JCRS (JOURNAL OF COMMUNITY RESEARCH AND SERVICE)
Vol. 8 No. 1, April 2024
ISSN (print): 2549-1849 ISSN (online): 2549-3434
Available online at https://jurnal.unimed.ac.id/2012/index.php/jcrs

Improving Creative Thinking Skills by Using the Reciprocal Teaching Model Assisted by the Geogebra Application of Class XI Mas Al Washliyah 12 Perbaungan Students

[1]Suci Rahmadani, [2]Risna Mira Bella Saragih, [3]Khoiruddin Matondang
[1,2,3] *Mathematics Education Study Program FKIP Al Washliyah University Medan, Indonesia*
amoybm88@gmail.com

Abstract. The ability to think creatively is the ability to generate new ideas or ideas in producing ways of solving problems, even producing new ways as alternative solutions. Creative thinking is very important in learning mathematics. The results of the study in the control class, namely classes using conventional learning models obtained pretest data with an average of (36%) and posttest data of (52%). While the experimental class is a class that uses creative thinking skills with a reciprocal teaching learning model assisted by the Geogebra application. Pretest data obtained an average score (18%) and posttest data obtained an average score (70%). The results of the study (1) rcalculate = 0.000 and rtabel value = 0.355 can be seen that the value of rcalculate ≤ rtabe so that it can be concluded that in this study there was an increase in creative thinking skills using a reciprocal teaching model assisted by Geogebra application to the linear inequality material of two variables in students using conventional models.

Keywords: Creative Thinking Ability, *Reciprocal Teaching Model,* Geogebra Application.

Article history: Received: Mar 2024; Revised: Apr 2024; Accepted: Apr 2024; Available online: Apr 2024
How to cite this article: Rahmadani, S., Saragih, R.M.B, Matondang, K. (2024). Reciprocal Teaching Model Assisted by the Geogebra Application of Class XI Mas Al Washliyah 12 Perbaungan Students. *Journal of Community Research and Service,*8(1).

1. Introduction

Education is an essential need of every individual throughout life. Without access to education, human progress will be hampered and risk being left behind. In Indonesia, one of the main challenges in the field of education is the unsatisfactory quality of the learning process. Despite many efforts to improve educational standards, progress in education conditions has been limited [1].

Mathematics learning is a process in which students experience learning through a series of planned activities with the aim of gaining understanding and skills connected to the mathematical content learned. In school, the main purpose of learning mathematics is to help students solve various problems. The ability to solve mathematical problems is one of the main important skills such as the application of rules in the context of different problems, pattern recognition, etc., can be further improved. developed [2]. Mathematics is a universal science that plays an important role in various fields of science. Along with the changing times, comprehensive efforts are needed to improve the quality of education, including developing various aspects of people's lives. Thus, efforts to achieve this by developing high-quality teaching methods in the context of mathematics learning [3].

Mathematical concepts have a close and clear relationship with each other. The existence of this relationship allows anyone who studies mathematics to think logically. In the context of mathematics

learning, students' creative thinking skills are very important. It is very important, because it has a significant influence on their success in understanding and mastering the subject. The ability to think creatively can be interpreted as a process in which someone develops alternative answers or solutions to solve certain problems or problems [4].

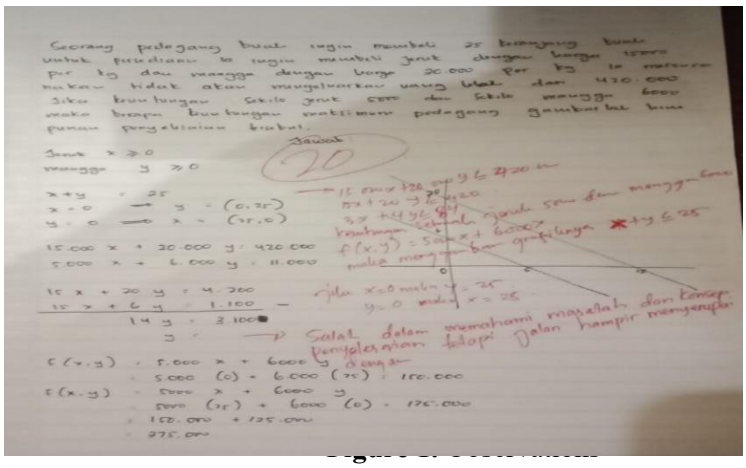
There are five points that illustrate the importance of understanding the meaning of learning, namely: 1) is a logical and clear way of thinking, 2) is a skill to solve problems in everyday life, 2) is the ability to identify patterns of relationships and build generalizations from experience, 4) is a factor in developing creativity and 5) is a factor that contributes to the development of cultural understanding. Therefore, mathematics is not only a very important subject but also has its own characteristics. However, in the context of mathematics education in Indonesia, there are still challenges such as low student achievement and lack of motivation and interest in learning mathematics [5].

The ability to think creatively is the ability to generate new ideas, create new methods to solve problems, and even produce alternative solutions. Qadri [6] argues that creative thinking in mathematics plays an important role in developing a deeper conceptual understanding of mathematics and developing students' mathematical potential. Therefore, the ability to think creatively has a significant impact on a person's life journey, including his role and contribution to society. New discoveries often come from the creative thinking of each individual, and creative thinking is the way a person expresses himself and creates personal satisfaction.

Reciprocal teaching is a discussion technique between teachers and students when discussing reading texts. In this technique, written notes serve only as a brief guide to encourage conversation. *Reciprocal teaching* can be interpreted as a learning method where students actively participate in the process of delivering information. This encourages students to dare to communicate information according to their understanding. On the other hand, from the teacher's point of view, this approach allows the teacher to observe how students communicate information by measuring how well students understand the material and how easily it is to understand the material. In the reciprocal teaching model, students also play a role in teaching by using strategies such as asking questions, making predictions, explaining, and summarizing [7].

With the rapid development of the times, the variety of media and tools used in the process of learning mathematics is becoming increasingly diverse. This is intended to make it easier for students to understand abstract concepts and also make it easier for teachers to present material in class. In the development of computer technology, Geogebra is an application used in mathematics lessons. Geogebra is software that allows simple visualization of complex concepts, making it easier for students to understand them and helping to improve students' creative thinking skills [8].

The results of direct observations conducted at MAS Al-Wasliyah 12 Perbaungan found that students' creative thinking ability when faced with mathematical problems is very limited. The identified math questions are connected with the "Wake up" indicator. in creative thinking skills. This poses a great challenge for students. Students have difficulty doing well on the problem, especially when it comes to creating the necessary graphs in the context of indicators of creative thinking "elaboration".



During the learning process, the teacher does not actively allow students to participate in the formation of mathematical concepts. The learning methods used in schools are still traditional, meaning that the learning method is more teacher-centered. This approach can limit the development of students' creativity

and active participation, especially in conveying their thoughts and ideas. This condition is no longer in accordance with the specific goals and objectives of mathematics learning. Successful learning objectives will be achieved if planning and learning methods can motivate and influence students' potential and abilities, and this can only be achieved if students actively participate in their thought processes. At MAS Al-Wasliyah 12 Perbaungan, the use of applications as a medium in learning has not been implemented. To improve students' creative thinking skills, actions are taken to create a learning environment that supports the development of students' creative abilities. One way is to use the Geogebra application. In this context, the role of the teacher develops into a supporter and motivator who guides students in using the Geogebra application to solve various questions asked. To overcome these problems, the learning model used is the "reciprocal teaching" model. This model helps students develop their ideas and concepts in the context of teaching and learning.

2. Method

This research will be carried out at Mas Al Washliyah 12 Perbaungan in the 2022/2023 school year with face-to-face implementation. The research plan will be adjusted to the schedule of mathematics subjects in class XI Science. This research will take place during the even semester at Mas Al Washliyah 12 Perbaungan.

In this study, researchers adopted the Pretest-Posttest Control Group Design. The process of processing test data begins with analyzing the results of the creative thinking ability test. To assess whether there was a difference between the abilities of students in the experimental group and the control group, a comparison test of two averages was conducted. Before proceeding to the difference test of the two averages, the initial step is to check whether the creative thinking ability test data from both groups meet the assumptions of normality and homogeneity.

2.1. Validity Test

a. Expert Validity

This study aims to validate the validity of research instruments used in mathematics education programs. Before conducting research, validation instruments such as syllabus, lesson plans (lesson plans), and learning materials used in this study include linear regression between two variables, topical analysis (pre and post testing), and interview questions. Next, the examiners (validators) review the data to make sure the instruments used in this study are accurate or not.

Table 1. Validity of Research Instrument Experts

Validators	**Instruments**	**V**	**Va**	**∑Va.**
Validator I	Syllabus	93,33	88,89	
Validator II		95,56		
Validator III		77,73		
Validator I	RPP	96,00	88,00	
Validator II		90,00		90,00%
Validator III		78,00		
Validator I	LKPD	77,14	95,24	
Validator II		94,29		
Validator III		94,29		

Validators	**Instruments**	**V**	**Va**	**ΣVa.**
Validator I	Media	94,29	88,57	
Validator II		77,14		
Validator III		94,29		
Validator I	Pretest	95,00	93,33	
Validator II		100,00		
Validator III		85,00		
Validator I	Posttest	90,00	93,33	
Validator II		100,00		
Validator III		90,00		
Validator I	Questionnaire	80,00	80,00	
Validator II		82,22		
Validator III		77,78		

a.

b. Construct Validation

The validity of its construction centers on how the measuring instrument produces measurement results that fit its definition. To facilitate the assessment of construction validity, the definition of variables should be clear. This definition comes from theory. If the definition is based on a reasonable theory and the question or statement is appropriate to the topic, then the instrument is considered valid in the sense of constructive validity

Table 2. Pretest and Posttest *Validity Test Decision Results*

No.	Indicators	Pretest	r_{tabel}	Posttest	Interpretation
		$r_{calculate}$		$r_{calculate}$	
1.	Smooth	0,711	0,344	0,560	Valid
2.	Authenticity	0,847	0,344	0,714	Valid
3.	Flexibility	0,768	0,344	0,771	Valid
4.	Elaboration	0,816	0,344	0,673	Valid

2.2. Reliability Test

Reliability refers to the level of confidence or reliability of an assessment tool or test in producing consistent and accurate results. To measure reliability, the Cronbach Alpha method is often used. Reliability indicates whether the measurement tool consistently produces comparable results if tested at different times. To assess whether a sample has high, medium, or low reliability, we can test the coefficient of determination obtained from the SPSS 26 output.

If Cronbach's Alpha > 0.60, then the question item is reliable.

If Cronbach's Alpha < 0.60, then the question item is reliable.

Table 3. Test Reliability Results

Question items	***Alpha Cronbach***	**Interpretation**
	Pre-Test	

1-4	0,791	Tall
Post-Test		
1-4	0,610	Keep

3. Result and Discussion

This research was conducted at Mas Al Washliyah 12 Perbaungan on grade XI students, consisting of two classes, namely class XI Science 1 and class XI Science 2. For this study, the sample used was grade XI Science 2 students, totaling 30 students, and in this class a Reciprocal Teaching learning model will be applied with the help of the Geogebra application. The test questions used in this study are in the form of essay questions of 4 questions, and the maximum score for each question is 4 if students answer correctly. The following are pre-test and post-test score data from grade XI science 1 students as a control class and grade XI science 2 students as an experimental class.

3.1. Normality Test

The Normality Test aims to determine whether the data obtained has a distribution that matches the normal distribution or not. To test the normality of the pre-test data of the experimental class and the control class, the Shapiro-Wilk method was used. The results of this pre-test and post-test data normality test are presented in a summary using the SPSS 26 application and can be found in the following table.

Table 4. Normality Test Results

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
TesControl	.145	31	.096	.962	31	.320
Control Posttes	.113	31	.200*	.971	31	.538
PretesEks	.188	31	.007	.938	31	.071
PosttesEks	.130	31	.198	.956	31	.233

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

The basis for decision making in the Kolmogorov-Smirnov normality test, namely:

a. If the significance value (sig) > 0.05, then the data is normally distributed.

b. If the significance value (sig) < 0.05, then the data is not normally distributed.

Based on Table 4, the statistical test yielded an estimated normality of 0.320 for the control group pretest, 0.538% for the control group posttest, 0.071% for the experimental group pretest.

3.2. Homogeneity Test

This homogeneity test is carried out to determine whether the sample used in the study has an adequate level of homogeneity. If the homogeneity test successfully qualifies, then the researcher can proceed with the hypothesis test using the t test. The data used in this homogeneity test is data on students' creative thinking ability after receiving treatment, namely students' post-test scores.

Table 5. Homogeneity Test Results

		Levene Statistic	df1	df2	Sig.
After Treatment	Based on Mean	.001	1	60	.973
	Based on Median	.000	1	60	1.000

	Based on Median and with adjusted df	.000	1	59.636	1.000
	Based on trimmed mean	.000	1	60	1.000

The basic results in a homogeneous test are as follows:

a. If the significance value (sig) > 0.05, then the distribution of data is homogeneous.

b. If the significance value (sig) < 0.05, then the distribution of data is not homogeneous.

Based on table 5, from these data it can be concluded that the significance value in the Based on mean is 0.973. from these *data, the value of Based on mean* > 0.05, it can be concluded that the data in this study is declared homogeneous.

3.3. Hypothesis Testing

After the normality test results showed that the pre-test and post-test data in the control and experimental classes had a normal distribution, then an analysis was carried out to assess the difference in the average creative thinking ability of students before and after applying the *Reciprocal Teaching learning model* with the help of the Geogebra application on the linear inequality material of one variable in grade XI science students at Mas Al Washliyah 12 Perbaungan. To test the difference between pre-test and post-test results in the control class and experimental class, an independent t test was used. This test aims to determine whether there is an average difference between two unpaired samples. The main requirement in an independent sample t-test is that the data must have a normal and homogeneous distribution (not absolute).

Determining the Hypothesis

Ha = H1 > H2 (There is an increase in students' creative writing skills when using the Reciprocal Teaching approach with the Geogebra application compared to students who obtain learning with the traditional paradigm).

H0 = H1 < H2 (There is no increase in students' creative drawing skills when learning Geogebra with the Reciprocal Teaching method compared to learning Geogebra with conventional techniques).

Ha = H1 > H2

H0 = H1 < H2

Information: H1 = *Pre-Test*

H2 = *Post-Test*

One-party (right-party) testing criteria:

H0 is rejected if : t_{count} > ttable

H0 is accepted if: tcalculate < ttable

The basis for decision making in the t test (*independent samples test*), namely:

a. If the significance value (2-tailed) is less than or equal to 0.05, it can be concluded that there is an increase in the creative thinking ability of students using the Reciprocal Teaching learning model with the support of the Geogebra application.

b. If the significance value (2-tailed) is greater than or equal to 0.05, it can be concluded that there is no increase in the creative thinking ability of students using conventional learning models.

Table 6. Test Results *Independent sample t test*

	Class	N	Mean	Std. Deviation	Std. Error Mean
Before Treatment	Control Class	31	35.65	18.786	3.374
	Experimental Class	31	17.58	8.551	1.536
After Treatment	Control Class	31	52.10	20.566	3.694
	Experimental Class	31	70.16	11.796	2.119

From Table 6, it can be seen that the average pretest score for the control class, which consisted of 31 students, was about 35.65. Meanwhile, the average pretest score for the experimental class, also with 31 students, was around 17.58. Furthermore, for the posttest score, the average of the control class was about 52.10, and the average of the experimental class was about 70.16.

The results of the analysis using the t-test with SPSS 26 showed that the significance value (*two-tailed*) was less than 0.05. This shows that there is a significant improvement in students' creative thinking ability after integrating the Geogebra application with the reciprocal learning paradigm. Therefore, it can be concluded that this learning model has proven effective in improving students' creative thinking abilities. Overall, the implementation of the research went well, although there is no denying that there were some obstacles during the process. This research was carried out in two classes, namely class XI Science 1 as a control class and class XI Science 2 as an experimental class, and lasted for a number of certain meetings.

The results of descriptive calculations using the Likert scale for questionnaire percentage data related to students' creative thinking skills in the control class and experimental class can be found in the following bar graph:

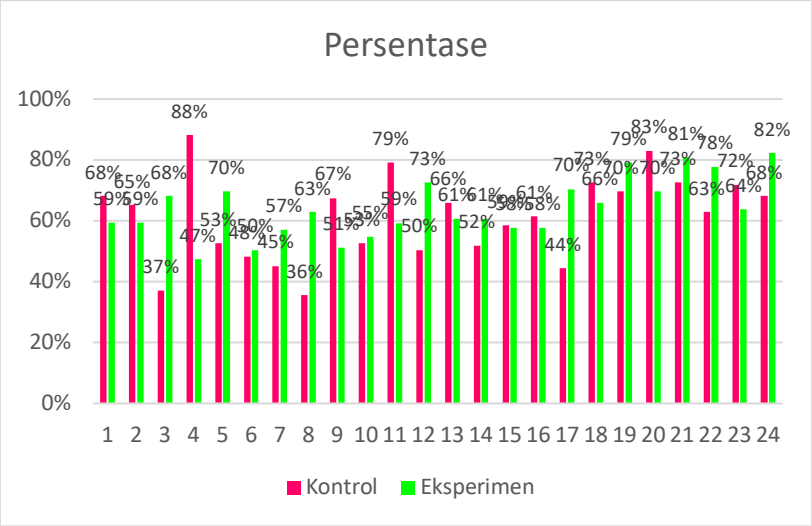


Figure 2. Results of student motivation questionnaires based on questionnaires.

4. Conclusion

In the pre-test *data control class* , the number of values was obtained with an average of 35.65 standard deviations of 18.786 and variance of 120.81. The lowest value is 10.00 and the highest value is 55.00. Then in the *post-test* data, the number of values was obtained with an average of 52.10 standard deviations of 20.566 and variances of 153.66. The lowest value is 35.00 and the highest value is 85.00. In the Experimental class, *pre-test* data obtained the number of values with an average of 17.58, a standard deviation of 8.551 and a variance of 218.49. The lowest value is 10.00 and the highest value is 70.00. Then in the *post-test* data, the number of values was obtained with an average of 70.16 standard deviations of 11.796 and variance of 163.92. The lowest value is 45.00 and the highest value is 95.00. Known significant value (2-tailed) of 0.000 < 0.05. Shiva's mathematical creative thinking ability on the *pretest questions for the control class was 36% and the experimental class was 18%, while the data on students' mathematical creative thinking skills on the* posttest questions had a success percentage of the control class by 52 *%, while for the experimental class* it was 70%. Therefore, it can be concluded that students who utilize the Geogebra program with a reciprocal teaching learning approach show a higher level of creative thinking ability than students who follow a conventional learning approach.

References

[1] Akbar, S. (2017). Learning Device Instruments. Bandung: PT Remaja Rosdakarya.
[2] Diyah. 2020. Geogebra in Mathematics Learning. Deepublish Publisher. Yogyakarta 55581. ISBN. 978-623-02-1194-2.

[3] Isrok'atun, Amelia Rosmala. 2018. Mathematical Learning Models. Jakarta. Earth Literacy. ISBN. 978-602-444-357-3.
[4] Sugiyono, 2018. Quantitative and Qualitative Research Methods. Alfabeta Bandung.
[5] Agustini, D., &; Pujiastuti, H. (2020). Analysis of Student Difficulties Based on Mathematical Understanding Ability in Solving Story Problems on SPLDV Material. Mathematics Education Media, 8(1), 18-27.
[6] Andiyana, M. A., Maya, R., &; Hidayat, W. (2018). Analysis of the mathematical creative thinking ability of junior high school students on building space material. JPMI (Journal of Innovative Mathematics Learning), 1(3), 239-248.
[7] Areq, A., Marsitin, R., & Suwanti, V. (2019). Reciprocal Teaching Model on Creative Thinking Ability of Mathematics. RAINSTEK: Journal of Applied Science & Technology, 1(4), 37-44.
[8] Budiman, H., &; Rosmiati, M. (2020). Application of Geogebra-Assisted Van Hiele Learning Theory to Improve Students' Mathematical Reasoning Ability. Prism, 9(1), 47-56.
[9] Darwanto, D. (2019). Mathematical Creative Thinking Ability: (Understanding and Indicators). Exponent, 9(2), 20-26.
[10] Diva, D. F., Andriyani, J., Rangkuti, S. A., Prasiska, M., Tobing, T. E. W. L., Irani, A. R., &; Saragih, R. M. B. (2023). The Importance of Understanding Geogebra Concepts in Mathematics Learning. Journal on Education, 5(3), 8441-8446.
[11] Indriani, R., &; Sritresna, T. (2022). The ability of mathematical connections is reviewed from the Self Efficacy of Junior High School Students on Number Pattern Material. Plusminus: Journal of Mathematics Education, 2(1), 121-130.
[12] Khotimah, S. H., &; Asâ, M. (2020). A realistic mathematics education approach to the mathematics learning outcomes of elementary school students. Journal of Imiah Education and Learning, 4(3), 491-498.
[13] La'ia, H. T., &; Harefa, D. (2021). The Relationship of Mathematical Problem Solving Ability with Students' Mathematical Communication Skills. Literacy: Journal of Non-Formal Education, 7(2), 463-474.
[14] Maulana, E., &; Lubis, A. (2022). Efforts to improve students' mathematical communication skills through reciprocal teaching approaches assisted by the Geogebra application. Journal of Education and Counseling (JPDK), 4(6), 12947-12952.
[15] Matondang, K., &; Matondang, A. R. (2021). Application of Open Ended Approach in Realistic Mathematics Learning. FARABI: Journal of Mathematics and Mathematics Education, 4(2), 197-201.
[16] Nufus, Z. (2021). Analysis of Creative Thinking Ability of MTsN Students (Doctoral dissertation, UIN Ar-raniry).
[17] Purnamasari, A., &; Afriansyah, E. A. (2021). Mathematical communication skills of junior high school students on the topic of presenting data in Islamic boarding schools. Plusminus: Journal of Mathematics Education, 1(2), 207-222.
[18] Putri, D. K., Sulianto, J., &; Azizah, M. (2019). Mathematical Reasoning Ability Reviewed from Problem Solving Ability. International Journal of Elementary Education, 3(3), 351-357.
[19] Putri, J. H., Syahputra, E., &; Mulyono, M. Development of Macromedia Flash-Based Learning Media by Using Problem-Based Learning to Improve Spatial Ability and Student Learning Motivation. PARADIKMA: Journal of Mathematics Education, 12(2), 18-27.
[20] Putri, J. H., Matondang, K., &; Ketaren, A. A. B. (2021). The Effect of the Numbered Head Together (NHT) Type Cooperative Learning Model on the Mathematical Problem Solving Ability of Class VII Fractional Materials of SMP Al-Washliyah 4 Medan Learning Year 2018-2019. FARABI: Journal of Mathematics and Mathematics Education, 4(2), 168-174.
[21] Pd, Muslimin M., Indaryanti Indaryanti, and Ely Susanti. "Mathematics learning with reciprocal teaching model to train students' academic skills in grade VIII SMP Negeri 1 Indralaya." Sriwijaya Journal of Mathematics Education 11.1: 1-14.
[22] Qadri, L., Ikhsan, M., &; Yusrizal, Y. (2019). Mathematical creative thinking ability for students through REACT strategies. International Journal for Educational and Vocational Studies, 1(1), 58-61.
[23] Rahayu, E. L., Akbar, P., &; Afrilianto, M. (2019). The influence of the mind mapping method on the thinking aloud pair problem solving strategy on the ability to think creatively mathematically. Journal on Education, 1(2), 271-278.
[24] Rokhmawati, L. N., &; Rahayu, D. V. (2023). Optimizing Students' Understanding of Mathematical Concepts on Distance Material In Geogebra-Based Learning Video-Assisted Space. Journal of Authentic Research on Mathematics Education (JARME), 5(1), 66-75.
[25] Rufaidah, D., &; Sari, N. R. (2019). The Effect of the Reciprocal Teaching Model on the Mathematical Creative Thinking Ability of Class X Students. TULIP (Educational Scientific Writing), 8(1), 8-14.
[26] Saputra, H. (2020). Mathematical Critical Thinking Skills. IAI Agus Salim Library, 2, 1-7.
[27] Sagala, Z. U., Simamora, Y., &; Maharani, I. (2019). The influence of the contextual teaching and learning learning model on the ability to solve mathematical problems. FARABI: Journal of Mathematics and Mathematics Education, 2(2), 11-19.
[28] Simamora, Y., Saragih, R. M. B., &; Susilawati, S. (2022). Error Analysis of Students Completing Mathematical Problem Solving Ability Test Questions Class X Private Vocational School Muhammad Yaasiin Sei Lepan. Omega: Journal of Mathematics Education, 1(1), 1-6.
[29] Siregar, N. U., Pulungan, F. K., Thahara, M., Dalimunthe, N. F., Fakhri, N., Herawati, N., ... & Saragih, R. M. B. (2023). Application of Geogebra Application in Mathematics Learning. Journal on Education, 5(3), 8151-8162.
[30] Suciati, I., Mailili, W. H., &; Hajerina, H. (2022). Implementation of geogebra on students' mathematical abilities in learning: a systematic literature review. Theorem: Mathematical Theory and Research, 7(1), 27-42.
[31] Utami, R. W., Endaryono, B. T., &; Djuhartono, T. (2020). Improve students' mathematical creative thinking skills through an open-ended approach. Factors: Scientific Journal of Education, 7(1), 43-48.
[32] Wicaksono, W. A., Supandi, S., &; Kusumaningsih, W. (2021). Mathematical Creative Thinking Ability with Cycle Learning and Reciprocal Learning Models Based on Realistic Mathematics Education (RME). Imaginary: Journal of Mathematics and Mathematics Education, 3(4), 353-357.
[33] Wulandari, L., &; Fatmahanik, U. (2020). The ability to think logically, mathematically, fractional material in students with high initial ability. Laplace: Journal of Mathematics Education, 3(1), 43-57.
[34] Wulandari, S., &; Maharani, I. (2022). The Effect of The Group Investigation Type Cooperative Learning Model on Students' Mathematical Creative Thinking Skills. OMEGA: Journal of Mathematics Education, 1(2), 09-16.

[35] Yusup, F. (2018). Test the validity and reliability of quantitative research instruments. Tarbiyah: Scientific Journal of Education, 7(1).