be passive because only the teacher plays a role in the learning process while students only listen and wait for information from the teacher who delivers. So that in conventional classes students do not develop the mathematical reasoning skills they have, because students in conventional classes only receive information from the teacher it without any demands to find out the information themselves or discuss with their friends. This shows that the mathematical reasoning ability of students given learning the *Multy Representacy Discourse* model is better than the conventional model.

This result is in line with research conducted, which states that there are differences between students who learn using a conventional learning model and students who learn using a cooperative learning model (*Diskursus Multy Representacy)*.

3. The Effect of *Multy Representacy Discourse* Learning Model on Mathematical Reasoning Ability.

Based on the test results of the influence of the learning model on mathematical reasoning ability using effect size, it shows that the influence of the *Multy Representacy Discourse* learning model is powerful and can be seen from the table of test results of *cohen's effect size* value which is categorized as having a very high value. This can be seen from the learning stages that require students to be able to find information on their own by discussing it with their group of friends. This triggers the development of reasoning abilities possessed by students. So the conclusion is that the Multy Representacy Discourse learning model has a powerful influence on the mathematical reasoning ability of junior high school students in Serang Regency.

This is in line with the research of Wakhidah *et al*. (2018) entitled Implementation of the Multy Representacy Discourse Learning Model In Terms of Proportional Reasoning Ability in Trigonometric Material which shows that there is an influence of the *Multy Representacy Discourse* learning model on students' proportional reasoning ability.

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4. Self-confidence Students are given a *Multy Representacy Discourse* Learning Model.

In the table of experimental class *self-confidence* results, it can be seen that the percentage of self-confidence obtained is relatively high in the experimental class. Namely, five indicators are categorized as high, and one as very high. Five of them are indicators categorized as high, namely believing in one's abilities, not relying on others, being responsible, wanting to achieve high, and not giving up easily. The indicator that is categorized as very high dares to act. According to Herdiana et al (2021), this aligns with the statement that the Multy Representacy Discourse learning model is student-centred learning by generating group discussions and requiring students to have the courage to express opinions.

Most students in *multi-represent discourse* learning dare to act, for example, acting in expressing opinions and asking friends or teachers if there is a difficulty they are going through. Therefore, the indicator of having the courage to act is categorized as very high. This ha shows that the influence of *self-confidence* provided by the *Multy Representacy Discourse* learning model is categorized as high.

This is in line with Saputri's research (2021) entitled The Influence of the Multy *Representation* (DMR) Discourse Learning Model with a *Reciprocal Teaching* Approach on Mathematical Problem Solving Ability and *Self Confidence,* which says that the influence of *self-confidence* is better in practical classes using the *Multy Representacy* Discourse learning model than conventional classes.

CONCLUSION

Based on the analysis of the research results that have been previously stated, it can be concluded that some of the results are as follows:

1. There is no difference in the initial ability of the experimental class students with the control class.
2. The mathematical reasoning ability of students given *multi Representacy Discourse* model learning is better than conventional learning.
3. The influence of *the Multy Representacy Discourse* learning model on the mathematical reasoning ability of junior high school students in Serang City is powerful.
4. The influence of *Self Confidence* provided by the *Multy Representacy Discourse* learning model is relatively strong.

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