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Improving Connection Ability and Mathematical Disposition of Junior High School Students with Connecting, Organizing, Reflecting, Extending (CORE) Learning Model

In In Supianti [1], Poppy Yaniawati[2], Adhitya Gilang Ramadhan[3], Muhamad Setyaji[4], Pipit Puspitasari[5]

[1, 2]Universitas Pasundan, Jl. Sumatera No. 41, Bandung, Jawa Barat, Indonesia
[3]SMPN 1 Pangalengan, Jl. Pasir Mulya Margamulya, Kabupaten Bandung, Jawa Barat, Indonesia
[4]SMK PGRI Jatiwangi, Jl. Olahraga No. 43, Kabupaten Majalengka, Jawa Barat, Indonesia
[5]SMKN 6 Garut, Jl. Raya Limbangan km 01, Kabupaten Garut, Jawa Barat, Indonesia
Email: pyaniawati@unpas.ac.id

Abstract

The connection ability and disposition of mathematics of junior high school students still need to be improved. This research purpose to analyze the enhancement of connection of mathematics abilities and mathematical dispositions of students who received CORE learning models and conventional learning and to analyze the correlation between the connection abilities and students' dispositions. This study uses the embedded type Mixed Method. The population was all eighth-grade students one of the public junior high schools in Pangalengan, Bandung Regency, and the sample involved as many as 74 students. The instruments used were a mathematical connection ability test, a disposition questionnaire, an observation sheet, and an interview guide. Analysis of data used two Independent Sample t-Test and Mann Whitney test. The results showed that: 1) the improvement of the connection ability of students who received CORE learning was better than students who received conventional learning 2) the disposition of students who received the CORE learning model was better than students who received conventional learning models, 3) there was no relationship between connection ability and disposition of students using the CORE learning model. The conclusion is CORE model is effective to improve students' mathematical connection ability and mathematical disposition.

Keywords: Two Variable Linear Equation System, Confidence, Reflection

Abstrak

Kemampuan koneksi dan disposisi matematis siswa SMP masih perlu ditingkatkan. Penelitian ini bertujuan untuk menganalisis peningkatan kemampuan koneksi matematis dan disposisi matematis siswa yang mendapatkan model pembelajaran CORE dan konvensional serta menganalisis korelasi antara kemampuan koneksi dan disposisi matematis siswa. Penelitian ini menggunakan *Mixed Method* tipe *embedded.* Populasi penelitian ini seluruh siswa kelas VIII di salah satu SMPN di Pangalengan Kabupaten Bandung dan sampel penelitian ini diambil sebanyak 74 siswa. Instrumen yang digunakan adalah tes kemampuan koneksi matematis, angket disposisi matematis, lembar observasi dan pedoman wawancara. Analisis data menggunakan uji *two Independent Sample t-Test* dan *uji Mann Whitney*. Hasil penelitian menunjukkan bahwa: (1) peningkatan kemampuan koneksi siswa yang memperoleh pembelajaran dengan CORE lebih baik daripada siswa yang memperoleh pembelajaran konvensional; (2) disposisi matematis siswa yang memperoleh model pembelajaran CORE lebih baik daripada siswa yang memperoleh model pembelajaran konvensional; dan (3) tidak terdapat hubungan antara kemampuan koneksi dan disposisi matematis siswa yang menggunakan model pembelajaran CORE. Kesimpulannya, model CORE efektif untuk meningkatkan koneksi dan disposisi matematis.

Kata kunci: Sistem Persamaan Linear Dua Varibel, Kepercayaan Diri, Refleksi

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INTRODUCTION

Mathematics has an important role in training the character and skills of 21st-century students. Mathematics serves to train students' thinking in analyzing mathematical problems, linking mathematical concepts, reasoning, drawing conclusions, and communicating ideas correctly (Astuti, Hartono, Bunayati, & Indaryanti, 2017). Connection of mathematics ability is one of the important factors that should be possessed by students because it is very useful for understanding mathematical concepts. With mathematical connections, previously understood mathematical concepts become the basic for understanding new concepts (Sari & Karyati, 2020; Eli, Mohr-Schroeder, & Lee, 2013). Mathematical connection ability refers to the ability to relate mathematical topics, link mathematics between topics with other sciences, and relate mathematics to everyday life (Jahring, 2020; Kenedi, Helsa, Arini, Zainil, & Hendri, 2019). Students' understanding of concepts of mathematics can be better if students' connection abilities are good (Islami, Sunardi & Slamin, 2018). An example of a mathematical connection ability problem in two variable linear equation system material is that a cruise ship takes 3 hours to cover a distance of 60 miles downstream of the river. If the same trip upstream takes 5 hours, determine: a) the speed of the boat in still water, b) the actual speed, c) the conclusions reached. To solve these problems, students need to use the concepts of distance and speed in the field of physics.

The facts that occur in the field show that the connection of mathematics ability of JHS students on two variable linear equation system material is still low, especially in applying it in everyday life (Nugraha, 2018). Regarding the analysis of national examination questions for the 2018/2019 school year stated that the mathematical connection question was the most difficult question for students to answer (Yusron, Retnawati & Rafi, 2020). This resulted in the need for a process of developing students' connection of mathematics skills through the application of potential models, methods, or strategies. The connection of mathematics ability of JHS students in the circle material is still low, one of which is in understanding the connection between mathematical topics (Zuyyina, Wijaya, Helmy, & Senjawati, 2018).

Another important factor that students have is mathematical disposition. Mathematical disposition support students in learning mathematics (Kariadinata, Yaniawati, Juariah, Susilawati, & Cahyana 2019; Setyaningsih & Widjajanti, 2015). Disposition of mathematics is a strong drive, conscious, or tendency to study mathematics and behave positively in solving mathematical problems (Mahmudi & Saputro, 2018; Siregar, Deniyanti & Hakim, 2018; Safitri, Surya, Syahputra, & Simbolon, 2017). Lin & Chun Tai (2016) stated that mathematical disposition affects student learning and performance, and also helps determine students' ability to motivate themselves and overcome learning difficulties, influencing learning choices, educational paths, and student careers in the future. Next, NCTM (Hendriana, Rohaeti & Sumarmo, 2017)describes indicators of mathematical disposition, namely a) self-confidence, b) flexible, c) diligence in doing math assignments, d) showing interest, curiosity, and inventiveness, e) reflection, f) appreciating the application of mathematics, and g) appreciating the mathematics role. Now, the condition of mathematical disposition is still low caused the learning carried out has not fully given service students' competences (Kariadinata, et al., 2019). The conclution of the research by Akbar et al., (2017) concluded that dispositional abilities students were included in the low category. This can be observed from the results of the questionnaire where 50% of students' disposition of mathematics abilities were low, 25% sufficient, 20% high, and 5% very high. Students perceive that mathematics is complicated and students' readability in studying mathematics is lessen, this is because students could not work math problems (Nurfitriyanti, 2017). The low positive attitude of students towards mathematics has a contribution on low learning outcomes (Lestari & Andinny, 2020).

Build upon the description of the problem, efforts are needed to improve the connection ability and mathematical disposition. One of the means is to provide a different model of learning than before. The right model of learning to inhancement students' mathematical connections is the CORE learning model (Triyanti, Jumroh & Retta, 2019). The disposition of mathematical of students who got the CORE model of learning was better than students who got the learning of conventional (Putri & Syarifuddin, 2019). According to Trisnowali & Aswina (2019), the CORE is a model of learning that pointed thinking skills of students to connect, organize, explore, manage, and develop the information obtained. In *connecting* activities, students are trained to remember the old information or concepts to be used in new information or concepts. In *organizing* activities, *s*tudents are trained to organize the information they already have. In *reflecting* activities, students are trained to deepen information from the concepts they already have. In *extending* activity, students are trained to develop and expand the information they have (Indriani & Noordyana, 2021).

Several previous studies on mathematical connection skills using the CORE model in SMK (Fatimah & Khairunnisah, 2019; Agustianti & Amelia, 2018). Mathematical connection ability using Discovery Learning (Istiqomah & Nurulhaq, 2021). The contribution of CORE model of learning on critical thinking skills and mathematical dispositions in SHS students (Siregar, et al., 2018). While state of the art research that we have done is an analysis of increasing connection skills and mathematical dispositions using CORE learning for JHS students.

The purposes of this study were to: (1) analyzing the enhancement of students' connection of mathematics skills who received the CORE model of learning and learning of conventional; (2) analyzing the disposition of mathematics of students who received the CORE model of learning and learning of conventional; and (3) analyzing the correlation between connection ability and students' disposition of mathematics.

METHODS

This study make use of a mixed-method embedded type. Insertion is carried out in parts that require reinforcement or affirmation so that the resulting conclusions have a better level of confidence in understanding when compared to using only one approach (Indrawan & Yaniawati, 2016). The quantitative research design be used is quasi-experimental (see Table 1). While qualitative research is triangulation. This study consists of an experimental class and a control class where the group division follows the existing class division (Indrawan & Yaniawati, 2016).

Table 1. Research Design Quasi-Experimental

Group	Pretest	Treatment	Postest
Eksperimental Group	Y_1	X	Y_2
Control Group	Y_1	-	Y_2

Information:

Y_1 = pretest

Y_2 = postest

X = handling in the form of CORE model

The population in this research were all eighth-grade students in one of the public junior high schools in Pangalengan. This school was choosen because based on the results of observations, the connection of mathematics skills and disposition of mathematics of the students still needed to be improved. Meanwhile, the sample was 74 students. The technique of sampling used is purposive sampling from two classes whose abilities are not significantly different, each class consist of 37 students. One class as control and one class as experiment.

The instruments were a connection of mathematics ability test, a questionnaire of mathematical disposition, an observation sheet, and an interview guide. Mathematical connection test questionsare made based on indicators: (1) the relationship among topics of mathematics; (2) the relationship of mathematics with other sciences; and (3) the relationship of mathematics to everyday life. Mathematical connection test questions used in *pretest and posttest* are the same. While the disposition questionnaire uses a *Likert* scale to measure the level of positive or negative student attitudes towards the application of the model CORE learning in mathematics learning. The validity of the research instrument was analyzed using the Pearson Correlation test with the results of all valid mathematical connection ability questions as well as 30 statements on the mathematical disposition questionnaire. Reliability analysis using the Cronbach Alpha test for mathematical connection skills resulted in high reliability with a value of 0.94 as well as a mathematical disposition questionnaire with a value of 0.91.

A mathematical disposition questionnaire developed based on the indicators: (1) confidence in solving problems of mathematics, communicating ideas, and giving reasons; (2)

supple in exploring mathematical ideas and trying various alternative strategy to solve problems; (3) strong determination to completement tasks of mathematics; (4) interest, curiosity, and ability to find indoing mathematics; (5) the tendency to monitor and reflect on one's thinking process and performance; (6) assess the application of mathematics in other fields and everyday life; and (7) appreciation of the role of mathematics in culture and its value, both mathematics as a tool, and mathematics as a language. The observation sheet is used to measure the activity level of students and teachers in carrying out learning. The aspects that were observed were preparation, introduction, core activities, use of media, models, learning resources, classroom management, evaluation, and closing. Interviews are used to complete information that has not been obtained from observations and questionnaires on students' mathematical dispositions.

The stages of quantitative data analysis techniques used to analyze mathematical connection abilities are descriptive statistics, normality test, homogeneity test, test of *two Independent Sample t-Test*, then proceed with counting-*gain*. The data analysis techniques in the disposition questionnaire are descriptive statistics, normality test, homogeneity test, and the different test of two means, which is then carried out with a *Pearson* correlation test for connection ability and mathematical disposition. The qualitative data analysis technique used was triangulation by comparing the data from observations, interviews, and mathematical disposition questionnaires, and are then drawn into conclusions based on the researcher's study.

RESULTS AND DISCUSSION

CORE Model Learning Process

The CORE model learning process begins with the *connecting* process where teachers and students discuss the connection between two variable linear equation system material and prerequisite material that has been studied previously, namely linear equations of one variable and distributive law.

Figure 1. Discussion group working on student worksheets

In the *organizing* process (as shown in Figure 1), the teacher conditions students to study the material and complete student worksheets in groups with the guidance of the teacher. Students were divided into 7 groups where each group studied and completed the same worksheet.

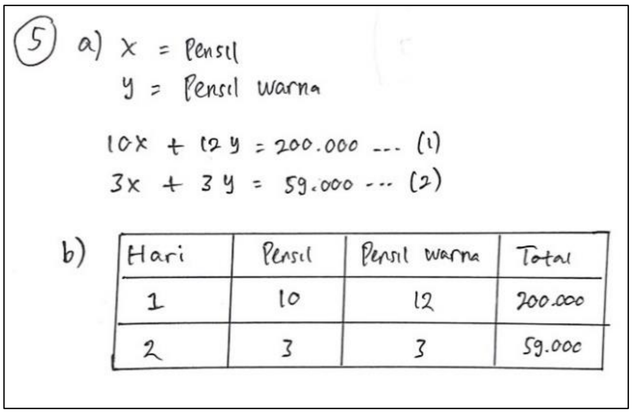

Figure 2. Mathematical connection practice results

Figure 2 depicts the result of working on the questions by students. The *reflecting* process was carried out by students presenting the results of their group work and discussing both with the teacher and their friends. Finally, the Extending process is carried out by providing more in-depth and varied practice questions for the two variable linear equation system material.

Mathematical Connection Ability

Table 2. Mathematical connection ability data analysis

	Class	Average	Test Value T-Test	Conclusion
Pretest	CORE	38.11	0,203	Not Significantly Different
	Conventional	34.24		
Postest	CORE	78.16	0,000	Significantly Different
	Conventional	69.76		
N-gain	CORE	0.6249	0,013	Significantly Different
	Conventional	0.5265		

Based on the results obtained in Table 2, improved mathematical connection ability average score n-*gain* the CORE class is better than the conventional class with a difference in the value of 0.0984. Based on the different tests of the two-mean n-*gain* the mathematical connection skills of the CORE class and the conventional class obtained a value of *sig 2-tailed* of 0.013 < 0.05 then H_0 rejected and H_1 accepted. The conclusion that the enhancement in mathematical connection skills for who had CORE model of learning is better than students who got conventional learning. The CORE learning model can improve connection of mathematics abilities (Yaniawati, Indrawan & Setiawan, 2019). The improvement in the connection mathematics skills of students who had the CORE model was better because students in classes whose learning using the CORE model were seen to be more active in constructing their understanding through group discussions and in-class discussions. Group discussions allow students to share their thoughts and ideas about the material being taught, while in class discussions students can provide feedback between groups. This is in line with Fisher, Yaniawati & Kusumah (2017) that CORE is model of learning based on constructivism theory in which students should construct their knowledge through interaction with the environment. Ramadhani & Kusuma (2020) stated that students gain mathematics learning through the CORE model, students become more enthusiastic about learning because there is a role for students to be able to connect between material and everyday life, students make presentations that require confidence, and students become more active in response to the results of the discussion.

The CORE model learning makes students active in building their knowledge. Students' mathematical connection abilities are in the high category after the implementation of the CORE model of learning (Yulianto, Rochmad & Dwidayati, 2019; Agustianti & Amelia 2018). The improvement of connection mathematics abilities of students who received the CORE model was better than students who received the model of conventional (Fatimah & Khairunnisah, 2019; Saputra, Said & Defitriani, 2019; Prasetyo, Syaban & Irmawan, 2018). On the other hand, Dolores-Flores, Rivera-López & García-García (2019) stated that procedural and conceptual knowledge play a necessary role in connections of mathematics and are positively correlated. This correlation can be developed through teaching to improve students' mathematical understanding ability.

Mathematical connection ability test questions about the relationship of mathematics with everyday life where students are required to make mathematical models and calculate the sold-out economy class tickets, as shown in Figure 3.

A football match at the Asian Games will be held at the Jalak Harupat Stadium. The organizers provided 500 tickets consisting of economy class tickets and first-class tickets. The price of one ticket for economy class is Rp. 60,000,- and for the main class is Rp. 80,000,. After the match is over, the committee calculates the sales proceeds. The total proceeds from the sale of economy class and first-class tickets are Rp. 33.600.000,- . determine:

a. the mathematical model
b. how many economy class tickets were sold??

Figure 3. Mathematical connection ability questions

The analysis of students' answers to the problem of mathematical connection ability on how to determine the mathematical model and how many economy class tickets were sold out is shown in Figures 4.

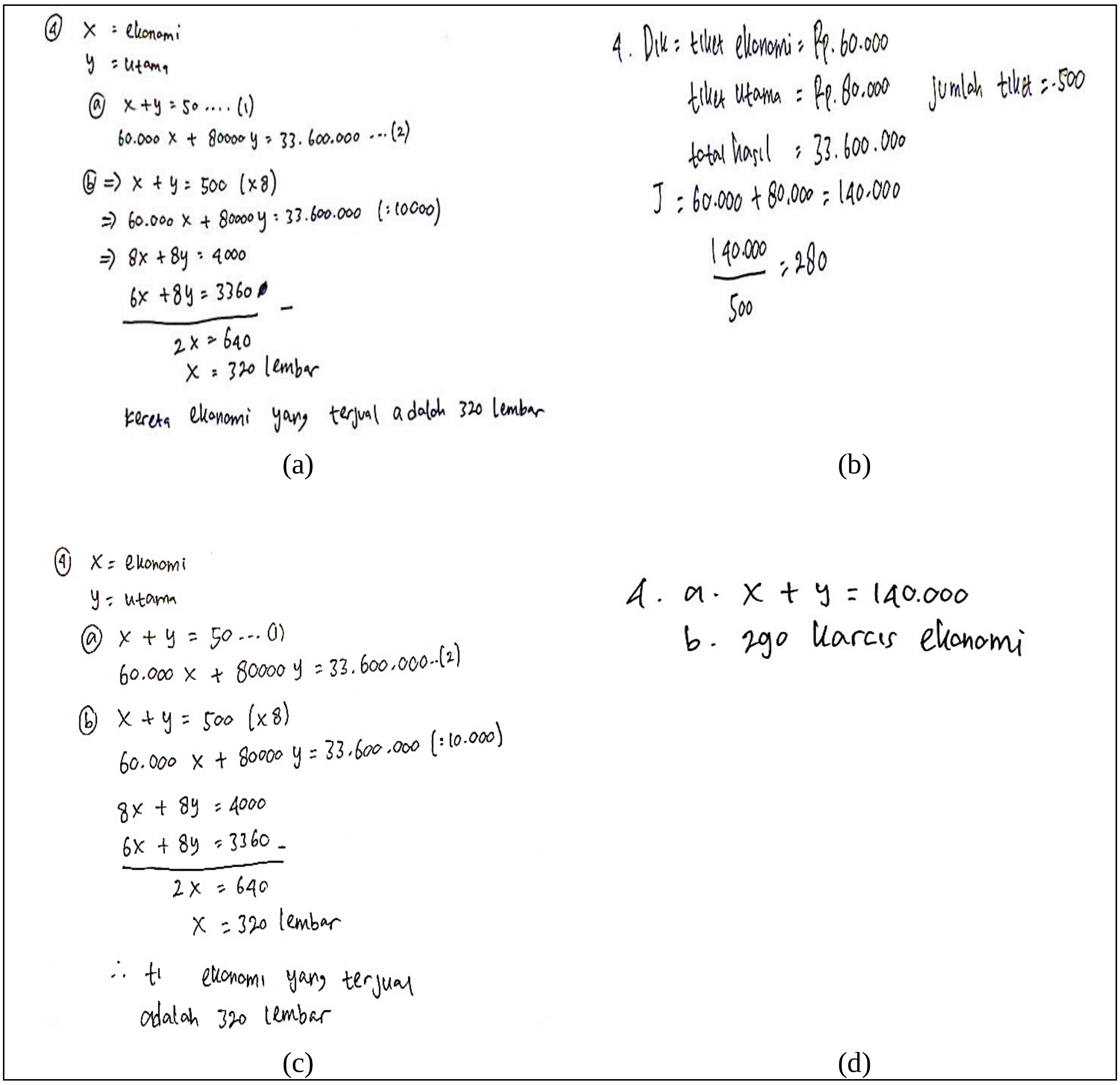

Figure 4. Student's solution to the problem of mathematical connection

Figure 4 shows shows students' solutions in different classes. Students in CORE class are able to make mathematical models as shown in Figure 4a, while students in conventional class are only superior students who can make mathematical models as shown in Figure 4c, but there are low-level students who cannot make mathematical models as shown in Figure 4d. Excellent students in the CORE and conventional classes have been able to represent sentences into mathematical notation, but lower grade students have not been able to do it, but the lower grade students in the CORE class have been able to write down what they knew on the questions as shown in Figure 4b. Overall, students in the CORE class CORE is better than conventional classes, judging from its achievement on indicators that relate mathematics to everyday life, especially when making a mathematical model of a problem. In line with that, the mathematical connection ability of students who received CORE learning was better than students who received conventional learning (Wahyuni, Mariyam & Kumang, 2019; Khaulah, 2019).

Mathematical Disposition

Table 3. Mathematical disposition data analysis

	Class	Average	Test Value T-Test	Conclusion
Postest	Experiment	79.92	0,032	Significantly Different
	Control	77.05		

Based on the results obtained (as shown in Table 3), the average score of the experimental class students' mathematical disposition is better than the control class. The difference in the disposition of mathematics of students who use learning with the CORE model and students who use learning of conventional is due to the ability of individuals in the experimental class to have confidence in the results they get, while in the control class they have low confidence that they will get good grades. The disposition of mathematics of students who got the CORE model was better than students who got learning of conventional (Ramadhani & Kusumah, 2020; Yaniawati et al., 2019). The achievement of the disposition of mathematics of students with high, medium, and low KAM has a significant difference. High KAM students have the best productive disposition, followed by moderate and low KAM students (Supianti, Zakiyah & Agustian, 2021). The CORE learning model is appropriate for groups of students with high mathematical dispositions (Irawan & Iasha, 2021). When observing and solving problems in groups students can see the relationship between learning mathematics and everyday life so that it can increase students' curiosity, interest in mathematics and change mathematics from rote subjects to applied subjects (Putri & Syarifuddin, 2019), due to an increase in students' curiosity and interest in learning mathematics the mathematical disposition also increases.

Mathematical Disposition and Connection Ability Correlation.

Table 4. Correlation of connection ability with students' mathematical disposition

		Value Connection Mathematical	Scale Mathematical Position
Value Connection Mathematical	Pearson Correlation	1	.104
	Sig. (2-tailed)		.542
	N	37	37
Scale Mathematical Position	Pearson Correlation	.104	1
	Sig. (2-tailed)	.542	
	N	37	37

Table 4 depicts the correlation test, it pointed that the obtained significance value is 0.542 > 0.05 so there is no relationship between disposition of mathematics and students' connection of mathematics abilities. From the outcomes of the calculation analysis with the correlation test, it was found that there was no relationship between mathematical connection abilities and students' mathematical dispositions. The high ability of students' mathematical connection does not cause their mathematical disposition to be also high. Students have a good increase in mathematical connection skills but lack self-confidence in trying to solve math problems, causing a low relationshipbetween student's mathematical connection abilities and dispositions. Even so based on interviews with students who have high connection of mathematics abilities when asked, "Are you able to convey the results of group discussions well?" Then the students answered that they did not have confidence in conveying the results of the discussion in front of their classmates. However, the mathematical connection is positively correlated with student learning independence (Yaniawati, Kariadinata, Kartasasmita, & Sari, 2017) and strategicintelligence (Muhammad & Faris, 2021). Early mathematical ability is also positively correlated with HOTS (Mathematical Connection) (Yaniawati, 2013).

Observation Results

Based on the results of observations of teacher activities during learning takes place in the classroom using the CORE Model. There is an assessment with an ideal score of 20. However, the teacher's activities have not fully achieved the ideal score. In the statement regarding guiding students to actively ask questions, the percentage reaches 85% with a total score of 17. Because in learning using the CORE model which focuses on solving problems, students are active in asking questions. In practice learning, the CORE model is student-centered where students seek solutions and build their knowledge (Saregar, Cahyanti, Misbah, Susilowati, Anugrah, & Muhammad, 2021). However, in the statement regarding time management for problem solving, teacher activity reaches the lowest percentage, reaching 55%, this is due to ineffectiveness in managing time so that problem solving cannot be carried out properly. Then the statement about reflection becomes hampered due to lack of time to convey to students.

The data from the observation of student activities, that the dominant activity carried out by students is contained in statements regarding asking the teacher if there are things that are not understood about the subject matter and questioning the idea of solving problems, where the percentage reaches 75% with a score of 15. Because with the questions both from students to teachers or students to students asking things that have not been understood are very useful for students in an effort to solve a problem. So that students who initially do not understand the material will most likely understand if they ask questions and activities in the class look more active. By asking questions, students will be encouraged to participate in discussions, argue, develop thinking skills and be able to draw conclusions. The CORE model emphasizes the construction of new information on existing information (Maknun, 2015).

There is a decrease in student activity, namely students do not discuss with their group friends about the material being studied and provide responses to questions posed by their friends. This decrease was because the observer considered that students were discussing not about the subject matter but discussing other things outside the subject matter. However, based on interviews, in general learning using the CORE learning model is more interesting, especially at the group discussion stage, they can exchange ideas or opinions with their group friends, and during presentations they can exchange ideas and express opinions to colleagues between groups. While in the control class, the learning is carried out with the teacher explaining beforehand so that the learning activities seem one-way and there is no interesting impression from the class that uses conventional learning. The CORE learning model is designed to improve students' thinking skills, participate actively in learning discussions and reflections, change students' thinking that mathematics is an interesting and not boring subject (Jahring, 2020).

Interview Result

From the results of interviews, in general learning using the CORE learning model is more interesting, especially at the group discussion stage, they can exchange ideas or opinions with their group friends, and make presentations because they can work together and also exchange ideas and express opinions to colleagues between groups. The CORE learning model can increase learning interest and understanding of mathematical concepts (Azizah, Surahmat & Walida, 2020), learning motivation (Triyanti, et al., 2019), and student learning outcomes (Muizaddin & Santoso, 2016). Whereas in conventional classes, learning is carried out with the teacher explaining in advance so that learning activities seem one-way without an interesting impression. Learning using the CORE learning model is more daring in working on difficult questions because they feel challenged, while in the control class they do not dare to work on difficult questions because they do not understand and are afraid of being wrong. CORE learning is effective in achieving problem-solving abilities and students' self-confidence (Anggraini, Kartono & Veronica, 2015). Increasing the mathematical self-efficacy of students who get learning the CORE model with a scientific approach is better than students who get ordinary learning (Deswita, 2020).

CONCLUSION

Based on the results of the study, the conclusions that can be drawn are as follows: the improvement of students' connection of mathematics skills whogot the CORE model of learning is better than learning of conventional, this can be observed from the indicators of connection mathematics abilities which include the relationship between topics in mathematics, the relationship between mathematics topics and other fields of science, and mathematical relationships. witheveryday life; The disposition mathematics of students who got the CORE model of learning is better than learning of conventional, this can be observed from the indicators of disposition of mathematics which include self-confidence, flexibility, perseverance in doing math tasks, showing interest, curiosity, and inventiveness, reflection, respect application of mathematics, and appreciate the role of mathematics; there is no correlation between connection skills and students' disposition of mathematics.

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