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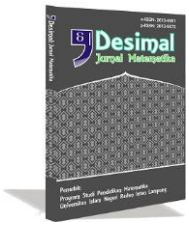

Students' mathematical communication skills by applying the round club type of cooperative learning model in terms of linguistic intelligence

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ABSTRACT

The purpose of this research is to determine the effect of the Round Club Type of Cooperative Learning model on mathematical communication skills in terms of linguistic intelligence. This research is a type of Quasy Experimental Design research with a $\mathbf{2 \times 3}$ factorial research design. The population in this research were all 7th grade students of SMP Karya Bhakti Panaragan Tulang Bawang Barat. The sampling technique used is the Cluster Random Sampling technique with The Operation of Algebraic Form material. The sample consisted of two classes, namely the experimental class and the control class. Techniques in data collection used were mathematical communication skills tests and student linguistic intelligence questionnaires. The analytical technique used in this research is a two-way analysis of variance with unequal cells. Based on theoretical studies and calculations, it can be concluded that: there is an effect on students who use the Round Club type of cooperative learning model on mathematical communication skills, there is an influence of linguistic intelligence on mathematical communication skills, and there is no interaction between the Round Club type of Cooperative learning model and linguistic intelligence on mathematical communication skills.

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INTRODUCTION

Education is a process in order to influence students to be able to adapt as well as possible to their environment, and thus will cause changes in themselves that make them to be useful adequately in people's lives (Suparman & Zanthy, 2019). The teacher is responsible for directing this process so that the goals of the change can be achieved as desired (Hamalik, 2017).

Mathematics subjects need to be taught to all students from elementary school to college so that they have the ability to think logically, analytically,

systematically, critically and creatively as well as the ability to work together (Zagoto & Dakhi, 2018). This activity is not the result of observation, but rather emphasizes the world of ratios. Structured and tiered lessons are those lessons, which means that each material is equally related (Widyastuti, 2015). Mathematics is a science that learns how the process of thinking rationally and makes sense in obtaining concepts. Mathematics is said to be a science because its existence can be studied from various phenomena (Isrok'atun & Rosmala, 2018).

In fact, mathematics is actually one of the subjects that is often disliked and becomes a scourge for students (Winarko, 2017). There are still many students who get low score when it comes to this subject (Rachman et al., 2019). They still find it difficult to solve problems in mathematics (Dewi & Yulia, 2018). One of the factors that cause students to have difficulty in learning is the teacher is not right in choosing the learning model (Wijaya, 2019) and less effective learning media (Maulidina & Bhakti, 2020).

Conventional learning models which are dominated by lectures when explaining learning materials are still often used by educators, causing difficulties in student learning (A.N et al., 2019) and being passive when receiving learning causes learning methods that are carried out only one direction because students only take notes and listen to what the teacher says. So that when working on math problems, students find it difficult to write down mathematical terms and symbols and find it difficult to create images that are relevant to the problem. This causes low student learning outcomes (Novela et al., 2017; Sari & Mintohari, 2018; Setyowati et al., 2018).

It is known that from 100 students of SMP Karya Bhakti Panaragan Tulang Bawang Barat in class VII A to class VII D there are 25 students or 25% who get a score ≥ 70 and students who get a score < 70 as many as 75 students or 75% who are considered to meet the Minimum Completeness Criteria (KKM) that has been set by the school, which is 70. It proves that students' completeness is not the same as what is expected. There are still many students who get the score below the KKM. It shows that learning so far is still not optimal because the average value of students is still below the KKM. It shows that teachers and students must know the factors that influence it, one of which is students' mathematical communication skills.

As stated in the National Council of Teachers of Mathematics (2000) it is explained that communication is an essential part of mathematics and mathematics education. Through communication, students can convey their ideas to the teacher and to other students. It means that the improvement of students' mathematical communication skills must be further improved (Robiana & Handoko, 2020) and developed (Ariawan & Nufus, 2017). Bassett and Peressini argued that without communication in mathematics we will have little information, data, and facts about students' understanding in carrying out mathematical processes and applications (Purwati, 2020). It shows that mathematical communication supports teachers in understanding students' abilities in expressing and interpreting mathematical processes and understanding concepts that students have learned (Purnama & Afriansyah, 2016).

In addition to mathematical communication problems experienced by students of SMP Karya Bhakti Panaragan Tulang Bawang Barat, students are also less able to express easily through speech or writing and remember objects or things verbatim. Linguistic intelligence is not only for communication skills but also needed to express one's thoughts, desires and opinions (Fitriani et al., 2018).

Children who have high linguistic intelligence are more capable to express ideas or thoughts systematically, creatively, and critically (Mufidah & Mukhlisin, 2020) in solving mathematical problems. It means that students' linguistic intelligence must be further improved in order to help students' mathematical communication skills.

The theory of multiple intelligences was discovered by Howard Gardner. According to Gardner, there are eight types of multiple intelligences that a person tends to have (Lutfiyah & Wardani, 2019). Of the 8 intelligences, linguistic intelligence is the intelligence possessed by every human being without any effort to develop it. This is because in everyday life, everyone will take advantage of this intelligence. Linguistic Intelligence was chosen in this research because this intelligence is related to students' mathematical communication skills.

The linguistic intelligence of each student is useful in communicating. Students' linguistic intelligence when communicating mathematically is able to use words to convey thoughts and understand other people's words such as solving problems appropriately and precisely (Mutmainah et al., 2016). Linguistic intelligence refers to the ability to form thoughts clearly and be able to use this ability competently through words to convey these thoughts in writing, speaking, and reading (Musfiroh, 2018).

Based on these problems, a learning model is needed to be able to establish student activity so that students' communication skills can be formed and students' mathematical communication skills can improve. One way is to change the pattern of learning by focusing on students not on the teacher (Anwar, 2017). This substitution aims to improve the value of the learning process and learning outcomes. Learning activities using group methods to work together to help each other in forming plans to solve problems is a Round Club or group tours learning model (Feriyanti & Kuswono, 2018).

The round club learning model is one of the learning models that can actively involve students, where students work together to help each other in solving problems and students are given the opportunity to state, explain, describe, listen, and ask the task given by the teacher to their group (Fitri & Oktri Yani, 2017). Through this learning model, students can give opinions in group that have been arranged, and students will not feel tense during the learning process. Each student in the group responds to the task given by the teacher, the task contains problems that must be answered by discussing. This round club learning model provides more opportunities for each student to show their participation and give their contribution to others in a problem solving.

The results of previous researches show that the implementation of the round club learning model is good compared to the implementation of conventional learning (Fitri & Oktri Yani, 2017), effective on mathematical communication skills (Nganus et al., 2021; Pujianto & Masrukan, 2016), and has a positive impact on improving learning outcomes (Iryanti, 2019; Wahyuni, 2019). In this research, the novelty that is carried is the application of the Round Club type of Cooperative Learning model to mathematical communication skills in terms of linguistic intelligence. Based on the reviews above, the purpose of this research is to determine the effect of the Round Club type of Cooperative Learning model on mathematical communication skills in terms of linguistic intelligence.

METHOD

The type of experiment in this research is a quasi-experimental design. This research includes two variables, including the independent variable and the dependent variable. The independent variable contained in this research is the Round Club type of Cooperative Learning model (X_1) and Linguistic Intelligence (X_2). While the dependent variable in this research is mathematical communication skills (Y). The population used in this research was class VII SMP Karya Bhakti Panaragan. The sampling technique used in this research was class randomization to determine the experimental class and the control class.

The samples obtained were grouped into two groups, namely class VII A as the experimental group to which the Round Club type of Cooperative learning model would be applied and class VII B as the control group which using conventional learning. The research instruments used in data collection were essay tests (mathematical communication skill tests) and student linguistic intelligence questionnaires. The following Table 1 is the scoring guidelines for the mathematical communication skill test.

Table 1. Mathematical Communication Skill Test Scoring Guidelines

Score	Writing	Drawing	Mathematical Expression
0	There is no answer, if there is an answer it contains information related to the question.		
1	Only a few of the explanations are correct.	Few things are true from pictures, diagrams, or tables.	Only a few of the mathematical model are correct.
2	Only partly correct, but the mathematical explanation makes sense.	Drawing pictures, diagrams, or tables is still incomplete and not correct.	Only partly correct from making the mathematical model.
3	The explanation is mathematically reasonable, but it is not logically arranged or there are still language errors.	Drawing pictures, diagrams, or tables completely, but there are still a few mistakes.	Make a mathematical model correctly, but the calculation has a slight error.
4	Mathematical explanations are reasonable and clear and logically arranged.	Drawing pictures, diagrams, or tables correctly and completely.	Make a mathematical model correctly, and the calculation gets a complete and correct solution.
		Maksimum Score = 4	

Data analysis in this research used a two-way ANOVA test. ANOVA test is used to test the comparison hypothesis of more than two samples and each sample consists of two or more types together. The ANOVA test was used to determine the effect of the round club type of cooperative learning model on mathematical communication skills. Posttest is used by researchers to obtain the value of students' mathematical communication skills. The research data obtained were analyzed using two-way analysis of variance after the normality and homogeneity tests were previously carried out. Based on the test results, each question item and questionnaire statement are feasible and can be used to measure the level of mathematical communication and the level of linguistic intelligence of students.

RESULTS AND DISCUSSION

Before performing the parametric statistical test, the assumption tests were carried out, namely the normality test and the homogeneity test. The normality test was conducted to determine whether the distribution of the data was normally distributed or not. Homogeneity test was carried out to determine whether or not the variance of two data distributions were equal (Novalia & Syazali, 2014). The results of the normality test of students' mathematical communication skills can be seen in Table 2 as follows.

Table 2. Normality Test Results of Mathematical Communication Skill Test in Experimental Class and Control Class

No.	Class	$L_{calculate}$	L_{table}	Conclusion
1	Experimental	0.1467	0.1726	H_0 is accepted
2	Control	0.1284	0.1726	H_0 is accepted

Based on Table 2, the normality test has a decision-making basis that the number of students involved in the experimental class and control class are 25 students by using a significance level of 0.05. The calculation result of the normality test in the experimental class is $L_{calculate}$ = 0.1467 while for the control class is $L_{calculate}$ = 0.1284 with each value of $L_{table} = 0.1726$. So, $L_{calculate} \leq L_{table}$ with the value of $0.1467 \leq 0.1726$ in the experimental class generated a normal distribution with H_0 is accepted. While in the control class, $L_{calculate} \leq L_{table}$ with the value of $0.1284 \leq 0.1726$, generates a normal distribution with H_0 is accepted.

Table 3. Normality Test Results of High, Medium, Low Linguistic Intelligence Questionnaire in Experimental and Control Class

Category		$L_{calculate}$	L_{table}	Conclusion
Linguistic Intelligence	High	0.1727	0.2506	H_0 is accepted
	Medium	0.0903	0.1590	H_0 is accepted
	Low	0.1538	0.274	H_0 is accepted

Based on Table 3, the normality test of the questionnaire was categorized into 3 categories, namely high, medium, and low obtained through a combination of data from the control class and the experimental class. The result obtained in the high category is $L_{hitung} \leq L_{tabel}$ with the value of $0.127 \leq 0.2506$ so that the data is normally distributed and H_0 is accepted. The normality test result in the medium category is $L_{calculate} \leq L_{table}$ with the value of $0.0903 \leq 0.1590$ so that the data is normally distributed and H_0 is accepted. The result in the low category is $L_{calculate} \leq L_{table}$ with the value of $0.1538 \leq 0.274$ so that the data is normally distributed and H_0 is accepted.

Homogeneity test is used to determine whether some variances have homogeneous data or not. Homogeneity test was used on mathematical communication skill data and Linguistic Intelligence questionnaire. The homogeneity test used is the Barlett test, with the following calculation results.

Table 4. Summary of Homogeneity Test Results

No.	Class	$\chi^2 calculate$	$\chi^2 table$	Conclusion
1	Experimenal and Control	1.041	3.481	H_0 is accepted
2	Linguistic Intelligence	0.521	5.591	H_0 is accepted

Based on Table 4, the homogeneity test is used to determine whether the variances of the samples studied have the same character or not. It is said to be homogeneous if $\chi^2{}_{calculate} \leq \chi^2{}_{table}$, so H_0 is accepted. Based on the results of the homogeneity test calculation in the table above, it shows that the experimental class and control class for mathematical communication skills obtained a value of $1.041 \leq 3.481$. Based on the results of the homogeneity test calculation in the table above, it shows that the linguistic intelligence class obtained a value of $0.521 \leq 5.591$.

After doing the normality and homogeneity tests, it is known that the data comes from homogeneous and normal data, the next step is to test the analysis of variance (ANOVA). The purpose of the research hypotheses tested with the Two-Way Analysis of Variance is to determine the effect on mathematical communication skills between students using round club type of cooperative learning treatment and linguistic intelligence, and to see the interaction between learning factors and students' linguistic intelligence factors related to students' mathematical communication skills. Data analysis used to test the hypothesis is carried out after the data is collected. The results of the two-way ANOVA calculation using Microsoft Excel are as follows.

Table 5. Two-Way Analysis of Variance Summary

Source	JK	dk	RK	$F_{calculate}$	F_{table}
Row	3486.768	1	3486.768	32.383	4.062
Column	3738.901	2	1869.451	17.362	3.209
Interaction	114.405	2	57.202	0.531	3.209
Error	4737.633	44			
Total	12077.707	49			

Based on the results of the two-way analysis of variance, with a significance level it is obtained that:

H_{0A} is rejected, based on $F_{A\ calculate} > F_{A\ table}$, with the value of $32.383 > 4.062$ then there is an effect of the round club type of cooperative learning model on mathematical communication skills.

H_{0B} is rejected, based on $F_{B\ calculate} > F_{B\ table}$ with a value of $17.362 > 3.209$ then there is an effect between students with linguistic intelligence on mathematical communication skills.

H_{0AB} is accepted, based on $F_{AB\ calculate} > F_{AB\ table}$ with a value of $0.531 < 3.209$ then there is no interaction between learning models and linguistic intelligence on mathematical communication skills.

The following is a summary of the mean and marginal mean:

Table 6. Summary of Mean and Marginal Mean

Learning Model	Linguistic Intelligence			Marginal Mean
	High	Medium	Low	
Round Club Type of Cooperatif Learning	96.17	80.00	68.60	81.59
Conventional	73.80	60.40	54.40	62.87
Marginal Mean	84.98	70.20	61.50	

In table 6, it is known that the marginal mean between rows for the round club type of cooperative learning model is 81.59 and the marginal mean for conventional learning is 62.87 which means $81.59 > 62.87$. Based on this situation, the conclusion is that students who get the round club type of cooperative learning model are better than students who get conventional learning.

In Table 6, the marginal mean of linguistic intelligence is high or $\mu_1 = 84.98$, medium or $\mu_2 = 70.20$ and low or $\mu_3 = 61.50$. This situation shows that linguistic intelligence has an unequal impact on mathematical communication skills, so double comparisons between columns need to be carried out on high and medium linguistic intelligence ($\mu_1 \; vs \; \mu_2$), high and low linguistic intelligence ($\mu_1 \; vs \; \mu_3$), and medium and low linguistic intelligence ($\mu_2 \; vs \; \mu_3$).

The following is a summary of the double comparison test between columns:

Table 7. Summary of Double Comparison Test Between Columns

No.	Interaction	$F_{calculate}$	F_{table}	Conclusion
1	(μ_1 vs μ_2)	16.187	6.419	H_0 is rejected
2	(μ_1 vs μ_3)	26.828	6.419	H_0 is rejected
3	(μ_2 vs μ_3)	5.227	6.419	H_0 is accepted

Based on Table 7, the calculation results of the double comparison test between columns can be concluded as follows:

Between (μ_1 vs μ_2) it is obtained that $F_{calculate} = 16.187$ and $F_{table} = 6.419$. It can be seen that $F_{calculate} > F_{table}$, so H_0 is rejected, it means that there is a significant difference in mathematical communication skills between students who have high and medium linguistic intelligence.

Between (μ_1 vs μ_3) it is obtained that $F_{calculate} = 26.828$ and $F_{table} = 6.419$. It can be seen that $F_{calculate} > F_{table}$, so H_0 is rejected, it means that there is a significant difference in mathematical communication skills between students who have high and low linguistic intelligence.

Between (μ_2 vs μ_3) it is obtained that $F_{calculate} = 5.227$ and $F_{table} = 6.419$. It can be seen that $F_{calculate} < F_{table}$, so H_0 is accepted, it means that there is no significant difference in mathematical communication skills between students who have medium and low linguistic intelligence.

Based on the data obtained from the data analysis results, the following discussion is obtained: The learning in this research used the algebraic number operation material which is used for learning in the control class and the experimental class. The experimental class used a round club type of cooperative learning model, while the control class used a conventional learning model. The conventional learning process is an educator-centered

learning process, and the round club type of cooperative learning process is a learning model in which it consists of several small groups who share their opinions for a common goal. During group discussions by giving all group members to tell their opinions, students feel happy and very enthusiastic. At the final stage, the teacher provides individual practice questions. When answering the questions, students look persistent in doing it. Based on this, students' mathematical communication skills if taught using the round club type of cooperative learning model are better than using conventional learning model. It can be concluded that the round club type of cooperative learning model affects learning outcomes and mathematical communication skills. This is also in line with the previous research that used the round club type of cooperative learning model conducted by Gusmalia which gave the result that the round club type of cooperative learning model could improve student learning outcomes. This is also in line with the research conducted by Sabeth (2013) which provides the results of the research, proving that there is a comparison of mathematics learning outcomes between students who apply the Round club type of cooperative learning model and students who use conventional learning. So, it can be concluded that the round club type of cooperative learning model has an effect on learning outcomes and students' mathematical communication skills.

Linguistic intelligence can be interpreted as developing problems, problem solving skills, and constructing things using language effectively, both writing and speaking. Linguistic intelligence means intelligent words, and quickly learns to use words or by observing and listening. This is in line with the previous research conducted by Swasti et al. (2013) which gave the results that the English writing skills of students who had high linguistic intelligence were better than the English writing skills of students who had low linguistic intelligence. From this explanation, it can be concluded that the previous research and this research are in line. Where students who have high linguistic intelligence are better than students who have low linguistic intelligence.

In theory, learning models and linguistic intelligence can affect mathematical communication skills. students who have high and moderate linguistic intelligence are more suitable in round club learning. These results are in line with the previous research conducted by Mutmainah et al. (2016) which states that students with high linguistic intelligence have a tendency to communicate mathematically in solving mathematical problems well. This is because the model requires active students such as asking a lot of questions, answering questions, and talking effectively when discussing problems by developing problems, problem solving skills, and constructing things using language effectively, both writing and speaking. The learning desired by students can affect their mathematical communication skills. In learning using conventional learning models, students are more passive because they only accept what is taught by the teacher. Based on this, it can be said that students who have high linguistic intelligence will adapt more quickly to the round club type of cooperative learning model.

CONCLUSIONS AND SUGGESTIONS

Based on the data analysis and hypothesis test that have been carried out, it can be concluded that (1) there is an effect of the Round Club type of cooperative learning model on students' mathematical communication skills. (2) There is an influence between students

who have high, medium, and low linguistic intelligence on students' mathematical communication skills. (3) there is no interaction between the learning model and linguistic intelligence on students' mathematical communication skills. There are several suggestions that the author gives in this research, namely for future researchers it is hoped that they can use the round club type of cooperative learning model on other subjects, and develop aspects of their mathematical communication skills.

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