

Covid-19 Pandemic: Application of Cooperative Learning Model Type Rotating Trio Exchange (RTE) to Increase Mathematic Connection Ability and Self Efficacy of Junior High School Students

¹Taufiqulloh Dahlan, ²Darhim, ³Dadang Juandi, ⁴Nia Gardenia, ⁵Thesa Kandaga

¹Lecturer in Mathematics Education, Universitas Pasundan, Jl. Taman Sari No. 6-8, Bandung 40116, Indonesia, taufiqulloh@upi.edu

²Mathematics Education, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia, darhim0355@gmail.com

³Mathematics Education, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia, dadang.juandi@upi.edu

⁴Mathematics Education, Universitas Indraprasta PGRI, Jl. Raya Tengah No. 80, Jakarta 13760, Indonesia, niagardenia140813@gmail.com

⁵Lecturer in Mathematics Education, Universitas Pasundan, Jl. Taman Sari No. 6-8, Bandung 40116, Indonesia, thesakandaga@unpas.ac.id

Abstract

The background of this research was carried out during the COVID-19 pandemic, starting with the understanding that topics in mathematics do not stand alone, but are interrelated with each other so that the importance of mathematical connection skills to be mastered by all students to make it easier for students to learn mathematics. By mastering mathematical connections, students will know that ideas in mathematics are interrelated, mathematical ideas are also applied in other subjects and mathematics is also used in everyday life. The aims of this study are: (1) To determine the improvement of students' mathematical connection skills who received the RTE learning model with students who received ordinary learning; (2) To determine the self-efficacy of students who received the RTE learning model with students who received ordinary learning; (3) To find out how much the value of the effectiveness of the RTE learning model in mathematical connection abilities. (4) To determine the effectiveness of using the learning management system (LMS) at schoolvirtual.com. The method used in this study is a quasi-experimental method with a pretest and posttest group design conducted online. The population in this study were students of class VIII SMP in Bandung. While the object in this study is the ability of mathematical connections and self-efficacy. The instruments used in this study were a mathematical connection ability test and a self-efficacy scale questionnaire. The results of this study indicate that: (1) Improved mathematical connection skills of students who received the RTE cooperative learning model were better than students who received the ordinary learning model; (2) The self-efficacy of students who received RTE learning was better than the self-efficacy of students who received ordinary learning; (3) The effectiveness of the RTE learning model for students' mathematical connection skills is 1.82 which is included in the large category. (4) The effectiveness of using the learning management system (LMS) of Sekolahvirtual.com is in the very good category.

Keywords: Mathematical connection ability, rotating trio exchange (RTE) model, self-efficacy, schoolvirtual.com.

I. INTRODUCTION

I During the COVID-19 pandemic, a solution for online learning is needed using a learning management system using Moodle (Modular Object-Oriented Dynamic Learning Environment), namely Sekolahvirtual.com (Taufiqulloh Dahlan, Darto Darto, Trian Pamungkas Alamsyah, 2021). Then one of the objectives of learning mathematics according to (Wardhani, 2008) is problem solving which includes the ability to understand problems, design mathematical models, complete models, and interpret the obtained models. Based on the 2013 curriculum (Depdikbud, 2014), the purpose of learning mathematics is that students understand mathematical concepts, explain concept interest and apply concepts or algorithms flexibly, accurately, efficiently, and precisely in problem solving. Mathematical connection ability is important but students who master mathematical concepts are not automatically smart in connecting mathematics, mathematical connection skills need to be trained to students at school (Kurniawan, 2006). If students are able to relate mathematical ideas, their mathematical connections will be deeper and longer lasting because they are able to see the interrelationships between topics in mathematics, with contexts other than mathematics, and with everyday life experiences (NCTM, 2000). Through mathematical connections, students' thinking concepts and insights will be more open to mathematics, not only focusing on certain topics that are being studied. Making connections is a clear standard in mathematics education which is also one of the main recommended standards (Kusuma, 2003).

According to the research results of Ruspiani (Ruspiani, 2013), which shows the average value of the mathematical connection ability of high school students is still low, which is less than 60% at a score of 100 (22.2% for mathematical connections in other subjects, 44% for connections in other fields of study, and 67.3% for connections mathematics in everyday life). Likewise with the results of research (Isfayani, E., Johar, R., & Munzir, 2018), which states that the level of

mathematical connection ability of junior high school students is still low. The results of this study indicate that the number of students who have connection skills is still low for each type. One of the best ways to solve problems is to have self-efficacy. Self-efficacy in mathematics is a belief in the ability of students' self-competence to solve mathematical problems. According to J. Saputra (J Saputra, W Eliyarti, BYG Putra, 2021), Self-efficacy is an attitude or feeling of confidence in one's own abilities, so that you are not too anxious in your actions. In addition, students' self-confidence and confidence level are still lacking when asked by teachers to solve math problems. For example, when the teacher appoints a student to work on a question on the blackboard, the student does not want to come forward because he is afraid of being wrong and is not sure himself whether his work is right. This indicates that students' self-efficacy and mathematical connection abilities are still low (Bandura, 1997). Overcoming the gap between expectations and reality above, in the teaching and learning process one must be able to use a model that prioritizes student activity and provides opportunities for students to develop their potential to the fullest. In a student must be instilled a spirit of togetherness. One of the learning models that prioritizes group work is the cooperative learning model (N Gardenia, T Herman, D Juandi, T Dahlan, 2021). With this model students can exchange opinions, express their thoughts, cooperate with each other if there are group friends who are having difficulties (Silberman, 2009). The rotating trio exchange (RTE) learning model develops an active learning environment so that students can move physically to exchange ideas to gain knowledge. Rotating trio exchange (RTE) cooperative learning model is an effective way to change learning patterns in the classroom. This model is student-centered so that it leads students to interact, express, express their own opinions, discover knowledge and express it to friends (T Kandaga, T Dahlan, N Gardenia, 2021). Based on the background described previously, the formulation of the research problem is: Is the increase in the mathematical connection ability of students who receive the RTE cooperative learning model higher than

students who receive the ordinary learning model? Is the self-efficacy of students who receive RTE learning better than the self-efficacy of students who receive ordinary learning? What is the value of the effectiveness of the RTE cooperative learning model for improving mathematical connection skills. Then to find out the effectiveness of using a moodle-based learning management system, namely Sekolahvirtual.com.

2. RESEARCH METHOD

The research method used is a quasi-experimental method. The approach used is a quantitative approach. The online learning system used is using a moodle-based learning management system, namely Sekolahvirtual.com. Then the research design is in the form of a nonequivalent Control Group Design (Nia Gardenia, Tatang Herman, Andri Rahadyan, 2020).

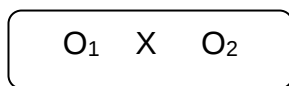


Figure 1 Research Design

This research was conducted in a junior high school in Bandung. The subjects of this study were students of class VIII junior high school in Bandung. The samples to be taken are class VIII A and VIII B with certain considerations. All students of class VIII are considered to have the same relative ability for each class (homogeneous). The object of this research is mathematical connection ability and self-efficacy. The method of collecting data is in the form of a mathematical problem solving ability test with a total of 5 questions and a self-efficacy scale (questionnaire) with a total of 30 statements. Then a questionnaire sheet on the use of a moodle-based learning management system, namely Sekolahvirtual.com. The instrument was first tested for validity, reliability, discriminatory power and difficulty index. Analysis of the data used in the form of normality test, homogeneity test, two-mean difference test (t-test), and effectiveness test (Effect Size).

3. RESEARCH RESULTS AND DISCUSSION

Based on the results of the data collected using a moodle-based learning management system, namely Sekolahvirtual.com, a learning research system used during the COVID-19 pandemic. This system is very effectively used as an online learning solution during the COVID-19 pandemic. On the virtualschool.com system, there is an attendance system, the provision of materials in the form of microsoft word, pdf, etc., discussion forums, task collection, videos, live chat, pictures, multiple-choice tests or descriptions, and so on.

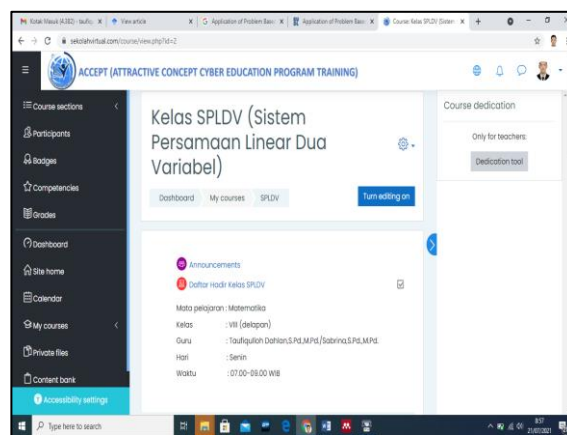


Figure 2 Display of a moodle-based learning management system with the link schoolvirtual.com

Then it was obtained that the experimental class value data was obtained from posttest data after being treated with the Rotating Trio Exchange (RTE) model in class VIII A, the highest score was 98 and the lowest value was 69. the highest score was 82 and the lowest score was 40. Testing the normality of the student learning outcomes data for the two groups used the Shapiro Wilk test. The significant data on increasing mathematical connection ability of the experimental class is 0.131 and the control class is 0.077. As the significant basis is more than 0.05, the data on increasing the mathematical connection ability of the two classes is normally distributed with H0 being accepted, while the homogeneity test shows a significant value of 0.258. As the hypothesis testing significant value is more

than 0.05, it can be concluded that the experimental class and control class have the same variance or the two classes are said to be homogeneous. Analysis of the results of the N-Gain score on the mathematical connection ability test of the total students who worked on the mathematical connection ability in the experimental class showed that they were in moderate improvement with an average of 0.59. While in the control class, mathematical problem solving ability is in moderate increase with an average of 0.36. It can be seen in Table 1 the N-Gain score for the mathematical connection ability as follows:

Table 1 Score N-Gain Mathematical Connection Ability

N-gain interval (g)	Number of Class Students at N-gain Interval		Classification
	Experiment Class	Control Class	
$g \geq 0,70$	7	2	High
$0,30 \leq g < 0,70$	23	18	Medium
$g < 0,30$	0	10	Low
Average	0,59	0,36	

Based on Table 1, to increase the mathematical connection ability of experimental class students with high criteria, as many as 7 students, 23 students with moderate criteria and 0 students with low criteria with a total average of 0.59. As for the control class, there were 2 students with high criteria, 18 students with moderate criteria, and 10 students with low criteria with a total average of 0.36. The results stated that the experimental class students had higher average scores than the control class, even though both classes were in the moderate improvement criteria. After the difference test of the two averages (t-test) the significance value is 0.000, it is smaller than 0.05. It can be concluded that the final mathematical connection ability of students who received the Rotating Trio Exchange (RTE) learning model was higher than students who received ordinary learning.

1. Dik: Andi		Budi	
2 buku tulis + 1 pensil		2 buku tulis + 2 pensil	
harga Rp 55.000,00		harga Rp 70.000,00	
jawab:		harga pensil	harga buku
		Rp.15.000,00	Rp.20.000,00
- Andi membeli 2 buku dan 1 pensil			
Rp. 40.000,00 (harga 2 buku) + Rp. 15.000,00 = Rp. 55.000,00			
- Budi membeli 2 buku dan 2 pensil			
Rp. 40.000,00 (harga 2 buku) + Rp. 30.000,00 (harga 2 pensil) = Rp. 70.000,00			

Figure 3 The results of students' answers related to math connection ability

Based on Figure 3, it can be seen that students are trying to connect their abilities to make modeling forms of shopping problems, where Andi and Budi buy notebooks and pencils. Then Andi bought two notebooks and a pencil for Rp. 55,000,-. Meanwhile, Budi bought two notebooks and two pencils that were the same as Andi's for Rp. 70,000,-. There it can be seen that students begin to identify the problem by writing down the part that is known, then writing down the part that is asked and then making knowledge connections to make a model of the problem.

5. Dik: Tesa		Opik	
5 mobil-mobilan + 2 robot-robotan		1 mobil-mobilan + 10 robot-robotan	
harga Rp 80.000,00		harga Rp 160.000,00	
jawab:		harga mobil-mobilan	harga robot-robotan
		Rp. 10.000,00	Rp. 15.000,00
- Tesa membeli 5 mobil-mobilan dan 2 robot-robotan			
Rp. 50.000,00 (harga 5 mobil) + Rp. 30.000,00 (harga 2 robot) = Rp. 80.000,00			
- Opik membeli 1 mobil-mobilan dan 10 robot-robotan			
Rp. 10.000,00 + Rp. 150.000,00 (harga 10 robot) = Rp. 160.000,00			

Figure 4 The results of students' answers related to math connection ability

Furthermore, based on Figure 4, students are directed to be able to determine the value of each item. With the form of the question that Tesa bought five toy cars and 2 robots at a toy shop with a retail price of Rp. 80,000, -. At the same shop, Opik bought one toy car and 10 robots for Rp.160,000,-. Students try to determine from each item, by writing the part they know, then writing down the part they

want to ask, making a table as an aid in determining prices.

Then the self-efficacy of students who received treatment with the Rotatting Trio Exchange (RTE) learning model was better than students who received ordinary learning. The results showed that after being given treatment from both classes and processing data from ordinal data into interval data scales using the help of the Method of Successive Interval (MSI) in Microsoft Excel 2013 software, the significant value was 0.0035 less than 0.05. It can be concluded that the Rotatting Trio Exchange (RTE) learning model can help develop a positive self-efficacy attitude through each stage that requires discussion and placing oneself in a group, as well as being communicative. Effect size is a method used to determine the effectiveness of the learning model, as a step to measure the effectiveness of a tested method/model applied to students. In calculating the effectiveness of the Rotatting Trio Exchange (RTE) model, we will first look at the average value and variance of the post-test results in the two classes. The t-test results show that the Rotatting Trio Exchange (RTE) learning model has a significant effect on mathematical connection ability, so the size of the effect will be sought. In Table 1, the mean, variance and effect size gain from the experimental class and the control class are presented.

Table 2 *Obtaining Effect Size*

Class	N	Average	Varians	Effect Size	Information
Experiment	30	81,1	91,403	1,82	High
Control	30	61,8	132,441		

Based on Table 1, the Effect Size obtained is 1.82 in the large classification. This shows that the Rotatting Trio Exchange (RTE) model has great effectiveness on mathematical connection abilities. Furthermore, based on the results of the questionnaire given to students, it was stated that students get very good benefits, when doing learning using a moodle-based learning management system, namely Sekolahvirtual.com. Because this system records all teacher and student activities during the learning process, on the virtualschool.com system, an attendance system is available, the

provision of materials in the form of microsoft word, pdf, etc., discussion forums, task collection, videos, live chat, pictures, tests in the form of multiple choice or description, and so on, so as to create active, creative, and collaborative learning.

4. CONCLUSIONS AND SUGGESTIONS

Based on the results of data analysis and hypothesis testing, the researchers drew the following conclusions: 1) Increased mathematical connection skills of students who received the RTE cooperative learning model were higher than students who received the ordinary learning model, 2) Self-efficacy of students who received RTE learning was better than self-efficacy of students who receive ordinary learning, 3) The RTE learning model on mathematical connection abilities has an effectiveness value of 1.82 which is included in the large category. 4) There is a good and positive response when students use a moodle-based learning management system, namely Sekolahvirtual.com, as a solution in online learning during the COVID-19 pandemic. Referring to the results and conclusions of research on learning mathematics using the RTE model, the researcher gives some suggestions as follows: 1) Learning mathematics using the RTE model is recommended to be used as an alternative to learning mathematics in schools, 2) For further researchers who want to use the RTE model that needs to be considered in the application of this model is the readiness of researchers and students, teaching and learning conditions and infrastructure. Every researcher and student must understand the stages that must be carried out in the implementation of RTE model learning. More able to set the time precisely because at the time of rotation it takes a relatively long time. 3) Further study the RTE model with different research populations and materials. . 4) Assessing good and positive responses when students use learning management systems on other platforms, as a solution in online learning during the covid-19 pandemic.

Reference

- [1] Bandura, A. (1997). *Self-Efficacy: the exercise of control*. New York: W. H. Freeman /Times Books.
- [2] Depdikbud. (2014). *Tentang Kurikulum 2013*. Jakarta: Depdikbud.
- [3] Isfayani, E., Johar, R., & Munzir, S. (2018). Peningkatan kemampuan koneksi matematis dan self- efficacy siswa melalui model pembelajaran kooperatif tipe Rotating Trio Exchange (RTE). *Jurnal Elemen*, 4(1), 80–92. <https://doi.org/http://dx.doi.org/10.24127/ajpm.v7i2.1508>
- [4] J Saputra, W Eliyarti, BYG Putra, T. K. (2021). Improvement of the Ability of Representation, Reasoning, and Self-Efficacy of Prospective Mathematics Teacher Students by Using Learning with A Scientific Approach. *Journal of Physics: Conference Series*, 1776(1), 1–13. Retrieved from <https://iopscience.iop.org/article/10.1088/1742-6596/1776/1/012002/pdf>
- [5] Kurniawan, R. (2006). *Pembelajaran Dengan Pendekatan Kontekstual Untuk Meningkatkan Kemampuan Koneksi Matematik Siswa SMK*. PPs UPI.
- [6] Kusuma, D. A. (2003). *Meningkatkan Kemampuan Koneksi Matematika Siswa SLTP dengan Menggunakan Metode Inkuiri*. PPS UPI Bandung.
- [7] N Gardenia, T Herman, D Juandi, T Dahlan, T. K. (2021). Analysis of mathematical communication skills of class 8 students on two-variable linear equation systems (SPLDV) concept. *Journal of Physics: Conference Series*, 1806(1), 1–7. Retrieved from <https://iopscience.iop.org/article/10.1088/1742-6596/1806/1/012073/pdf>
- [8] NCTM. (2000). *Principles And Standards Schools Mathematics*.
- [9] Nia Gardenia, Tatang Herman, Andri Rahadyan, T. D. (2020). Application of Problem Based Learning Approaches with Probing-Prompting Techniques to Improve Students' Adaptive Reasoning Capabilities. *EUDL: European Union Digital Library*, 7(1), 1–6. <https://doi.org/http://dx.doi.org/10.4108/ea.i.12-10-2019.2296525>
- [10] Ruspiani. (2013). *Kemampuan Siswa Dalam Melakukan Koneksi Matematika*. PPs UPI.
- [11] Silberman, M. (2009). *Active Learning 101 Startegi Pembelajaran*. Yogyakarta: Yappendis.
- [12] T Kandaga, T Dahlan, N Gardenia, J. S. (2021). A lesson study to foster prospective teachers' disposition in STEM education. *Journal of Physics: Conference Series*, 1806(1), 1–7. Retrieved from <https://iopscience.iop.org/article/10.1088/1742-6596/1806/1/012107/pdf>
- [13] Taufiqulloh Dahlan, Darta Darta, Trian Pamungkas Alamsyah, I. S. W. (2021). Covid-19 Pandemic: Online Learning Platforms For Elementary Schools. *JPsd (Jurnal Pendidikan Sekolah Dasar)*, 7(1), 33–44. <https://doi.org/http://dx.doi.org/10.30870/jpsd.v7i1.10409>
- [14] Wardhani. (2008). *Penelitian Tindakan Kelas*. Jakarta: Universitas Terbuka.